DR. A P J ABDUL KALAM UNIVERSITY, INDORE

SYLLABUS

of

MASTER OF TECHNOLOGY (DIGITAL COMMUNICATION)

Department of Electronics & Communication

(First Year)

(Session July- December 2016)

College of Engineering

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Master of Technology (Digital Communication)

Department of Electronics & Communication

List of Subject (First Year)

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Unit 1

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 2

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 3

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 4

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

Unit 5

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.

References:

[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] Numerical Solution of Differential Equation by M. K. Jain.
[5] Numerical Mathematical Analysis By James B. Scarborogh.
[6] Fuzzy Logic in Engineering by T. J. Ross.

Unit 1: Digital Cellular Mobile System

Introduction to Mobile communication system. GSM, The European TDMA Digital cellular standard. IS-136 the North American TDMA, PDC the Japanese TDMA, IS-95 The North American COMA.

Unit 2: IMT -2000 Third Generation Mobile Communication System

Introduction 2.5G TDMA Evolution Path, GPRS Technology, EDGE Technology, 2.5G CDMA one cellular N/W, Need of 3G Cellular N/w, IMT 2000 Global Standard, UNITS Technology, W-CDMA Aire interface, TD-SCDMA Technology, CDMA 2000 Cellular Technology.

Unit 3: Cellular Antenna System Design Consideration

Antenna characteristics, Antennas at cell cite, Mobile Antennas, Design of Omni – directional, Antenna cellular system, Design of Directional Antenna cellular system.

Unit 4: Equalisation, Diversity and channel coding

Fundamentals of Equalization, Algorithms for adaptive equalization, Diversity Techniques, RAKE Recivers, Fundamental of channel coding.

Unit 5: Intelligent Cell concept and application

Intelligent cell concept, Application of intelligent Microcell systems, In building communication, CDMA Cellular Radio Network

References:

[1] Mobile and Personal Communication System & service by Raj Pandya Prentice-Hall of India (PHI) Private Limited.
[2] Wireless Communication by T.L. Signal, Tata McGraw Hill Publication.
[3] Wireless Communication Principles & Practice by Rappaport Theodore S., Pearson education 2nd edition.

Unit 1:

Review of 8-Bit and 16-bit microprocessor, support chips and interfacing techniques, single chip micro-computers, architecture, program and data memory, ports, input Output interfacing and programming.

Unit 2:

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 3:

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

Unit 4:

ATMEL 89C51/52 and PIC micro-Controllers- Case studies. Design and application of Micro-Controller in Data acquisition, Embedded controllers, Process control etc.

Unit 5:

DSP Processor architecture and sample design using TI – DSP.

References

[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.

Sub Code: MTDC104 Sub Name: Digital Signal Processing & Its Application 4 Credits

Unit 1: Review of Digital Signal Processing

A typical real-time DSP system**.** DFT, its computation (DIT & DIF algorithms), & important Properties**.** FIR filter design– Window & frequency sampling method**.** IIR filter design – Impulse invariant & Bilinear z-transform method**,** Realization structures for FIR & IIR filters.

Unit 2: Multirate DSP

Introduction & concept of multirate processing. Design of practical sampling rate converters**.** Sample rate conversion using polyphase filter structure.

Unit 3: Spectrum estimation & analysis

Introduction, Principles of spectrum estimation, Traditional methods. Modern parametric estimation methods**.** Autoregressive spectrum estimation.

Unit 4: General- and special-purpose digital signal processors

Introduction, Computer architecture for signal processing. General purpose digital signal processors. Selecting digital signal processors. Special purpose DSP hardware.

Unit 5: Analysis of finite wordlength effect in fixed-point DSP systems

Introduction. DSP arithmetic. ADC quantization noise & signal quality. Finite word length effects in IIR & FIR digital filters.

References:

[1] Discrete Time signal Processing by Alan V. Oppenheim, Ronald Schafer, Pearson Education.

[2] Digital Signal Processing, A Practical Approach by Emmanuel C. Ifeachor, Barrie W. Jervis, Pearson Education.

[3] Digital Signal Processing, Principles, algorithms and applications - J. Proakis, D. G. Manolakis D. Sharma, Pearson Education.

[4] Digital Signal Processing, S. K. Mitra, Tata McGraw Hill Publication 2001.

[5] Fundamentals of Digital Signal Processing using MATLAB- Robert Schilling, Sandra Harris, Cengage Learning.

Unit 1:

Data Communications and Networks Overview: Data Communications Model Communication Tasks, Basic concepts of Networking and Switching, Networking configurations, Protocols and Architecture, Key Elements of a Protocol, Protocols in Simplified Architecture, Protocol Data Units (PDU), Operation of a Protocol Architecture, Operation of a Protocol Architecture, Standardized Protocol Architectures, OSI and TCP/IP Architectures, Comparisons between OSI and TCP/IP, TCP/IP Addressing Concepts, concepts of Frequency, Spectrum and Bandwidth, Modem, Codec and Shannon Capacity.

Unit 2:

Line Configuration, Interfacing, Characteristics of Physical Layer Interface, Flow Control, Sliding Window Flow Control, Error control, CRC, ARQ Protocols, Data Link Control, Bit stuffing, HDLC Operation; Hierarchy of FDM schemes, WDM Operation, TDM Link Control, Hierarchy of TDM, DS-1 Transmission Format, SONET/SDH Frame Formats. Asymmetrical Digital Subscriber Line, xDSL.

Unit 3:

Circuit Switching and Packet Switching: Circuit Switching concepts, Circuit Switching applications, Circuit Switch Elements, Three Stage Space Division Switch, Blocking and Nonblocking switching, Time Division Switching, Control Signaling Functions, In Channel Signaling, Common Channel Signaling, Introduction to Signaling System Number 7 (SS7), Packet Switching Principles, Datagram and Virtual Circuit switching, Effects of variable packet size, X.25, X.25 Protocol Control Information. Routing: Routing in Circuit Switched Network, Routing in Packet Switched Network, Routing Strategies, Least Cost Algorithms, Bellman-Ford Algorithm.

Unit 4:

LAN Architecture. Topologies, Choice of Topology, Ring and Star Usage, MAC and LLC, Generic MAC Frame Format, Bridge, Bridge Operation, Bridges and LANs with Alternative Routes, Spanning Tree, Loop resolution in bridges, Hubs, Two Level Star Topology, Layer 2 Switches, Wireless LAN, Multi cell Wireless LANs, IEEE 802.11 Architecture, IEEE 802.11 Medium Access Control logic.

Unit 5:

ATM, Architecture of ATM, Congestion Control and Quality of Service in ATM. Internetworking, IPv4, IPv6 comparison , Transport layer protocols, UDP Operation, TCP features, Flow Control, Error Control, Congestion Control, Network Management System, Security in the Internet, IP Security, Firewalls.

References:

[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] William Stallings, "Data and Computer Communications", Eigth Edition, Pearson Prentice Hall, 2007.

[5] Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, Tata Mc Graw Hill, 2007.

Suggested List of Experiments:

1. Write a program for LCD INTERFACING in 8051 Microcontroller.
2. Write an 8051 C program to send letters 'M', 'D', and 'E' to the LCD using the busy flag method.
3. Write a program for Key Board INTERFACING in 8051 Microcontroller.
4. Write a program to get data from PA and send it to both B and C.
5. In MATLAB Determine the discrete-time Fourier transform of x(n) = $(0.5)^n$ u(n). The sequence x(n) is absolutely summable; therefore its discrete-time Fourier transform exists
6. In MATLAB Let $x(n) = 2^n, -10 \leq n \leq 10$ investigate the conjugate symmetry property of its discrete-time Fourier transform.
7. In MATLAB
   To verify the conjugate property. Let $x(n)$ be acomplex-valued random sequence over $-5 \leq n \leq 10$ with real and imaginary parts uniformly distributed between [0, 1].
8. In MATLAB, To verify symmetry-property of real signal. Let $x(n) = sin(\pi n/2),\ -5 \leq n \leq 10$. Compute the even and odd part of $x(n)$.
9. To perform a Decimation Operation Using MATLAB.
10. To perform a IIR Low pass filter Using MATLAB.

Suggested List of Experiments:

1. To study of CMOS fabrication process.
2. To study of N Well process.
3. To study of Advanced CMOS Fabrication Technologies.
4. To study of Ethernet and Wireless LAN.
5. To study of FDM & WDM & TDM
6. To study of switching techniques.
7. Second-Generation Mobile Phones: Digital Voice techniques
8. To study of broadband wireless, Bluetooth

Unit-I

Introduction: Syntactic and semantic rules of a Programming language, Characteristics of a good programming language, Programming language translators compiler & interpreters , Elementary data types – data objects, variable & constants, data types, Specification & implementation of elementary data types, Declarations ,type checking & type conversions , Assignment & initialization, Numeric data types, enumerations, Booleans & characters.

Unit-II

Structured data objects, Subprograms and Programmer Defined Data Type : Structured data objects & data types , specification & implementation of structured data types, Declaration & type checking of data structure ,vector & arrays, records Character strings, variable size data structures , Union, pointer & programmer defined data objects, sets, files. Evolution of data type concept, abstraction, encapsulation & information hiding, Subprograms, type definitions, abstract data types.

Unit-III

Sequence Control and Data Control: Implicit & explicit sequence control, sequence control within expressions, sequence control within statement, Subprogram sequence control: simple call return, recursive subprograms, Exception & exception handlers, co routines, sequence control. Names & referencing environment, static & dynamic scope, block structure, Local data & local referencing environment, Shared data: dynamic & static scope. Parameter & parameter transmission schemes.

Unit-IV

Storage Management, Programming languages: Major run time elements requiring storage, programmer and system controlled storage management & phases, Static storage management, Stack based storage management, Heap storage management, variable & fixed size elements. Introduction to procedural, non-procedural, structured, functional and object oriented programming language, Comparison of C & C++ programming languages.

Unit-V

Brief History of C, C is middle-level Language. C is a Structured Language, Complier Vs Interpreters, The Form of a C Program. Library & Linking, Compilation & Execution of C. Program on Dos & Unix 2 Variables, Data Types, Operator & Expression Character Set C Token Identifier & Keyword Constant Integer, Floating Point, Character, String, Enumeration Data Types in C Data Declaration & Definition Operator & Expression Arithmetic, Relational, Logical, Increment & Decrement, Bit wise, Assignment, Conditional Precedence & Associability of Operators.

Reference:

[1] Programming languages Design & implementation by T.W. Pratt, 1996, Prentice Hall Pub.

[2] Programming Languages – Principles and Paradigms by Allen Tucker & Robert Noonan, 2002, TMH.

[3] Fundamentals of Programming languages by Ellis Horowitz, 1984, Galgotia publications (Springer Verlag).

[4] Programming languages concepts by C. Ghezzi, 1989, Wiley Publications.

[5] Programming Languages – Principles and Pradigms Allen Tucker , Robert Noonan 2002, TMH.

Unit-I

Introduction to Simulation: System and System environment, Components of system, Type of systems, Type of models, Steps in simulation study, Advantages and Disadvantages of simulation. Simulation Examples: Simulation of Queueing systems, other examples of simulation. General Principles: Concepts of discrete event simulation, List processin. Simulation Software: History of simulation software, Desirable software features, General-purpose simulation packages, Object oriented simulation, Trends in simulation software.

Unit-II

Statistical Models in Simulation: Useful statistical model, discrete distribution, Continuous distribution, Poisson process, and Empirical distribution. Queueing Models: Characteristics of Queueing systems, Queueing notations, Long run measures of performance of Queueing systems, Steady state behavior of infinite population Markovian models, Steady state behavior finite population model, Network of Queues. Random Number Generation: Properties of random numbers, Generation of pseudo random numbers, Techniques for generating random numbers, Tests for random numbers.

Unit-III

Random Variate Generation: Inverse transforms technique, Convolution method, Acceptance rejection techniques. Input Modeling: Data Collection, Identifying the Distribution of data, Parameter estimation, Goodness of fit tests, Selection input model without data, Multivariate and Time series input models..Verification and Validation of Simulation Model: Model building, Verification, and Validation, Verification of simulation models, Calibration and Validation of models.

Unit-IV

Output Analysis for a Single Model: Types of simulations with respect to output analysis, stochastic nature of output data, Measure of performance and their estimation, Output analysis of terminating simulators, Output analysis for steady state simulation.

Unit-V

Comparison and Evaluation of Alternative System Design: Comparison of two system design, Comparison of several system design, Meta modeling, Optimization via simulation. 13.Case Studies: Simulation of manufacturing systems, Simulation of computer systems, Simulation of super market, Simulation of pert network.

Reference:

[1] Jerry Banks, John Carson, Barry Nelson, David Nicol, Discrete Event System Simulation.

[2] Averill Law, W. David Kelton, Simulation Modeling and Analysis, McGRAW-HILL.

[3] Geffery Gordon, System Simulation, PHI.

[4] Narsing Deo, System Simulation with Digital Computer, PHI

[5] Donald W. Body, System Analysis and Modeling, Academic Press Harcourt

[6] Bernard Zeigler, Herbert Praehofer, Tag Gon Kim, Theory of Modeling and Simulation, Academic Press.

Unit-I

The basic concepts of network engineering, concept and model of network engineering System Integration approach of network engineering system integration model of System Integration Document management of System Integration, bidding for network engineering projects.

Unit-II

Configure an Ethernet Switch : Be familiar with the basic functions of a switchboard, Configuring the layer two switches to implement the VLAN function Configuration of routers and layer three switches realizing communication between VLAN host basic principle of spanning tree and configuration of spanning tree protocol Configure the link aggregation of switchboard connection between switchboard.

Unit-III

Structured cabling system and room design: Conception and system constitution of integrated wiring system Design of integrated wiring project Design of network room Router configuration: Be familiar with basic router configuration Configure the router's routing function WAN port configuration Network engineering cases

Unit-IV

Enterprise network design Designing a network topology IP address planning Select the routing protocol Select the network management protocol and system Case: design a large-scale campus network Design of network security Select the network security mechanism Select the data backup and fault-tolerant technology Design of network security solution.

Unit-V

Configure common intranet server An introduction of common services of Intranet.DHCP, WWW, FTP server configuration Network address translation and Internet connection sharing Maintenance and acceptance test: Fault diagnosis and elimination methods Ping, test utility Ipconfig and Winipcfg Netstat and Nbtstat Tracert and Pathpin.

Reference:

[1] Chen Ming, , network engineering design tutorial ---System Integration, China Machine Press

[2] Hou Zhongai, LAN networking technology, post and Telicomm Press.

[3] Zhang Jingfeng, LAN technology and network engineering Training Course, China Water & Power Press

Unit-I

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system, overview of generations of cellular systems.

Unit-II

Elements of Cellular Radio Systems Design and interference: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an Omni directional antenna system, cell splitting, consideration of the components of cellular systems, introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects.

Unit-III

Cell Coverage for Signal & antenna structures: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model-characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Unit-IV

Introduction Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage- Launching Procedures -launch vehicles and propulsion. Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Brocast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption.

Unit-V

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

Reference:

[1] C. Y. Lee and William, "Mobile Cellular Telecommunications", 2nd Ed, McGraw Hill. 2001

[2] Mischa Schwartz, "Mobile Wireless Communications", Cambridge Univ. Press, UK, 2005.

[3] Mobile Communication Hand Book", 2nd Edition, IEEE Press. 2002

[4] Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.

[5] Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2007.

[6] N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.

[7] Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech House Bostan London, 1997.

[8] Tri T. Ha, 'Digital Satellite Communication', II edition, 1990.

[9] Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984.

[10] Robert G. Winch, 'Telecommunication Trans Mission Systems', McGraw-Hill Book Co., 1983.

[11] Brian Ackroyd, 'World Satellite Communication and earth station Design', BSP professional Books, 1990.

[12] G.B.Bleazard, 'Introducing Satellite communications NCC Publication, 1985.

[13] M.Richharia, 'Satellite Communication Systems-Design Principles",Macmillan 2003

[14] Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons (Asia) Pvt. Ltd, 2nd Edition 2004

UNIT I OPTICAL SYSTEM COMPONENTS

Light propagation in optical fibers-Loss& Bandwidth, System limitations, Non-Linear effect, Solitons, Optical Network Components- Couplers, Isolators & Circulators, Multiplexers & Filters Optical Amplifiers, Switches Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES

Introduction to Optical Networks; WDM networks , SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks- Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture. WOBAN and OTDM networks.

UNIT III WAVELENGTH ROUTING NETWORKS

The Optical layer, Node Designs, Optical layer cost tradeoff, Routing and Wavelength Assignment algorithms, Virtual Topology design, Architectural variations.

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS

Photonic Packet Switching – OTDM , Multiplexing and De multiplexing, Synchronization, Broadcast OTDM networks, Switch based networks; Access Networks- Network Architecture overview , Future Access Networks, Optical Access Network Architectures.

UNIT V NETWORK DESIGN AND MANAGEMENT

Transmission system Engineering-system model, Power penalty-transmitter, receiver, Optical amplifiers, crosstalk, dispersion, wavelength stabilization; overall design consideration; Control and Management-Network management functions, Configuration management, Performance management, Fault management. Optical safety, Service interface.

REFERENCES:

1. Rajiv Ramaswami and Kumar N.Sivarajan, “Optical Networks: A Practical Perspective”, Harcourt Asia Pvt Ltd., Second Edition 2004.

2. C.Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks: Concept, Design and Algorithms”, PHI, 1st Edition, 2002.

3. P.E.Green, jr., "Fiber Optical Networks", Prentice Hall, New Jersey, 1993.

Suggested List of Experiments:

1. Write an algorithm to delete an element from a binary search tree.
2. Write a c program for sorting the elements by bubble sort.
3. Write a C program for sorting the elements by heap sort.
4. Write algorithm for insertion sort. How many key comparisons are made in its worst case?
5. Write algorithms to perform various operations on list.
6. Write down the non-recursive algorithm for preorder traversal of a binary tree.
7. Write an algorithm for inserting a node in an AVL tree.
8. Write a program to find out the largest and smallest elements in an array.
9. Study of assembler and compiler.

Sub Code: MTDC207 Sub Name: Lab IV (Modeling & Simulation of Computer) 6 Credits

Suggested List of Experiments:

1. To study of Discrete event system simulation.
2. To study of modeling of system and type of models discrete event system simulation.
3. To study of Simulation of Queuing Systems.
4. To study of discrete distributions, continuous distributions.
5. To study of Characteristics of queuing system transient.
6. To study of validation of simulation models.