JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. (ELECTRONICS AND COMMUNICATION ENGINEERING/ DIGITAL ELECTRONICS AND COMMUNICATION ENGINEERING/ DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS)
COURSE STRUCTURE AND SYLLABUS

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Digital System Design	25	75	4	--	4
Core Course II	VLSI Technology and Design	25	75	4	--	4
Core Course III	Advanced Data Communications	25	75	4	--	4
Core Elective I	Detection and Estimation Theory Embedded System Design Advanced Digital Signal Processing	25	75	4	--	4
Core Elective II	Internetworking Advanced Computer Architecture Real Time Operating Systems	25	75	4	--	4
Open Elective I	Spread Spectrum Communication Advanced Communications and Networks Virtual instrumentation	25	75	4	--	4
Laboratory I	Digital Signal Processing Lab	25	75	--	4	2
Seminar I	Seminar	50	--	--	4	2
Total Credits				**24**	**8**	**28**

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Coding Theory and Techniques	25	75	4	--	4
Core Course V	Digital Signal Processors and Architectures	25	75	4	--	4
Core Course VI	Wireless Communications and Networks	25	75	4	--	4
Core Elective III	Speech Signal Processing Biomedical Signal Processing Radar Signal Processing	25	75	4	--	4
Core Elective IV	Network Security And Cryptography Wireless MIMO Communications. Optical Communications Technology	25	75	4	--	4
Open Elective II	Image and Video Processing Software Defined Radio Adhoc Wireless Networks	25	75	4	--	4
Laboratory II	Advanced Communications Lab	25	75	--	4	2
Seminar II	Seminar	50	--	--	4	2
Total Credits				**24**	**8**	**28**

II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review I	50	--	--	24	12
Total Credits			--	24	**16**

II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review II	50	--	--	8	4
Project Evaluation (Viva-Voce)	--	150	--	16	12
Total Credits			**--**	**24**	**16**

DIGITAL SYSTEM DESIGN

UNIT -I:
Minimization and Transformation of Sequential Machines: The Finite State Model – Capabilities and limitations of FSM – State equivalence and machine minimization – Simplification of incompletely specified machines.
Fundamental mode model – Flow table – State reduction – Minimal closed covers – Races, Cycles and Hazards.

UNIT -II:
Digital Design: Digital Design Using ROMs, PALs and PLAs, BCD Adder, 32 – bit adder, State graphs for control circuits, Scoreboard and Controller, A shift and add multiplier, Array multiplier, Keypad Scanner, Binary divider.

UNIT -III:
SM Charts: State machine charts, Derivation of SM Charts, Realization of SM Chart, Implementation of Binary Multiplier, dice game controller.

UNIT -IV:
Fault Modeling & Test Pattern Generation: Logic Fault model – Fault detection & Redundancy- Fault equivalence and fault location –Fault dominance – Single stuck at fault model – Multiple stuck at fault models –Bridging fault model.
Fault diagnosis of combinational circuits by conventional methods – Path sensitization techniques, Boolean Difference method – Kohavi algorithm – Test algorithms – D algorithm, PODEM, Random testing, Transition count testing, Signature analysis and test bridging faults.

UNIT - V:
Fault Diagnosis in Sequential Circuits: Circuit Test Approach, Transition Check Approach – State identification and fault detection experiment, Machine identification, Design of fault detection experiment

TEXT BOOKS:
1. Fundamentals of Logic Design – Charles H. Roth, 5th Ed., Cengage Learning.
2. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman- John Wiley & Sons Inc.
3. Logic Design Theory – N. N. Biswas, PHI

REFERENCE BOOKS:
1. Switching and Finite Automata Theory – Z. Kohavi , 2nd Ed., 2001, TMH
2. Digital Design – Morris Mano, M.D.Ciletti, 4th Edition, PHI.
3. Digital Circuits and Logic Design – Samuel C. Lee , PHI

VLSI TECHNOLOGY AND DESIGN

UNIT –I:
Review of Microelectronics and Introduction to MOS Technologies:
MOS, CMOS, BiCMOS Technology. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits:
Ids – Vds relationships, Threshold Voltage VT, Gm, Gds and ωo, Pass Transistor, MOS, CMOS & Bi
CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT –II:
Layout Design and Tools:
Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.
Logic Gates & Layouts:
Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and
Inductive interconnect delays.

UNIT –III:
Combinational Logic Networks:
Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks,
Gate and Network testing.

UNIT –IV:
Sequential Systems:
Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and
testing.

UNIT –V:
Floor Planning:
Floor planning methods, Global Interconnect, Floor Plan Design, Off-chip connections.

TEXT BOOKS:
1.   Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A. Pucknell, 2005,
PHI.
2.   Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.

REFERENCE BOOKS:
1.   Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC
Press, 2011.
2.   Principals of CMOS VLSI Design – N.H.E Weste, K. Eshraghian, 2nd Ed., Addison Wesley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. – I Year –I Sem (ECE /DECE/DECS)

ADVANCED DATA COMMUNICATIONS

Unit I
Data Communications, Networks and Network Types, Internet History, Standards and Administration, Protocol Layering, TCP/IP protocol suite, OSI Model. Digital Data Transmission, DTE-DCE interface.
Data Link Layer
Introduction, Data Link Layer, Nodes and Links, Services, Categories of Links, sub layers,   Link Layer Addressing, Address Resolution Protocol.

Unit II
Error Detection and Correction: Types of Errors, Redundancy, detection versus correction, Coding Block Coding: Error Detection, Vertical redundancy cheeks, longitudinal redundancy cheeks, Error Correction, Error correction single bit, Hamming code.
Cyclic Codes: Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder Using Polynomials, Cyclic Code Analysis, Advantage of Cyclic Codes, Checksum
Data Link Control: DLC Services, Data Link Layer Protocols, HDLC, Point to Point Protocol

Unit III
Switching: Introduction to Switching, Circuit Switched Networks, Packet Switching, Structure of switch
Multiplexing : Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing.
Connecting devices: Passive Hubs, Repeaters, Active Hubs, Bridges, Two Layer Switches, Routers, Three Layer Switches, Gateway, Backbone Networks.
Wired LANS: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Giga bit Ethernet

Unit IV
Media Access Control (MAC) Sub Layer
Random Access, ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA),Controlled Access- Reservation, Polling- Token Passing, Channelization - Frequency Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA).
Spectrum Spreading: Spread Spectrum-Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum.

Unit V
Networks Layer: Packetizing, Routing and Forwarding, Packet Switching, Network Layer Performance, IPv4 Address, Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution(NATF), Forwarding of IP Packets, Forwarding based on Destination Address, Forwarding based on Label, Routing as Packet Switches.
Unicast Routing : Introduction, **Routing Algorithms**-Distance Vector Routing, Link State Routing, Path Vector Routing, **Unicast Routing Protocols**- Routing Information Protocol(RIP), Open Short Path First Version 4.

TEXT BOOKS:
1. Data Communications and Networking - B. A. Forouzan, 5th , 2013,TMH.
2. Data and Computer Communications - William Stallings, 8th ed., 2007, PHI.
REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data Communications and Networking - B. A. Forouzan, 2nd , 2013, TMH.
3. Data Communications and Computer Networks- Brijendra Singh, 2nd ed., 2005, PHI.

DETECTION AND ESTIMATION THEORY
(ELECTIVE - I)

UNIT –I:
Random Processes: Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:
Detection Theory: Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:
Linear Minimum Mean-Square Error Filtering: Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics: Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V:
Estimating the Parameters of Random Processes from Data: Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS:
1. Random Signals: Detection, Estimation and Data Analysis - K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
2. Random Processes: Filtering, Estimation and Detection - Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.

REFERENCE BOOKS:
1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
2. Fundamentals of Statistical Signal Processing: Volume I Detection Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
4. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L.Scharf, 1991, Addison Wesley.
5. Detection, Estimation and Modulation Theory: Part – I – Harry L. Van Trees, 2001, John Wiley & Sons, USA.
6. Signal Processing: Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, Mc Graw Hill.

EMBEDDED SYSTEM DESIGN
(ELECTIVE -I)

UNIT -I:
Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II:
Typical Embedded System:
Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT -III:
Embedded Firmware:
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:
RTOS Based Embedded System Design:
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:
Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:
1.   Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:
1.   Embedded Systems - Raj Kamal, TMH.
2.   Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3.   Embedded Systems – Lyla, Pearson, 2013
4.   An Embedded Software Primer - David E. Simon, Pearson Education.

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M. Tech. – I Year –I Sem (ECE /DECE/DECS)

ADVANCED DIGITAL SIGNAL PROCESSING
(ELECTIVE -I)

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters: Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing: Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Over Sampling A/D and D/A Conversion.

UNIT -III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters: Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:
Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

TEXT BOOKS:
1.   Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2.   Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3.   DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education.

REFERENCE BOOKS:
1.   Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2.   Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3.   Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH
4.   Digital Spectral Analysis – Jr. Marple

INTERNETWORKING
(Core Elective –II)

UNIT -I:
Internetworking Concepts: Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of the Internet, Internet Architecture, Wired LANS, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.
IP Address: Classful Addressing: Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting
Classless Addressing: Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router.
ARP and RARP: ARP, ARP Package, RARP.

UNIT -II:
Internet Protocol (IP): Datagram, Fragmentation, Options, Checksum, IP V.6.
Transmission Control Protocol (TCP): TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.
Stream Control Transmission Protocol (SCTP): SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.
Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.
Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/ Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT -III:
Unicast Routing Protocols (RIP, OSPF, and BGP: Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.
Multicasting and Multicast Routing Protocols: Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT -IV:
Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.
Remote Login TELNET: Concept, Network Virtual Terminal (NVT).
File Transfer FTP and TFTP: File Transfer Protocol (FTP).
Electronic Mail: SMTP and POP.
Network Management-SNMP: Concept, Management Components, World Wide Web- HTTP Architecture.

UNIT -V:
Multimedia: Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.

TEXT BOOKS:
1.   TCP/IP Protocol Suite- Behrouz A. Forouzan, Third Edition, TMH
2.   Internetworking with TCP/IP Comer 6th Edition PHI, Volume -1.

REFERENCE BOOKS:

1.   Mobile Communications, Jochen Schiller, 2nd edition, Pearson Education 2003.
2.   Data Communications & Networking – B.A. Forouzan – 4nd Edition – TMH
3.   High Speed Networks and Internets- William Stallings, Pearson Education, 2002.
4.   Data and Computer Communications, William Stallings, 7th Edition., PEI.
5.   The Internet and Its Protocols – Adrin Farrel, Elsevier, 2005.

ADVANCED COMPUTER ARCHITECTURE
(Core Elective –II**)**

UNIT -I:
Fundamentals of Computer Design: Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law.
Instruction set principles and examples- Introduction, Classifying instruction set- MEmory addressing-type and size of operands, Operations in the instruction set.

UNIT –II:
Pipelines: Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.
Memory Hierarchy Design: Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT -III:
Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.
ILP Software Approach : Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT –IV:
Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism-Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.

UNIT –V:
Inter Connection and Networks: Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.
Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS:
    1. John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

REFERENCE BOOKS:
    1.   John P. Shen and Miikko H. Lipasti - Modern Processor Design : Fundamentals of Super Scalar Processors
    2.   Computer Architecture and Parallel Processing - Kai Hwang, Faye A.Brigs., MC Graw Hill.
    3.   Advanced Computer Architecture - A Design Space Approach - Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson Ed.

REAL TIME OPERATING SYSTEMS
(Core Elective –II)

UNIT – I
Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT -II:
Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency.
Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT -III:
Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT -IV:
Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT -V:
Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS, and Android OS.

TEXT BOOKS:
   1.   Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

REFERENCE BOOKS:
   1.   Embedded Systems- Architecture, Programming and Design - Rajkamal, 2007, TMH.
   2.   Advanced UNIX Programming - Richard Stevens
   3.   Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

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SPREAD SPECTRUM COMMUNICATION
(OPEN ELECTIVE I)

UNIT -I:
Introduction to Spread Spectrum Systems: Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access.
Binary Shift Register Sequences for Spread Spectrum Systems:
Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT -II:
Code Tracking Loops: Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.

UNIT -III:
Initial Synchronization of the Receiver Spreading Code: Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

UNIT -IV:
Cellular Code Division Multiple Access (CDMA) Principles: Introduction, Wide Band Mobile Channel, The Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity,
Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

UNIT -V:
Performance of Spread Spectrum Systems in Jamming Environments: Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding.
Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

TEXT BOOKS:
1.   Rodger E Ziemer, Roger L. Peterson and David E Borth - "Introduction to Spread Spectrum Communication- Pearson, 1st Edition, 1995.
2.   Mosa Ali Abu-Rgheff – "Introduction to CDMA Wireless Communications." Elsevier Publications, 2008.

REFERENCE BOOKS:
1.   George R. Cooper, Clare D. Mc Gillem - "Modern Communication and Spread Spectrum," McGraw Hill, 1986.
2.   Andrew j. Viterbi - "CDMA: Principles of spread spectrum communication," Pearson Education, 1st Edition, 1995.
3.   Kamilo Feher - "Wireless Digital Communications," PHI, 2009.
4.   Andrew Richardson - "WCDMA Design Handbook," Cambridge University Press, 2005.
5.   Steve Lee - Spread Spectrum CDMA, McGraw Hill, 2002.

ADVANCED COMMUNICATIONS AND NETWORKS
(OPEN ELECTIVE I)

UNIT I

Spread Spectrum Communications

Spreading sequences- Properties of Spreading Sequences, Pseudo- noise sequence, Gold sequences, Kasami sequences, Walsh Sequences, Orthogonal Variable Spreading Factor Sequences, Barker Sequence, Complementary Codes

Direct sequence spread spectrum – DS-CDMA Model, Conventional receiver, Rake Receiver, Synchronization in CDMA, Power Control, Soft handoff, Multiuser detection – Optimum multiuser detector, Liner multiuser detection.

UNIT II

Orthogonal Frequency Division Multiplexing

Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, OFDM Signal Mathematical Representation, Selection parameter for Modulation, Pulse shaping in OFDM Signal and Spectral Efficiency, Window in OFDM Signal and Spectrum, Synchronization in OFDM, Pilot Insert in OFDM Transmission and Channel Estimation, Amplitude Limitations in OFDM, FFT Point Selection Constraints in OFDM, CDMA vs OFDM, Hybrid OFDM.

UNIT III

MIMO Systems

Introduction, Space Diversity and System Based on Space Diversity, Smart Antenna system and MIMO, MIMO Based System Architecture, MIMO Exploits Multipath, Space – Time Processing, Antenna Consideration for MIMO, MIMO Channel Modelling, MIMO Channel Measurement, MIMO Channel Capacity, Cyclic Delay Diversity (CDD), Space Time Coding, Advantages and Applications of MIMO in Present Context, MIMO Applications in 3G Wireless System and Beyond, MIMO-OFDM

UNIT IV

Wireless LANs/IEEE 802.11x: Introduction to IEEE802.11x Technologies, Evolution of wireless LANs, IEEE 802.11 Design Issues, IEEE 802.11 Services, IEEE 802.11 MAC Layer operations, IEEE 802.11 Layer1, IEEE 802.11 a/b/g Higher Rate Standards, Wireless LAN Security, Computing Wireless Technologies, Typical WLAN Hardware

UNIT V

Wireless PANs/IEEE 802.15x: Introduction to IEEE 802.15x Technologies,

Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link Controllers Operational States, IEEE 802.15.1 Protocols and Host Control Interface. Evaluation of IEEE 802.15 Standards

Broad Band Wireless MANs/IEEE 802.16x

Introduction to WMAN/IEEE 802.16x Technology, IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details, IEEE 802.16 Physical Layer Details, IEEE 802.16 Physical Layer Details for 2-11 GHz, IEEE 802.16 Common System Operations.

Text Books

1. Introduction to Wireless Telecommunications Systems and Networks – Gary J. Mullett, CENGAGE
2. Wireless Communication-Upena Dalal, Oxford University Press, 2009

References

1. Wireless Communication System –Ke-Lin Du & M N S Swamy, Cambridge University Press, 2010
2. Mobile Cellular Communication - Gottapu Sasibhusan Rao, PEARSON

VIRTUAL INSTRUMENTATION

UNIT- I
Virtual Instrumentation: An introduction
Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI,
Real-time systems.

UNIT- II
VI programming techniques:
VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT- III
Data acquisition basics:
 Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

UNIT -IV
VI Interface requirements:
Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT- V
VI toolsets:
Distributed I/O modules. Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

TEXTBOOKS
1. LabVIEW Graphical Programming , Gary Johnson, Second edition, McGraw Hill, Newyork, 1997.
2. LabVIEW based Advanced Instrumentation Systems, S. Sumathi and P. Surekha, Spinger.

REFERENCES
1. PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Kevin James, Newnes, 2000.
2. WEB RESOURCES: www.ni.com.
3.LabVIEW for everyone, Lisa K. wells & Jeffrey Travis Prentice Hall, New Jersey, 1997.

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DIGITAL SIGNAL PROCESSING LAB

Note:

    A. Minimum of 10 Experiments have to be conducted

    B. All Experiments may be Simulated using MATLAB and to be verified theoretically.

1. Basic Operations on Signals, Generation of Various Signals and finding its FFT.
2. Program to verify Decimation and Interpolation of a given Sequences.
3. Program to Convert CD data into DVD data
4. Generation of Dual Tone Multiple Frequency (DTMF) Signals
5. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods
6. Estimation of Power Spectrum using Bartlett and Welch methods
7. Verification of Autocorrelation Theorem
8. Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation
9. Estimation of data series using Nth order Forward Predictor and comparing to the Original Signal
10. Design of LPC filter using Levinson-Durbin Algorithm
11. Computation of Reflection Coefficients using Schur Algorithm
12. To study Finite Length Effects using Simulink
13. Design and verification of Matched filter
14. Adaptive Noise Cancellation using Simulink
15. Design and Simulation of Notch Filter to remove 60Hz Hum/any unwanted frequency component of given Signal (Speech/ECG)