JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU (A.P.)
COURSE STRUCTURE AND SYLLABUS
(For Affiliated Engineering Colleges w.e.f. 2017-18 Admitted Batch)
M.Tech -ECE-Digital Electronics and Communication Systems (DECS)

M.Tech I Semester

S.No	Subject Code	Subject	L	T	P	C
1.	17D06101	Structural Digital System Design	4	-	-	4
2.	17D38101	Error Control Coding	4	-	-	4
3.	17D38102	Digital Communication Techniques	4	-	-	4
4.	17D06108	Advanced Digital Signal Processing	4	-		4
5.	17D06105 17D06210 17D38103	**Elective-I** a. Advanced Operating Systems b. Low Power VLSI Design c. Advanced Computer Architecture	3	-	-	3
6.	17D38104 17D38105 17D38106	**Elective-II** a. Transform Techniques b. Statistical Signal Processing c. Spread Spectrum Communication	3	-	-	3
7.	17D38107	Structural Digital System Design Lab	-	-	3	2
8.	17D38108	Advanced Digital Signal Processing Lab	-	-	3	2
		TOTAL	**22**	**-**	**06**	**26**

M.Tech II Semester

S.No	Subject Code	Subject	L	T	P	C
1.	17D06201	Embedded System Design	4		-	4
2.	17D06209	Digital Image and Video Processing	4		-	4
3.	17D06204	Sensors and Actuators	4		-	4
4.	17D38201	Wireless Communications and Networks	4			4
5.	17D38202 17D38203 17D38204	**Elective-III** a. Internet of Things b. Speech Processing c. Software Defined Radio	3		-	3
6.	17D06208 17D38205 17D38206	**Elective-IV** a. Network Security & Cryptography b. Wireless Adhoc Networks c. Optical Communication Technology	3		-	3
7.	17D38207	Advanced Communication Systems Lab	-		3	2
8.	17D38208	Embedded System Design Lab	-		3	2
		TOTAL	**22**		**06**	**26**

M.Tech. II YEAR (III Semester)

S. No	Course Code	Subject	L	T	P	C
1.	17D20301 17D20302 17D20303	Elective – V (Open Elective) 1. Research Methodology 2. Human Values & Professional Ethics 3. Intellectual Property Rights	4	---	---	4
2.	17D38301	ELECTIVE – VI (MOOCs)	--	---	---	--
3.	17D38302	Comprehensive Viva Voce	--	---	---	2
4.	17D38303	Seminar	--	---	---	2
5.	17D38304	Teaching Assignment	--	---	---	2
6.	17D38305	Project Work Phase I	--	---	---	4
		Total	4			14

M.Tech. II YEAR (IV Semester)

S. No	**Course Code**	**Subject**	**L**	**T**	**P**	**C**
1.	17D38401	Project Work Phase II	--	---	---	12
		Total				**12**

Project Viva Voce Grades:

A: Very Good

B: Good

C: Satisfactory

D: Not Satisfactory

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M.Tech I year I Semester (DECS)

L	T	P	C
4	0	0	4

(17D06101) STRUCTURED DIGITAL SYSTEM DESIGN

Course Objective:

- To study about structural functionality of different Digital blocks (Both Combinational and Sequential)
- To provide an exposure to ASM charts, their notations, and their realizations.
- To provide an exposure to VHDL and different styles of modeling using VHDL.
- To introduce concept of microprogramming and study issues related to microprogramming

Course Outcome:

After Completion of this course, students will be able to

- Understand structural functionality of different digital blocks
- Represent and Realize their designs in ASM charts
- Represent their designs in different modeling styles by using VHDL
- Understand concept of Micro program and issues related to microprogramming

UNIT-1

BUILDING BLOCKS FORDIGITAL DESIGN: Multiplexer, Demultiplexer, Decoder, Encoder, Comparator, Adder, ALU, Carry-look-ahead adder.

BUILDING BLOCKS WITH MEMORY: Clocked building blocks, register building blocks, RAM, ROM, PLA, PAL, Timing devices.

UNIT -II

DESIGN METHODS: Elements of design style, top-down design, separation of controller and architecture, refining architecture, and control algorithm, Algorithmic State Machines, ASM chart notations.

UNIT-III

REALISING ASMS - Traditional synthesis from ASM chart, multiplexer controller method, one-shot method, ROM based method.

ASYNCHRONOUS INPUTS AND RACES - Asynchronous ASMs, Design for testability, test vectors, fault analysis tools.

UNIT-IV

MICROPROGRAMMED DESIGN: Classical Microprogramming with Modem Technology; Enhancing the Control Unit; The 2910 Microprogram Sequencer; Choosing a Microprogram Memory; A Development System for Microprogramming; Designing a Microprogrammed Minicomputer

UNIT-V

MODELLING WITH VHDL: CAD tools, simulators, schematic entry, synthesis from VHDL.

DESIGN CASE STUDIES: Single pulse, system clock, serial to parallel data conversion, traffic light controller.

TEXT BOOKS:

1. Franklin P. Prosser and David E. Winkel, "The Art of Digital Design", Prentice Hall.
2. Roth, “Digital System Design using VHDL”, Mc. Graw Hill, 2000

REFERENCE BOOKS:

1. William Fletcher, An Engineering Approach to Digital Design, 1st Edition, Prentice-Hall India, 1997.
2. William J Dally and John W Poulton, Digital Systems Engineering, Cambridge University Press, 2008.
3. Jayaram Bhasker, A VHDL Primer, 3rd edition, Prentice-Hall India, 2009.
4. VHDL for Programmable Logic - Kevin Skahill, Cypress Semiconductors

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M.Tech I year I Semester (DSCE)

L	T	P	C
4	0	0	4

(17D38101) ERROR CONTROL CODING

Course Objective:

- To understand mathematical concepts related to coding
- To get a clear understanding in formulation and computation of Linear Block Codes, Cyclic Codes, and Binary BCH Codes.
- To get complete understanding regarding Convolutional Codes and different algorithms associated with Convolutional Coding

Course Outcome:

After completion of this course, the students will be able to

- .Understand mathematical concepts related to coding
- Understands concepts involved in formulation and computation of Linear Block Codes, Cyclic Codes, and Binary BCH Codes.
- Get complete knowledge regarding Convolutional Codes and different algorithms associated with Convolutional Coding

UNIT – I

Introduction: Coding for Reliable Digital Transmission and Storage – Types of codes, Modulation and coding, Maximum likelihood decoding, Types of errors, Error control strategies, performance measures, Coded modulation, ***Introduction to Algebra*** - Groups & fields, Binary field arithmetic, Construction of Galois field and its basic properties, Computations, Vector spaces, matrices, problem solving.

UNIT – II

Linear Block Codes: Introduction linear block codes, Syndrome and Error Detection, Error Detection and Error correction capabilities of a Block Code, Standard array and syndrome decoding, Probability of an undetected error for linear codes over a BSC, Single parity check codes, repetition codes, and self-dual codes, Hamming codes, A class of single error correcting and double error detecting codes, Reed-Muller codes and other constructions, The squaring construction of codes, The Golay code, Interleaved Codes, Illustrative Problems.

UNIT – III

Cyclic and Binary BCH Codes: Description of Cyclic codes, Generator and parity – check matrices of cyclic codes, Encoding of Cyclic codes, Syndrome computation and error detection, Decoding of Cyclic Codes, Cyclic Hamming codes, The Golay code, Shortened Cyclic codes, Cyclic product codes, Binary primitive BCH codes, Decoding of BCH codes, Iterative algorithm for finding the error location polynomial & its iterative algorithm, Finding the error location numbers and error correction, Correction of errors and erasures, Implementation of Galois Field arithmetic, Implementation of error correction, Weighted distribution & Error detection of binary BCH codes, Illustrative Problems.

UNIT – IV

Other Block Codes: q-ary Linear block codes, Primitive BCH codes, Reed-Solomon codes, Decoding of Non-binary BCH and RS codes, Decoding with the Euclidean algorithm, Frequency domain decoding, Correction of errors and erasures, One Step majority logic decoding and its variations, Multiple step majority logic decoding, Euclidean Geometry (EG) and its codes, Twofold EG codes, Projective geometry and projective geometry codes, Illustrative problems.

UNIT – V

Convolutional Codes: Encoding of Convolutional codes, Structural properties and distance properties of Convolutional codes, The Viterbi Algorithm, Performance Bounds for Convolutional Codes, Construction of good Convolutional codes, Implementation and performance of the Viterbi algorithm, The soft output of Viterbi algorithm (SOVA), The BCJR algorithm, Punctured and Tail-biting Convolutional codes, ZJ sequential decoding algorithm, The Fano Sequential Decoding algorithm, Performance characteristics and code construction of Sequential decoding, Majority Logic decoding and its performance characteristics, Code construction of Majority logic decoding, Illustrative problems.

TEXT BOOKS:

1. Shu Lin, Daniel J. Costello, Jr., "Error Control Coding," Pearson Publications, Second Edition, 2011.
2. Bernard Sklar, Pabitra Kumar Ray, "Digital Communications *Fundamentals and Applications,"* Pearson Publications, Second Edition, 2009.

REFERENCE BOOKS:

1. Blahut. R. E, "Theory and practice of error control codes", Addison-Wesley, 1984.

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M.Tech I year I Semester (DSCE)

L	T	P	C
4	0	0	4

(17D38102) DIGITAL COMMUNICATION TECHNIQUES

Course Objective:

- To study about baseband signal concepts and different equalizers.
- To study in detail about coherent detection schemes such as ASK, FSK, PSK
- To study in detail about M'arysignalling schemes like QPSK, QAM, MSK.

Course Outcome:

- Students will be aware of baseband signal concepts and different equalizers.
- Students will be able to get complete knowledge regarding coherent detection schemes like ASK, FSK, PSK.
- Students will be able to design M'arysignalling schemes like QPSK, QAM, MSK

UNIT I

Review of Random Variables and Random Processes:

The random variable, Moment generating function, Markov's inequality, Chebyshev's inequality, Central limit theorem, Different distributions – Gaussian, Poisson, Chi-square, Rayleigh, Rician; Correlation - Auto-correlation, Cross correlation, Correlation matrix; Stationary processes, Wide sense stationary processes, Gaussian &Ergodic processes, Problem-solving.

UNIT II

Baseband Signal Concepts:

Baseband data transmission, the Nyquist criterion for zero ISI, Correlative level coding, Data Detection, Optimum design of transmitting and receive filters, Equalization - Linear, adaptive, fractionally spaced and decision feedback equalizers.

UNIT III

Digital Modulation Schemes:

Detection using matched filter – Optimum receivers for arbitrary binary signals and M'ary Orthogonal signals, Analysis of coherent detection schemes for ASK, PSK, and DPSK, M'arysignalling schemes – QPSK, QAM, MSK, Performance of the data transmission schemes under AWGN. Trellis-coded Modulation.

UNIT IV

Synchronization:

Receiver synchronization, Costas loop, symbol synchronization, synchronization with CPM – data aided and Non-aided synchronization- synchronization methods based on properties of wide sense cyclo-stationary random process – Carrier recovery circuits – Symbol clock estimation schemes.

UNIT V

Spread Spectrum Systems:

PN sequences, Generation of PN sequences, DS spread spectrum systems, FH spread spectrum systems and performance of DSSS & FHSS in AWGN – Synchronization – Jamming considerations – Commercial Applications, Cellular subsystems.

TEXT BOOKS:

1. J.G.Proakis, Digital Communication (4/e), McGraw- Hill, 2001
2. Bernard Sklar, "Digital Communications – Fundamentals &Applications,"Prentice Hall, 2001.

REFERENCE BOOKS:

1. S.Haykin, Communication Systems (4/e), Wiley,2001.
2. R.E.Zimer&R.L.Peterson: Introduction to Digital Communication, PHI, 2001.
3. G. R. Cooper & C. D. McGillem, "Modern Communications & Spread Spectrum,"McGraw-Hill, 1986.
4. L.Hanzoetal, Turbo Coding, Turbo Equalization & Space-Time Coding Wiley,2002.

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M.Tech I year I Semester (DSCE)

L	T	P	C
4	0	0	4

(17D06108) ADVANCED DIGITAL SIGNAL PROCESSING

Course outcomes: Students will be able to

- Analyze discrete-time systems in both times & transform domain and also through pole-zero placement.
- Analyze discrete-time signals and systems using DFT and FFT.
- Design and implement digital finite impulse response (FIR) filters.
- Design and implement digital infinite impulse response (IIR) filters.
- Understand and develop multirate digital signal processing systems.

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 ofSampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:

Applications of Multi-Rate Signal Processing:

The 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, OverSampling 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 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 effects 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., PearsonEducation.

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

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M.Tech I year I Semester (DSCE)

L	T	P	C
3	0	0	3

(17D06105) ADVANCED OPERATING SYSTEMS

Elective-I

Course Objective:

- To Study in detail about kernel structures associated with various Operating systems
- To Study in detail about various systems calls, statements and their arguments associated with Unix.
- To Study in detail about various systems calls, statements and their arguments associated with Linux

Course Outcome:

After completion of the course, students will be able to

- Get complete knowledge regarding different types of operating systems and their Kernel structures.
- To work effectively on Unix Platform
- To work effectively on Linux Platform

UNIT I

INTRODUCTION

General Overview of the System: History – System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel: Architecture of the UNIX operating system – Introduction to system concepts. The Buffer Cache: Buffer Headers – Structure of the buffer pool – Scenarios for retrieval of a buffer – Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

UNIT II

UNIX I*:* Overview of a UNIX system, Structure, files systems, type of file, ordinary & Special files, file permissions, Introduction to the shell.UNIX basic commands & command arguments, Standard input / output Input / output redirection, filters and editors,System calls related file structures, input / output process creation & termination.

UNIT III

INTERPROCESS COMMUNICATION IN UNIX: Introduction, file and record locking, Client – Server example, pipes, FIFOs, Streams & Messages, Name Specs, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

UNIT IV

INTRODUCTION TO NETWORKS AND NETWORK PROGRAMMING IN UNIX: Network Primer, TCP/IP, Internet Protocols, Socket Programming, Introduction & overview, UNIX domain protocols, Socket Addresses, Elementary Socket system calls, Simple examples.

UNIT V

LINUX: Introduction to LINUX System, Editors, and Utilities, Type of Shells, Shell Operations, File structure, File Management, Operations. Memory Management Policies: Swapping – Demand paging. The I/O Subsystem: Driver Interface – Disk Drivers – Terminal Drivers– Streams – Inter-process communication.

TEXT BOOKS:

1. Maurice J.Bach, “The design of the UNIX Operating Systems”, PHI
2. Kernighan & Pike, “The UNIX Programming Environment”, PHI

REFERENCE BOOKS:

1. W.Richard Stevens, “UNIX Network Programming”, PHI, 1998.
2. Richard Peterson, “The Complete Reference LINUX”, TMH
3. Ritchie & Yates, “UNIX User Guide”.

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M.Tech I year I Semester (DSCE)

L	T	P	C
3	0	0	3

(17D06210) LOW POWER VLSI DESIGN
Elective-I

Course Outcomes:

After completion of this subject, students will be able to

- Understand the concepts of velocity saturation, Impact Ionization and Hot Electron Effect
- Implement Low power design approaches for system level and circuit level measures.
- Design low power adders, multipliers, and memories for efficient design of systems.

UNIT –I:

Fundamentals:

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT –II:

Low-Power Design Approaches:

Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT –III:

Low-Voltage Low-Power Adders:

Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look Ahead Adders, Carry-Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT –IV:

Low-Voltage Low-Power Multipliers:

Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, BaughWooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT –V:

Low-Voltage Low-Power Memories:

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Pre-charge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1.CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.

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M.Tech I year I Semester (DSCE)

L	T	P	C
3	0	0	3

(17D38103) ADVANCED COMPUTER ARCHITECTURE

Elective-I

Course objective:

- To study about various parallel computer models and also to study the program and network properties
- To study the concepts of pipelining and superscalar techniques.
- To study about architectures of multiprocessors and multi-computers

Course ***Outcome:***

After completion of the course, the students will be able to

- Know about different parallel computer models and their network properties.
- Understand about different concepts related to pipelining and superscalar techniques.
- Get complete knowledge regarding multiprocessors and multi-computers.

UNIT - I

Parallel Computer Models – System attributes to performance, Multiprocessors and Multicomputers, Classifications of Architectures, Multivector and SIMD Computers, Architecture development tracks

UNIT - II

Program and Network Properties- Conditions for parallelism, Program Partitioning and Scheduling, Program flow mechanisms, System interconnect architectures, Performance metrics, and measures, Parallel Processing Applications

UNIT-III

Processors and Memory Hierarchy- Advanced Processor Technology, Superscalar and Vector Processors, Memory hierarchy technology, Virtual Memory, Backplane bus systems, Cache memory organizations, Shared memory organizations

UNIT - IV

Pipelining and Superscalar Techniques Linear Pipeline processors, Nonlinear pipeline processors, Instruction pipeline design, Arithmetic pipeline design, Superscalar and Super Pipeline Design

UNIT- V

Multiprocessors and Multicomputers Multiprocessor System Interconnects, Cache Coherence and Synchronization mechanisms, Three generations of Multicomputers, Message passing mechanisms, Vector Processing Principles, Principles of Multithreading

TEXT BOOKS:

1. Hwang kai, “Advanced Computer Architecture”, McGraw-Hill, 2001.
2. Patterson, David and Hennessy John, Morgan Kaufmann, “Computer Architecture”,2001.

REFERENCE BOOKS

1. William Stallings, Computer Organization, and Architecture, 8th Edition, Prentice-Hall India, 2010.
2. David A Patterson and John L. Hennesey, Computer Organization and Design, 4th Edition, Elsevier India, 2011.
3. Andrew S Tanenbaum and James R Goodman, Structured Computer Organization, 5th Edition PrenticeHall India, 2009.

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M.Tech I year I Semester (DSCE)

L	T	P	C
3	0	0	3

(17D38104) TRANSFORM TECHNIQUES
Elective-II

Course Objective:

- Study of different types of transforms which can be applied for different types of signals.
- To study the application of wavelets for different types of signals.
- To study the applications of Multi-rate systems and filter banks.

Course Outcome:

After completion of the course, the student will be able to

- Use different 1-d and 2-d transforms for different signals.
- Apply wavelet transforms for different signals and will be able to appreciate its differences with other transformations.
- Use differently advanced transforms such as DCT, DWT, and KLT for different applications like signal de noisy, sub-band coding of speech and music and signal compression.

UNIT I:

REVIEW OF TRANSFORMS: Signal spaces, the concept of convergence, Hilbert spaces for energy signals, Orthogonality, Orthonormality, Fourier basis, FT-failure of FT-need for time-frequency analysis, spectrogram plot-phase space plot in time-frequency plane, Continuous FT, DTFT, Discrete Fourier Series and Transforms, Z-Transform.

ADVANCE TRANSFORMS

The relation between CFT-DTFT, DTFT-DFS, DFS-DFT, DCT (1D&2D), Walsh, Hadamard, Haar, Slant, KLT, Hilbert Transforms – definition, properties, and applications.

UNIT II:

CWT & MRA: Time-frequency limitations, tiling of time-frequency plane for STFT, Heisenberg uncertainty principle,Short-time Fourier Transform (STFT) analysis, shortcomings of STFT.

NEED FOR WAVELETS: Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time Wavelet Transform Equation- Series Expansion using Wavelets- CWT.

UNIT III:

NEED FOR SCALING FUNCTION: Multiresolution analysis, Tiling of time-scale plane for CWT. Important Wavelets: Haar, Mexican Hat Meyer, Shannon, Daubechies.

SPECIAL TOPICS: Wavelet Packet Transform, Bi-orthogonal basis- B-splines, Lifting Scheme of Wavelet Generation-implementation.

UNIT IV:

MULTIRATE SYSTEMS, FILTER BANKS AND DWT: Basics of Decimation and Interpolation in time & frequency domains, Two-channel Filter bank, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet basis, DWT Filter Banks for Daubechies Wavelet Function.

UNIT V:

APPLICATIONS OF TRANSFORMS: Signal De-noising, Sub-band Coding of Speech and Music, Signal Compression - Use of DCT, DWT, KLT.

TEXT BOOKS:

1. Jaideva C Goswami, Andrew K Chan, "Fundamentals of Wavelets- Theory, Algorithms and Applications", John Wiley & Sons, Inc, Singapore, 1999.
2. RaghuveerM.Rao and Ajit S. Bopardikar, "Wavelet Transforms-Introduction theory and applications" Pearson Edu, Asia, New Delhi, 2003.
3. Soman.K.P, Ramachandran K.I, "Insight into Wavelets from Theory to Practice", Prentice Hall India, First Edition, 2004.

REFERENCE BOOKS:

1. Vetterli M. Kovacevic, "Wavelets and subband coding", PJI, 1995.
2. C. Sydney Burrus, "Introduction to Wavelets and Wavelet Transforms", PHI, First Edition, 1997.
3. Stephen G. Mallat, "A Wavelet Tour of Signal Processing", Academic Press, Second Edition,
4. Jayaraman, "Digital Image Processing", TMH,2009
5. S.Jayaraman, S.Esakkirajan, T.Veera Kumar, "Digital Image Processing", TMH,2009

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M.Tech I year I Semester (DSCE)

L	T	P	C
3	0	0	3

(17D38105) STATISTICAL SIGNAL PROCESSING

Elective-II

Objective:
The subject aims to make the students understand the statistical theory of telecommunication, which are the basics to learn analog and digital telecommunication

Course outcomes: Students are able to

- Show how the information is measured and able to use it for effective coding.
- Summarize how the channel capacity is computed for various channels.
- Use various techniques involved in basic detection and estimation theory to solve the problem.
- Summarize the applications of detection theory in telecommunication.
- Summarize the application of estimation theory in telecommunication.

UNIT I

Signal models and characterization: Types and properties of statistical models for signals and how they relate to signal processing, Common second-order methods of characterizing signals including autocorrelation, partial correlation, cross-correlation, power spectral density and cross power spectral density.

UNIT II

Spectral estimation: Nonparametric methods for estimation of power spectral density, autocorrelation, cross-correlation, transfer functions, and coherence form finite signal samples.

UNIT III

Review of signal processing: A review on random processes, A review on filtering random processes, Examples.
Statistical parameter estimation: Maximum likelyhood estimation, maximum a posterior estimation, Cramer-Rao bound.

UNIT IV

Eigenstructure based frequency estimation: Pisarenko, MUSIC, ESPRIT their application sensor array direction finding.
Spectrum estimation: Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), Various non-parametric approaches.

UNIT V

Wiener filtering: The finite impulse case, causal and non-causal infinite impulse responses cases, Least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

TEXT BOOKS:

1. Steven M.Kay, Fundamentals of statistical signal processing: estimation Theory, Pretice-Hall,1993.
2. Monsoon H. Hayes, Statistical Digital signal processing and modeling, USA, Wiley,1996.

REFERENCE BOOKS:

1. DimitrisG.Manolakis, Vinay K. Ingle, and Stephen M. Kogon, Statistical and adaptive signal processing, Artech House, Inc,2005, ISBN 1580536107

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M.Tech I year I Semester (DSCE)

L	T	P	C
3	0	0	3

(17D38106) SPREAD SPECTRUM COMMUNICATION

Elective-II

OBJECTIVES:

- To understand the basics of spread spectrum communication systems.
- To understand the way in which spread spectrum is applied to CDMA.
- To understand the performance of spread spectrum techniques.

OUTCOMES:

- To be able to arrive at detailed specifications of the spread spectrum systems.
- To design the spread spectrum based systems for CDMA.
- To be able to evaluate the performance of spread spectrum based systems.

UNIT I

PERFORMANCE CHARACTERIZATION OF DIGITAL DATA TRANSMISSION

Detection of binary signals in AWGN - Quadrature multiplexed signaling schemes - Signaling through band limited channels - Equalization of digital data transmission system - Realization imperfections - Degradations in performance. Communication in the presence of pulse noise jamming - Low probability detection scheme - Direct Sequence Spread Spectrum (DSSS) and Frequency Hop Spread Spectrum Systems and examples of Spread Spectrum Systems.

UNIT II

SPREAD SPECTRUM SYSTEMS

Direct sequence spread spectrum methods employing BPSK, QPSK, and MSK - Frequency Hop spread spectrum methods - Coherent slow frequency Hop technique - Non-coherent slow and fast frequency Hop spread spectrum techniques - Hybrid DS/FH spread spectrum - Complex envelope representation of spread spectrum systems.

UNIT III

BINARY SHIFT REGISTER SEQUENCES FOR SPREAD SPECTRUM SYSTEMS

Definition - PN sequence generator fundamentals - Maximal length sequences - Properties, Power spectrum and Polynomial tables for maximal length sequences - Gold codes - Rapid Acquisition systems - Non-linear code generators.

UNIT IV

SYNCHRONIZATION OF SPREAD SPECTRUM SYSTEMS

Optimal tracking of wideband signals - Early-late tracking loops - Code tracking loops for FHSS - Optimum synchronization techniques - Multiple dwell and sequential detectors - Synchronization using a matched filter - Synchronization by estimating the received spreading code.

UNIT V

PERFORMANCE OF SPREAD SPECTRUM SYSTEM

SS Systems communications models - Performance without coding under AWGN and different jamming environments - spread spectrum systems performances with forwarding error correction - Block coding - Convolutional coding and specific error correcting codes - Interleaving - Random coding bounds.

TEXT BOOKS:

1. Ziemer R E and Peterson R L, "Digital Communication and Spread Spectrum Systems", Macmillan Publishing Co., 1985.
2. Dixon R C, "Spread Spectrum Systems", Wiley Interscience, 1976.

REFERENCE BOOKS:

1. Holms J K, "Coherent Spread Spectrum Systems", Wiley Interscience, 1982

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M.Tech I year I Semester (DSCE)

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(17D38107) STRUCTURAL DIGITAL SYSTEM DESIGN LAB

Course Objective:

- To understand about VHDL and Verilog Programming in all available styles.
- To understand differences between Verilog and VHDL.
- To represent the different digital blocks in Verilog and VHDL in all available styles of modeling

Course Outcome:

After completion of this course, the students will be able to understand

- Different modeling styles available in VHDL and Verilog and difference between them
- Difference between Verilog and VHDL
- Representation of different digital modules in different modeling styles available in VHDL and Verilog

Using VHDL or Verilog do the following experiments

1. Design of 4-bit adder/subtractor
2. Design of Booth Multiplier
3. Design of 4-bit ALU
4. Design SISO, SIPO, PISO, PIPO Registers
5. Design of Ripple, Johnson and Ring counters
6. Design of MIPS processor
7. Design of Washing machine controller
8. Design of Traffic Light Controller
9. Design “1010” pattern detector using Mealy state Machine
10. Design “1100” recursive pattern detector using Moore state Machine
11. Design simple Security System Using FSM/ASM
12. Mini Project

Tools Required:

VHDL or VERILOG

Hardware Required:

Computers with the latest Configuration.

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(17D38108) ADVANCED DIGITAL SIGNAL PROCESSING LAB

Note:
A. Minimum of 10 Experiments have to be conducted
B. All Simulations are be carried out using MATLAB/DSP Processors/Labview Software & DSP Kits

1. Study of various addressing modes of DSP using simple programming examples
2. Generation of waveforms using recursive/filter methods
3. Sampling of input signal and display
4. Implementation of Linear and Circular Convolution for sinusoidal signals
5. Framing & windowing of speech signal.
6. Finding voice & unvoiced detection for each frame of the speech signal.
7. IIR Filter Implementation using probe points
8. Implementation of FIR filters on DSP processor
9. Loop back using DSK kit
10. Real-time signal enhancement using Adaptive Filter.
11. Representation of different Q-formats using GEL function
12. Verification of Finite word length effects (Overflow, Coefficient Quantization, Scaling and Saturation mode in DSP processors)
13. Image enhancement using spatial & frequency domain
14. Implementation of Image segmentation techniques
15. Extraction of frames from Video signal

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(17D06201) EMBEDDED SYSTEM DESIGN

Course Objective:

- To study about current technologies, integration methods and hardware and software design concepts associated with the processor in Embedded Systems.
- To study about a simple low power microcontrollers and their applications
- To get detail knowledge regarding testing and hardware software co- design issues pertaining to design of an Embedded System using low power microcontrollers

Course Outcome:

After completion of this course, the students will be able to understand

- The issues relating to hardware and software design concepts associated with the processor in Embedded Systems.
- The concept of low power microcontrollers.
- The hardware-software co- design issues pertaining to the design of an Embedded System using low power microcontrollers.

UNIT – I

Introduction to Embedded Electronic Systems and Microcontrollers:

An Embedded System-Definition, Embedded System Design and Development Life Cycle, An Introduction to Embedded system Architecture, The Embedded Systems Model, Embedded Hardware:The Embedded Board and the von Neumann Model, Embedded Processors: ISAArchitectureModels, Internal Processor Design, Processor Performance, Board Memory: Read-Only Memory (ROM), Random-Access Memory (RAM), Auxiliary Memory, Memory Management of External Memory and Performance, Approaches to Embedded Systems, Small Microcontrollers, Anatomy of a Typical Small Microcontroller, Small Microcontrollers Memory, Embedded Software, Introduction to small microcontroller (MSP430).

UNIT-II

MSP430 – I:

The architecture of the MSP430 Processor: Central Processing Unit, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Examples, Reflections on the CPU and Instruction Set, Resets, Clock System, Memory, and Memory Organization.

Functions, Interrupts, and Low-Power Mode: Functions and Subroutines, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Mixing C, and Assembly Language, Interrupts, Interrupt Service Routines, Issues Associated with Interrupts, Low-Power Modes of Operation.

UNIT – III

MSP430 – II:

Digital Input, Output, and Displays: Parallel Ports, Digital Inputs, Switch Debounce, Digital Outputs, Interface between Systems, Driving Heavier Loads, Liquid Crystal Displays, Simple Applications of the LCD.

Timers: Watchdog Timer, Timer_A, Timer_A Modes, Timer_B, Timer_B Modes, Setting the Real-Time Clock, State Machines.

UNIT – IV

MSP430 Communication:

Communication Peripherals in the MSP430, Serial Peripheral Interface, SPI with the USI, SPI with the USCI, A Thermometer Using SPI Modes, Inter-integrated Circuit Bus(I^2C) and its operations, State Machines for I^2C Communication, A Thermometer Using I^2C, Asynchronous Serial Communication, Asynchronous Communication with the USCI_A, A Software UART Using Timer_A, Other Types of Communication.

UNIT – V

MSP430 Case Studies:

Introduction to Code Composer Studio (CC Studio Ver. 6.1) a tutorial, A Study of blinking LED, Enabling LED using Switches, UART Communication, LCD interfacing, Interrupts, Analog to Digital Conversion, General Purpose input and output ports, I^2C.

TEXT BOOKS:

1. Tammy Noergaard "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", Elsevier(Singapore) Pvt.Ltd.Publications, 2005.
2. John H. Davies "MSP430 Microcontroller Basics", Elsevier Ltd Publications, Copyright 2008.

REFERENCE BOOKS:

1. Manuel Jiménez Rogelio, PalomeraIsidoroCouvertier "Introduction to Embedded SystemsUsing Microcontrollers and the MSP430" Springer Publications, 2014.
2. Frank Vahid, Tony D. Givargis, "Embedded system Design: A Unified Hardware/Software Introduction", John Wily & Sons Inc.2002.
3. Peter Marwedel, "Embedded System Design", Science Publishers, 2007.
4. Arnold S Burger, "Embedded System Design", CMP Books, 2002.
5. Rajkamal, "Embedded Systems: Architecture, Programming, and Design", TMH Publications, Second Edition, 2008.

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(17D06209) DIGITAL IMAGE AND VIDEO PROCESSING

OBJECTIVES:

- To provide the basic concepts of image & pattern recognition.
- To give an exposure to basic image processing and modeling techniques.
- To provide an understanding of various concepts related to video object extraction.
- To prepare students for development and implementation of algorithms

OUTCOMES:

- To be able to design pattern recognition systems.
- To design and implement feature extraction techniques for a given application.
- To design a suitable classifier for a given application.

UNIT-I

IMAGE FUNDAMENTALS AND TRANSFORMS

Image Representation- Sampling and Quantization - Two-dimensional DFT- Discrete Cosine Transform - Walsh - Hadamard transforms - Wavelet transform - Construction of Wavelets-Types of wavelets - principal component analysis.

UNIT -II

PROCESSING AND MODELING OF IMAGES

Pre-processing -Point operations – contrast stretching – Histogram - Histogram equalization - Image segmentation- pixel based, edge based, region based segmentation - Morphological image processing - Edge and texture models - Image registration - Colour Image Processing –

UNIT-III

SPATIAL FEATURE EXTRACTION

Feature selection - Localized feature extraction- Boundary Descriptors - Moments - Texture Descriptors - Co-occurrence Features

UNIT-IV

CLASSIFIERS

Kernel-based approaches - clustering methods - Maximum Likelihood Estimation- Bayesian approach- Pattern Classification

UNIT-V

VIDEO OBJECT EXTRACTION

Background subtraction – Frame difference - Static and dynamic background modeling - optical flow techniques-Handling occlusion- scale and appearance changes - Shadow removal.

TEXT BOOKS:

1. A.K.Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall, 2002.
2. R.C.Gonzalez and R.E.Woods, „Digital Image Processing‟, Second Edition, Pearson Education, 2002.
3. A.Bovik, “Handbook of Image and Video Processing”, 2nd Edition, Academic Press, 2005.

REFERENCE BOOKS:

1. Mark Nixon and Alberto Aguado, “Feature Extraction and Image Processing”, Academic Press, 2008.
2. John C.Russ, “The Image Processing Handbook”, CRC Press, 2007.
3. Richard O. Duda, Peter E. Hart and David G. Stork., “Pattern Classification”, Wiley, 2001

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(17D06204) SENSORS AND ACTUATORS

Objectives

- To introduce the student to some basic principles and techniques of micro sensors and actuators
- understanding basic laws and phenomena on which operation of sensors and actuators-transformation of energy is based,

Outcomes: The student should after the course:

- Have knowledge about of the working principles and architecture of a large number of sensors and their elements.
- Be able to choose and use sensors and equipment for measuring mechanical quantities and temperature.
- Have knowledge about the architecture and working principles of the most common electrical motor types.
- Be able to choose and use electrical drives and actuators.
- Be able to cooperate in an active way with specialists in these areas.

UNIT -I:

Sensors / Transducers:

Principles – Classification – Parameters – Characteristics - Environmental Parameters (EP) – Characterization Mechanical and Electromechanical Sensors: Introduction – Resistive Potentiometer – Strain Gauge – Resistance Strain Gauge – Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors:– Electrostatic Transducer– Force/Stress Sensors Using Quartz Resonators – Ultrasonic Sensors

UNIT –II

Thermal Sensors:

Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermosensors – Helium Low Temperature Thermometer – Nuclear Thermometer – Magnetic Thermometer – Resistance Change Type Thermometric Sensors –Thermoemf Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Thermometry – Spectroscopic Thermometry – Noise Thermometry – Heat Flux Sensors Magnetic sensors: Introduction – Sensors and the Principles Behind – Magnetoresistive Sensors – Anisotropic Magnetoresistive Sensing – Semiconductor Magnetoresistors– Hall Effect and Sensors – Inductance and Eddy Current Sensors– Angular/Rotary Movement Transducers – Synchros – Synchro-resolvers - Eddy Current Sensors – Electromagnetic Flowmeter – Switching Magnetic Sensors SQUID Sensors

UNIT -III

Radiation Sensors:

Introduction – Basic Characteristics – Types of Photosensors/Photodetectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electroanalytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential - Standard Hydrogen Electrode (SHE) – Liquid Junction and Other Potentials – Polarization – Concentration Polarization-– Reference Electrodes - Sensor Electrodes – Electroceramics in Gas Media.

UNIT –IV

Smart Sensors:

Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation Sensors –Applications: Introduction – On-board Automobile Sensors (Automotive Sensors)– Home Appliance Sensors – Aerospace Sensors — Sensors for Manufacturing –Sensors for Environmental Monitoring

UNIT -V:

Actuators:

Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control Valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection Electrical Actuation Systems-Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors

TEXTBOOKS

1. D. Patranabis – “Sensors and Transducers” –PHI Learning Private Limited.
2. W. Bolton – “Mechatronics” –Pearson Education Limited.

REFERENCE BOOKS

1. Sensors and Actuators – D. Patranabis – 2nd Ed., PHI, 2013

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(17D38201) WIRELESS COMMUNICATIONSAND NETWORKS

Course Outcomes

After completion of the course students able to

- Understand concepts of wireless communication systems and their applications.
- Know about the mobile radio propagation techniques and detailed understanding in wireless mobile communication.
- Understand communication networks and detailed analysis of wireless communications networks.
- Understand the different protocols used for wireless communication systems and networks.

UNIT –I The Cellular Concept-System Design Fundamentals:

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co-channel Interference and system capacity, Channel Planning for Wireless Systems, Adjacent Channel Interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II Mobile Radio Propagation:

Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- LongleyRyce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT –III Mobile Radio Propagation:

Small –Scale Fading and Multipath: Small-Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for Multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT –IV Equalization and Diversity:

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Nonlinear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT –V Wireless Networks:

Introduction to Wireless Networks, Advantages and Disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXTBOOKS

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – GottapuSasibhushanaRao, Pearson Education, 2012.

REFERENCE BOOKS

1. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – KamiloFeher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – UpenDalal, Oxford Univ. Press 5. Wireless Communications and Networking – Vijay K. Gary, Elsevier

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(17D38202) INTERNET OF THINGS
Elective-III

Course description and objectives:

Students will be explored to the interconnection and integration of the physical world and the cyberspace. They are also able to design & develop IOT Devices.

Course Outcomes:

- Able to understand the application areas of IOT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics.

Unit I

Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

Unit II

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

Unit III

M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software-defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

Unit IV

Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages

Unit V

IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

TEXT BOOKS:

1. Vijay Madisetti, ArshdeepBahga," Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515

REFERENCE BOOKS:

1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0
2. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN

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(17D38203) SPEECH PROCESSING

Course Objective:

- To understand how speech signals are processed for Analysis and Synthesis. Also to understand speech processing in the context of its creation (anatomy, classification of sounds, etc.) as well as in its perception (psychology & neuroscience).
- To analyze tools that are needed for analysis and synthesis, in the areas of digital signal processing for time-frequency analysis.

Course Outcome:

- After completing the course, the student will be familiar with the principles and the techniques used in speech processing. This includes speech synthesis, speech coding , and speech recognition.

UNIT I

FUNDAMENTALS OF DIGITAL SPEECH PROCESSING: Anatomy & Physiology of Speech organs, the process of speech production, the acoustic theory of speech production, Digital models for speech signals.

TIME DOMAIN MODELS FOR SPEECH PROCESSING: Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate ,Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short-time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT II

LINEAR PREDICTIVE CODING (LPC) ANALYSIS: Basic Principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition, Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT III

HOMOMORPHIC SPEECH PROCESSING: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, the Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, TheHomomorphicVocoder.

SPEECH ENHANCEMENT: Nature of interfering sounds, Speech enhancement techniques, Spectral subtraction, Enhancement by re-synthesis.

UNIT IV

AUTOMATIC SPEECH RECOGNITION: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated Digit Recognition System, Continuous Digit Recognition System

SPEAKER RECOGNITION: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

UNIT V

HIDDEN MARKOV MODEL (HMM) FOR SPEECH: Hidden Markov model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Adapting to variability in speech, Language models.

TEXT BOOKS:

1. L.R Rabiner and S.W.Schafer, "Digital processing of speech signals", Pearson.
2. Douglas O Shaughnessy, "Speech Communication", Second Edition Oxford University Press, 2000.
3. L.R Rabiner and B.H.Juang, "Fundamentals of Speech Recognition"

REFERENCE BOOKS:

1. Thomas F. Qatari, "Discrete-Time Speech Signal Processing", 1/e, Pearson
2. Ben Gold & Nelson Morgan, "Speech & Audio Signal Processing", 1/e, Wiley

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(17D38204) SOFTWARE DEFINED RADIO

Elective-III

Course Objective:

- To study about requirements, benefits and different models for Software Defined Radio
- To study in detail about Software Defined Radio Architectures for performance optimization
- To get complete knowledge regarding the functioning of different blocks and techniques associated with Software Defined Radio.

Course Outcome:

After completion of this course, the students will be able to

- Analyze requirements, benefits and different models for Software Defined Radio.
- Understand in detail about Software Defined Radio Architectures for performance optimization.
- Gets complete knowledge regarding the functioning of different blocks and techniques associated with Software Defined Radio.

UNIT-I

Requirement for Software defined radio, Benefits of multi-standard terminals, Operational requirements, models for SDR, Smart antenna systems,

UNIT - II

Software defined radio architectures, Hardware specifications, Digital aspects of Software-defined radio, Current technology limitations, minimum power consumption, ADC performance trends

UNIT-III

Flexible RF receiver architectures, Digital Receiver, Single carrier and multi-carrier designs, undersampling, oversampling, Noise figure, Receiver sensitivity, ADC spurious signals

UNIT-IV

Multiband Flexible receiver design, RF Transmit/receive switch, Image rejection mixing, Dynamic range enhancement, Feed-forward techniques, cascaded nonlinearity techniques

UNIT - V

Flexible transmitters, Power Amplifiers, Analog quadrature upconversion, Interpolated bandpass upconversion, PLL based modulator transmitter, All-pass filtering, Polyphase filtering

TEXT BOOKS:

1. P Kensington, "RF and Baseband Techniques for Software Defined Radio", Artec House, 2005
2. JoukoVanakka, "Digital Synthesizers And Transmitter For Software Radio", Springer, 2005

REFERENCE BOOKS:

1. Wally H. W. Tuttlebee, "Software Defined Radio: Baseband Technologies for 3G Handsets and Base stations", John Wiley &sons, 2003

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(17D06208) NETWORK SECURITY AND CRYPTOGRAPHY

Elective-IV

Course Objective:

- To study about need and role of security and cryptography in computer networks.
- To study about different techniques associated with encryption.
- To study about different algorithms associated with computer networks.
- To study about different security architecture and design issues related to firewalls.

Course Outcome:

After completion of this course, students will be able to know

- The need and role of security and cryptography in computer networks.
- Gain knowledge about different techniques associated with encryption.
- Functioning of different algorithms associated with computer networks.
- Gain knowledge regarding different security architecture and design issues related to firewalls.

UNIT – I

Introduction: Attacks, services, and mechanisms, security attacks, security services, a model for internetwork security, protection through cryptography, the role of cryptography in network security.

UNIT – II

Conventional Encryption: Substitution techniques and transposition techniques, block cipher principles, block cipher design principles, block cipher modes of operation. The data encryption standard

UNIT – III

Public-key encryption: Principles of public-key cryptosystems, the RSA algorithm, key management. Authentication requirements, authentication functions, message authentication codes, hash functions.

UNIT – IV

Digital Signatures and Authentication Protocols: Digital signatures, Digital signature standard, Authentication Protocols, MD5, message digest algorithm, secure hash algorithm, HMAC.

UNIT – V

Mall Security & IP Security: Pretty good privacy, IP security overview, IP security architecture, Intruders, viruses and related threats, firewall design principles

TEXT BOOKS:

1. W. Stallings**, "**Cryptography & Network Security", 3/e, PHI, 2003
2. Eric Maiwald**, "**Fundamental of Network Security", Dreamtech Press Osborne MGH, 2004

REFERENCE BOOKS:

1. Sean Convery, " Network Security Architectures, Published by Cisco Press, First Ed. 2004.
2. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.
3. Bruce Schneier, "Applied Cryptography", John Wiley and Sons Inc, 2001.
4. Stewart S. Miller, "Wi-Fi Security", McGraw Hill, 2003.
5. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security In Computing", 3rd Edition, Pearson Education, 2003.
6. Jeff Crume, "Inside Internet Security" Addison-Wesley, 2005.

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(17D38205) WIRELESS ADHOC NETWORKS

Elective-IV

OBJECTIVES:

- To introduce the characteristic features of ad-hoc wireless networks and their applications to the students.
- To enable the student to understand the functioning of different access and routing protocols that can be used for ad-hoc networks.
- To enable the student to understand the need for security and the challenges and also the role of cross layer design in enhancing the network performance.

OUTCOMES:

- The student would be able to demonstrate an understanding of the trade-offs involved in the design of ad-hoc networks
- The student would be able to design and implement protocols suitable to ad-hoc communication scenario using design tools and characterize them.
- The student is exposed to the advances in ad-hoc network design concepts.

UNIT I

INTRODUCTION Introduction to Ad Hoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models: - entity and group models.

UNIT II

MEDIUM ACCESS PROTOCOLS

design issues, goals and classification. Contention based protocols, reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III

NETWORK PROTOCOLS

Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification.Proactive Vs Reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNITIV

END -TO - END DELIVERY AND SECURITY

Transport layer: Issues in designing- Transport layer classification, ad-hoc transport protocols. Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT

CROSS-LAYER DESIGN AND INTEGRATION

Cross-layer Design: Need for cross-layer design, cross layer optimization, parameter optimization techniques, Cross-layer cautionary perspective, Co-operative Networks:- Architecture, methods of co-operation, co-operative antennas, Integration of ad hoc network with other wired and wireless networks.

TEXT BOOKS:

1. C.Siva Ram Murthy and B.S.Manoj, ―Ad hoc Wireless Networks Architectures and protocols‖, 2nd edition, Pearson Education. 2007

2. Charles E. Perkins, ―Ad hoc Networking‖, Addison – Wesley, 2000
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Sto Meno Vic, ―Mobile ad-hoc networking‖, Wiley-IEEE Press, 2004.

REFERENCE BOOKS:

1. Mohammad Ilyas, ―The Handbook of ad-hoc wireless networks‖, CRC Press, 2002.
2. T. Camp, J. Boleng, and V. Davies ―A Survey of Mobility Models for Ad Hoc Network Research,‖ Wireless Communication and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
3. Fekri M. Abduljalil and Shrikant K. Bodhe, ―A survey of integrating IP mobility protocols and Mobile Ad hoc networks‖, IEEE Communication Survey and tutorials, v 9.no.1 2007.
4. ErdalÇayırcı and ChunmingRong c, ― *Security in Wireless Ad Hoc and Sensor Networks* 2009, John Wiley & Sons, Ltd. ISBN: 978-0-470-02748-6

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(17D38206) OPTICAL COMMUNICATION TECHNOLOGY

Elective-IV

Course Outcomes:

- Distinguish Step Index, Graded index fibers and compute mode volume.
- Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.
- Classify the construction and characteristics of optical sources and detectors.
- Discuss splicing techniques, passive optical components and explain noise in the optical system.
- Design short haul and long haul Analog/ Digital optical communication system and explain advanced optical transmission systems

UNIT –I:

Signal Propagation in Optical Fibers:

Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, ChromaticDispersion, Non-Linear Effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self-Phase Modulation, and Cross-Phase Modulation, Four Wave Mixing, Principle of Solitons.

UNIT –II:

Fiber Optic Components for Communication & Networking:

Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, MachZender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel CountMultiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT –III:

Modulation and Demodulation:

Signal formats for Modulation, Subcarrier Modulation, and Multiplexing, Optical Modulations – Duobinary, Single Side Band and Multilevel Schemes, Ideal and Practical receivers forDemodulation, Bit Error Rates, Timing Recovery and Equalization, Reed-Solomon Codes forError Detection, and Correction.

UNIT -IV:

Transmission System Engineering:

System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk andReduction of Crosstalk, Cascaded Filters, Dispersion Limitations, and CompensationTechniques.

UNIT –V:

Fiber Nonlinearities and System Design Considerations:

Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, WavelengthStabilization against Temperature Variations, Overall System Design considerations – FiberDispersion, Modulation, Non-Linear Effects, Wavelengths, All-Optical Networks.

TEXT BOOKS:

1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N.
2. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier). Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000, McGraw-Hill.

REFERENCE BOOKS:

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000, PE.
2. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004, PEI
3. Optical Networks: Third Generation Transport Systems – Uyless Black, 2nd Ed., 2009, PEI
4. Optical Fiber Communications – GovindAgarwal, 2nd Ed., 2004, TMH.
5. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.

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M.Tech I year II Semester (DSCE)

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(17D38207) ADVANCED COMMUNICATION SYSTEMS LAB

Note:

1) Minimum of 10 Experiments have to be conducted
2) All Experiments may be Simulated using MATLAB and to be verified using related training kits.

1. Measurement of Bit Error Rate using Binary Data
2. Determination of output of convolution Encoder for a given sequence
3. Determination of output of convolution Decoder for a given sequence
4. Efficiency of Direct Sequence Spread Spectrum Technique
5. Simulation of Frequency Hopping (FH) Spread- Spectrum
6. Implementation of an optimum receiver for the AWGN channel.
7. Measurement of the effect of Inter-Symbol Interference.
8. Design of FSK system
9. BPSK Modulation and Demodulation Techniques
10. DQPSK Modulation and Demodulation Techniques
11. 8-QAM Modulation and Demodulation Techniques
12. OFDM Transceiver design
13. Performance evaluation of CDMA system
14. Implementation of QPSK Modulation with Rayleigh Fading and AWGN channel

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(17D38208) EMBEDDED SYSTEM DESIGN LAB

List of Experiments

PART – A

Using Embedded C

Note: Any 10 Programs from the following

1. Write a simple program to print "hello world"
2. Write a simple program to show a delay.
3. Write a loop application to copy values from P1 to P2
4. Write a c program for counting the no of times that a switch is pressed & released.
5. Illustrate the use of port header file (port M) using an interface consisting of a keypad and liquid crystal display.
6. Write a program to create a portable hardware delay.
7. Write a c program to test loop timeouts.
8. Write a c program to test hardware based timeout loops.
9. Develop a simple EOS showing traffic light sequencing.
10. Write a program to display elapsed time over the RS-232 link.
11. Write a program to drive SEOS using Timer 0.
12. Develop software for milk pasteurization system.

PART – B

Note. Any 6 Programs from the following (Experiment – 1 is mandatory)

1. A Study of Code Composer Studio (CC Studio Latest Version)
2. Flashing a light by a software delay.
3. Displaying Characters on LCD.
4. Serial Communication using UART.
5. Basic Input and Output using MSP430 UART.
6. Interrupt Handling using MSP430.
7. Analog to Digital Conversion using MSP430.
8. Interfacing External Devices to GPIO Ports

Equipment's Required:

1. Computer with latest configurations
2. Code Composer Studio v6.1 (Preferably Latest version)
3. MSP430/ARM based Hardware kits and add-on boards.

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M.Tech III semester (DECS)

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(17D20301) RESEARCH METHODOLOGY

(Elective V-OPEN ELECTIVE)

UNIT I

Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

UNIT II

Sampling Design – steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design.
Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation.
Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

UNIT III

Correlation and Regression Analysis – Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

UNIT IV

Statistical Inference: Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multi-variate Analysis.

UNIT V

Report Writing and Professional Ethics: Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

Text Books:

Research Methodology:Methods And Techniques – C.R.Kothari, 2nd Edition,New Age International Publishers.
Research Methodology: A Step By Step Guide For Beginners- Ranjit Kumar, Sage Publications (Available As Pdf On Internet)
Research Methodology And Statistical Tools – P.Narayana Reddy And G.V.R.K.Acharyulu, 1st Edition,Excel Books,New Delhi.

REFERENCES:

1. Scientists Must Write - Robert Barrass (Available As Pdf On Internet)
2. Crafting Your Research Future –Charles X. Ling And Quiang Yang (Available As Pdf On Internet)

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M.Tech III semester (DECS)

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(17D20302) HUMAN VALUES AND PROFESSIONAL ETHICS

(Elective V-OPEN ELECTIVE)

Unit I:

HUMAN VALUES:Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

Unit II:

ENGINEERING ETHICS: Senses of Engineering Ethics- Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg‟s theory- Gilligan‟s theory- Consensus and controversy – Models of professional roles- Theories about right action- Self interest - Customs and religion –Uses of Ethical theories – Valuing time –Co operation – Commitment.

Unit III :

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

UNIT IV:

ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK: Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing riskSafety and the Engineer- Designing for the safety- Intellectual Property rights(IPR).

UINIT V:

GLOBAL ISSUES: Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics .

Text Books :

1. “Engineering Ethics includes Human Values” by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
2. “Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. “Ethics in Engineering” by Mike W. Martin and Roland Schinzinger – Tata McGrawHill– 2003.
4. “Professional Ethics and Morals” by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
5. “Professional Ethics and Human Values” by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran , Laxmi Publications.

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M.Tech III semester (DECS)

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(17D20303) INTELLECTUAL PROPERTY RIGHTS
(Elective V-OPEN ELECTIVE)

UNIT – I
Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

UNIT – II
Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

UNIT – III
Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.
Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

UNIT – IV
Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.
Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

UNIT – V
New Development Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.
International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

TEXT BOOKS & REFERENCES:

1. Intellectual Property Right, Deborah. E. Bouchoux, Cengage Learing.
2. Intellectual Property Right – Nleashmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,