

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)**

M. Tech –Systems & Signal Processing

**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
M.TECH - SYSTEMS & SIGNAL PROCESSING
COURSE STRUCTURE & SYLLABUS**

I Year I Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R17D9301	Transform Techniques	3	-	3	30	70
2	R17D9302	Multi Media Processing	3	-	3	30	70
3	R17D9303	Embedded System Design	3	-	3	30	70
4	R17D9304 R17D9305 R17D9306	Elective I 1. Biomedical Signal Processing 2. Radar Signal Processing 3. VLSI Signal Processing	3	-	3	30	70
5	R17D9307 R17D9308 R17D9309	Elective II 1. Advanced Data Communications 2. Detection and Estimation Theory 3. Digital System Design	3	-	3	30	70
6	R17DEC51 R17DCS51 R17DME51 R17DAE51	OPEN ELECTIVE –I 1. Embedded Systems Programming 2. Scripting Languages 3. Non-conventional Energy Sources 4. Mathematical Modeling Techniques	3	-	3	30	70
7	R17D9381	Advanced Signal Processing Lab1	-	3	2	30	70
8	R17D9382	Technical Seminar-I	-	-	2	50	-
Total			18	3	22	260	490

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I Year II Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R17D9310	Adhoc –Wireless Networks	3	-	3	30	70
2	R17D9311	Coding Theory & Techniques	3	-	3	30	70
3	R17D9312	Multi Rate Signal Processing	3	-	3	30	70
4	R17D9313 R17D9314 R17D9315	Elective III 1. Hardware-Software Co-Design 2. Embedded RTOS 3. Wireless Channel Coding	3	-	3	30	70
5	R17D9316 R17D9317 R17D9318	Elective IV 1.Mobile Computing Technologies 2. SoC Architectures 3. Array Signal Processing	3	-	3	30	70
6	R17DEC52 R17DCS52 R17DME52 R17DCS53	OPEN ELECTIVE- II 1.Internet of Things 2.Information Security 3.Industrial Management 4.Research Methodology	3	-	3	30	70
7	R17D9383	Advanced Signal Processing Lab 2	-	3	2	30	70
8	R17D9384	Technical Seminar-II	-	-	2	50	-
Total			18	3	22	260	490

II Year I Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R17D9385	Technical Seminar-III	-	-	2	50	-
2	R17D9391	Project Review-I	-	-	10	100	-
3	R17D9392	Project Review-II	-	-	10	100	-
Total			-	-	22	-	-

II Year II Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R17D9386	Technical Seminar-IV	-	-	2	50	-
2	R17D9393	Project Review-III	-	-	10	100	-
3	R17D9394	Project Viva-Voce	-	-	10	-	100
Total			-	-	22	-	-

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M. Tech – I Year – I Sem. (Systems & Signal Processing)

(R17D9301) TRANSFORM TECHNIQUES

UNIT -I:

Fourier Analysis: Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -II:

Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, – definition, properties and applications

UNIT -III:

Continuous Wavelet Transform (CWT): 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- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV:

Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:

Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis-BSplines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

1. Wavelet Transforms-Introduction theory and applications -Raghuveer M.Rao and Ajit S.Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. "Insight into Wavelets from Theory to Practice" - Soman. K. P, Ramachandran. K.I,Printice Hall India, First Edition, 2004.

REFERENCE BOOKS:

1. Fundamentals of Wavelets- Theory, Algorithms and Applications -Jaideva C Goswami,Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. Wavelets and Sub-band Coding -Vetterli M. Kovacevic, PJI, 1995.
3. Introduction to Wavelets and Wavelet Transforms -C. Sydney Burrus, PHI, First Edition,1997.
4. A Wavelet Tour of Signal Processing-Stephen G. Mallat, Academic Press, 2 Ed
5. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009

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(R17D9302) MULTIMEDIA PROCESSING

UNIT I - Audio Processing Systems

Digital Signal Processors: Fixed Point DSPs, Floating Point DSPs, Development Tools, Digital Audio Interfaces: Two-Channel AES/EBU Interface, MADI Interface, Single Processor Systems: Peripherals, Control, Multi Processor Systems: Connection via Serial Links, Connection via Parallel Links, Connection via Standard Bus Systems, Scalable Audio System

UNIT II – Equalizers

Recursive Audio Filters: Design, Parametric Filter structures, Quantization Effects, Non-recursive Audio Filters: Fast Convolution, Fast Convolution of Long Sequences, Filter Design by Filter Sampling, Multi-Complementary Filter Bank: Principles, Example: 8-band Multi Complementary Filter Bank

UNIT III - Audio Coding

Audio Coding: Lossless Audio Coding, Lossy Audio Coding, Psycho acoustics, Advanced Audio Coding (MPEG Coding Standards), Spectral Band Replication, Java Applet- Psycho acoustics.

UNIT -IV:

Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT –V:

Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

1. .Udo Zolzer, “Digital Audio Signal Processing” 2nd Edition, John Wiley Sons & Pvt Ltd.
2. Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
3. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.

REFERENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International.
3. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4. Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5. Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

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(R17D9303) EMBEDDED SYSTEM DESIGN

UNIT –I:

ARM Architecture:

ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and

Vector Table, Architecture Revision, ARM Processor Families.

UNIT –II:

ARM Programming Model – I:

Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions,

PSR Instructions, Conditional Instructions.

UNIT –III:

ARM Programming Model – II:

Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions,

Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT –IV:

ARM Programming:

Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops.

UNIT –V:

Memory Management:

Cache Architecture, Policies, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch.

TEXT BOOKS:

1. ARM Systems Developer's Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.
2. Professional Embedded ARM development-James A Langbridge, Wiley/Wrox

REFERENCE BOOKS:

1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.
2. ARM System on Chip Architecture, Steve Furber, 2nd Edition, Pearson

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**(R17D9304) BIOMEDICAL SIGNAL PROCESSING
(ELECTIVE – I)**

UNIT -I:

Random Processes: Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

UNIT -II:

Data Compression Techniques: Lossy and Lossless data reduction Algorithms, ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III:

Cardiological Signal Processing: Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition. Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT -IV:

Signal Averaging, Polishing: Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y – W) equations, Analysis of Evoked Potentials.

UNIT -V:

Neurological Signal Processing: Modelling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modelling of seizure EEG, Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, 2005, TMH.

REFERENCE BOOKS:

1. Digital Biosignal Processing - Weitkunat R, 1991, Elsevier.
2. Biomedical Signal Processing - Akay M , IEEE Press.
3. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, 1986, CRC Press.
4. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J. Tompkins, PHI.

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**(R17D9305) RADAR SIGNAL PROCESSING
(ELECTIVE - I)**

UNIT -I:

Introduction: Radar Block Diagram, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, Bistatic Radar. Matched Filter Receiver – Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.

UNIT -II:

Detection of Radar Signals in Noise: Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors – Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection - CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management – Schematics, Component Parts, Resources and Constraints.

UNIT -III:

Waveform Selection [3, 2]: Radar Ambiguity Function and Ambiguity Diagram – Principles and

Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT -IV:

Pulse Compression in Radar Signals: Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics

of Passive System, Digital Compression, SAW Pulse Compression.

UNIT V:

Phase Coding Techniques: Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar. Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Side lobe Reduction for Phase Coded PC Signals.

TEXT BOOKS:

1. Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.
2. Radar Design Principles : Signal Processing and The Environment - Fred E. Nathanson, 2nd Ed., 1999, PHI.
3. Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.

REFERENCE BOOKS:

1. Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.
2. Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.
3. Radar Design Principles - F.E. Nathanson, 1st Ed., 1969, McGraw Hill.

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**(R17D9306) VLSI SIGNAL PROCESSING
(ELECTIVE -I)**

UNIT -I:

Introduction to DSP: Typical DSP algorithms, DSP algorithms benefits, Representation of DSP

algorithms

Pipelining and Parallel Processing: Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power

Retiming: Introduction – Definitions and Properties – Solving System of Inequalities – Retiming

Techniques

UNIT –II:

Folding and Unfolding: Folding: Introduction -Folding Transform - Register minimization Techniques – Register minimization in folded architectures – folding of multirate systems

Unfolding: Introduction – An Algorithm for Unfolding – Properties of Unfolding – critical Path,

Unfolding and Retiming – Applications of Unfolding

UNIT -III:

Systolic Architecture Design: Introduction – Systolic Array Design Methodology – FIR Systolic Arrays – Selection of Scheduling Vector – Matrix Multiplication and 2D Systolic Array Design –Systolic Design for Space Representations contain Delays

UNIT -IV:

Fast Convolution: Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT -V:

Low Power Design: Scaling Vs Power Consumption –Power Analysis, Power Reduction techniques – Power Estimation Approaches Programmable DSP: Evaluation of Programmable Digital Signal Processors, DSP Processors for Mobile and Wireless Communications, Processors for Multimedia Signal Processing

TEXT BOOKS:

1. VLSI Digital Signal Processing- System Design and Implementation – Keshab K. Parhi,1998, Wiley Inter Science.
2. VLSI and Modern Signal Processing – Kung S. Y, H. J. White House, T. Kailath, 1985,Prentice Hall.

REFERENCE BOOKS:

1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, 1994, Prentice Hall.
2. VLSI Digital Signal Processing – Medisetti V. K, 1995, IEEE Press (NY), USA

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**(R17D9307) ADVANCED DATA COMMUNICATIONS
(ELECTIVE – II)**

UNIT -I:

Digital Modulation Schemes: BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:

Basic Concepts of Data Communications, Interfaces and Modems: Data Communication Networks, Protocols and Standards, UART, USB, I2C, I2S, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSI model.

UNIT -III:

Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code

Data Link Control: Line Discipline, Flow Control, Error Control

Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT -IV:

Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.

Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.

Metropolitan Area Networks: IEEE 802.6, SMDS

Switching: Circuit Switching, Packet Switching, Message Switching.

Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:

Multiple Access Techniques: Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- 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), OFDM and OFDMA.

TEXT BOOKS:

1. Data Communication and Computer Networking - B. A. Forouzan, 2nd Ed., 2003, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5th Ed., 2008, PEI.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th Ed., 2007, PHI.
3. Data Communication and Tele Processing Systems - T. Housely, 2nd Ed, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2005, PHI.

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**(R17D9308) DETECTION AND ESTIMATION THEORY
(ELECTIVE - II)**

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 tored 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 Spectral 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.

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**(R17D9309) DIGITAL SYSTEM DESIGN
(ELECTIVE -II)**

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

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**(R17DEC51) EMBEDDED SYSTEMS PROGRAMMING
(OPEN ELECTIVE –I)**

Unit 1 - Embedded OS (Linux) Internals

Linux internals: Process Management, File Management, Memory Management, I/O Management. Overview of POSIX APIs, Threads – Creation, Cancellation, POSIX Threads Inter Process Communication - Semaphore, Pipes, FIFO, Shared Memory
Kernel: Structure, Kernel Module Programming Schedulers and types of scheduling.
Interfacing: Serial, Parallel Interrupt Handling Linux Device Drivers: Character, USB, Block & Network

Unit 2 – Open source RTOS

Basics of RTOS: Real-time concepts, Hard Real time and Soft Real-time, Differences between General Purpose OS & RTOS, Basic architecture of an RTOS, Scheduling Systems, Inter-process communication, Performance Matrix in scheduling models, Interrupt management in RTOS environment, Memory management, File systems, I/O Systems, Advantage and disadvantage of RTOS.

Unit 3 – Open Source RTOS Issues

POSIX standards, RTOS Issues - Selecting a Real Time Operating System, RTOS comparative study. Converting a normal Linux kernel to real time kernel, Xenomai basics.
Overview of Open source RTOS for Embedded systems (Free RTOS/ Chibios-RT) and application development.

Unit 4 – VxWorks / Free RTOS

VxWorks/ Free RTOS Scheduling and Task Management - Realtime scheduling, Task Creation, Intertask Communication, Pipes, Semaphore, Message Queue, Signals, Sockets, Interrupts I/O Systems - General Architecture, Device Driver Studies, Driver Module explanation, Implementation of Device Driver for a peripheral

Unit 5 – Case study

Cross compilers, debugging Techniques, Creation of binaries & porting stages for Embedded Development board (Beagle Bone Black, Rpi or similar), Porting an Embedded OS/ RTOS to a target board (). Testing a real time application on the board

TEXT BOOKS:

1. Essential Linux Device Drivers, Venkateswaran Sreekrishnan
2. Writing Linux Device Drivers: A Guide with Exercises, J. Cooperstein
3. Real Time Concepts for Embedded Systems – Qing Li, Elsevier

REFERENCES:

1. Embedded Systems Architecture Programming and Design: Raj Kamal, Tata McGraw Hill
2. Embedded/Real Time Systems Concepts, Design and Programming Black Book, Prasad, KVK
3. Software Design for Real-Time Systems: Cooling, J E Proceedings of 17th IEEE Real-Time Systems Symposium December 4-6, 1996 Washington, DC: IEEE Computer Society
4. Real-time Systems – Jane Liu, PH 2000
5. Real-Time Systems Design and Analysis : An Engineer's Handbook: Laplante, Phillip A
6. Structured Development for Real - Time Systems V1 : Introduction and Tools: Ward, Paul T & Mellor, Stephen J

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7. Structured Development for Real - Time Systems V2 : Essential Modeling Techniques: Ward, Paul T & Mellor, Stephen J
8. Structured Development for Real - Time Systems V3 : Implementation Modeling Techniques: Ward, Paul T & Mellor, Stephen J
9. Monitoring and Debugging of Distributed Real-Time Systems: TSAI, Jeffrey J P & Yang, J H
10. Embedded Software Primer: Simon, David E.
11. Embedded Systems Architecture Programming and Design: Raj Kamal, Tata McGraw Hill

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**(R17DCS51) SCRIPTING LANGUAGES
(OPEN ELECTIVE – I)**

UNIT I

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines, advance perl - finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT II

PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Datatypes, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT III

Advanced PHP Programming Php and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World – Translating Websites- Updating Web sites Scripts, Creating the Localization Repository, Translating Files, text, Generate Binary Files, Set the desired language within your scripts, Localizing Dates, Numbers and Times.

UNIT IV

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and up level commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk- Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

UNIT V

Python Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling, Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dreamtech)

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Programming Python, M.Lutz, SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. PHP 5.1,I.Bayross and S.Shah, The X Team, SPD.

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M. Tech – I Year – I Sem. (Systems & Signal Processing)

5. Core Python Programming, Chun, Pearson Education.
6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Perl by Example, E.Quigley, Pearson Education.
8. Programming Perl, Larry Wall, T.Christiansen and J.Orwant, O'Reilly, SPD.
9. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
10. PHP and MySQL by Example, E.Quigley, Prentice Hall(Pearson).
11. Perl Power, J.P.Flynt, Cengage Learning.
12. PHP Programming solutions, V.Vaswani, TMH.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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M. Tech – I Year – I Sem. (Systems & Signal Processing)

(R17DME51) NON-CONVENTIONAL ENERGY SOURCES
(OPEN ELECTIVE-I)

UNIT-I

Introduction: Energy Scenario, Survey of energy resources. Classification and need for conventional energy resources.

Solar Energy: The Sun-sun-Earth relationship, Basic matter to waste heat energy circuit, Solar Radiation, Attention, Radiation measuring instruments.

Solar Energy Applications: Solar water heating. Space heating, Active and passive heating, Energy storage, Selective surface, Solar stills and ponds, solar refrigeration, Photovoltaic generation.

UNIT -II

Geothermal Energy: Structure of earth, Geothermal Regions, Hot springs. Hot Rocks, Hot Aquifers. Analytical methods to estimate thermal potential. Harnessing techniques, Electricity generating systems.

UNIT-III

Direct Energy Conversion: Nuclear Fusion, Fusion reaction, P-P cycle, Carbon cycle, Deuterium cycle, Condition for controlled fusion, Fuel cells and photovoltaic, Thermionic and Thermoelectric generation and MHD generator.

Hydrogen Gas as Fuel: Production methods, Properties, I.C. Engines applications, Utilization strategy, Performances.

UNIT-IV

Bioenergy: Biomass energy sources. Plant productivity, Biomass wastes, aerobic and anaerobic bioconversion processes, Raw material and properties of bio-gas, Bio-gas plant technology and status, the energetic and economics of biomass systems, Biomass gasification

UNIT-V

Wind Energy: Wind, Beaufort number, Characteristics, Wind energy conversion systems, Types, Betz model. Interference factor. Power coefficient, Torque coefficient and Thrust coefficient, Lift machines and Drag machines. Matching Electricity generation.

Energy from Oceans: Tidal energy, Tides, Diurnal and semi-diurnal nature, Power from tides, Wave Energy, Waves, Theoretical energy available. Calculation of period and phase velocity of waves, Wave power systems, submerged devices. Ocean thermal Energy, Principles, Heat exchangers, Pumping requirements, Practical considerations.

TEXTBOOKS:

- 1.Non-conventional Energy Sources / GD Rai/Khanna publications.
- 2.Non-Conventional Energy Sources and Utilisation (Energy Engineering)/ R KRajput/ S.Chand.
- 3.Renewable Energy Sources /Twidell & Weir/Taylor and Francis/ 2nd special Indian edition .

REFERENCE BOOKS:

- 1.Renewable Energy Resources- Basic Principles and Applications/ G.N.Tiwari and M.K.GhosalNarosa Publications.
- 2.Renewable Energy Resources/ John Twidell & Tony Weir/Taylor & Francis/2nd edition.
- 3.Non Conventional Energy / K.Mittal/ Wheeler.

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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M. Tech – I Year – I Sem. (Systems & Signal Processing)

**(R17DAE51) MATHEMATICAL MODELING TECHNIQUES
(OPEN ELECTIVE-I)**

UNIT-I: INTRODUCTION TO MODELING AND SINGULAR PERTURBATION METHODS

Definition of a model, Procedure of modeling: problem identification, model formulation, reduction, analysis, Computation, model validation, Choosing the model, Singular Perturbations: Elementary boundary layer theory, Matched asymptotic expansions, Inner layers, nonlinear oscillations

UNIT-II: VARIATIONAL PRINCIPLES AND RANDOM SYSTEMS

Variational calculus: Euler's equation, Integrals and missing variables, Constraints and Lagrange multipliers, Variational problems: Optics-Fermat's principle, Analytical mechanics: Hamilton's principle, Symmetry: Noether's theorem, Rigid body motion, Random systems: Random variables, Stochastic processes, Monte Carlo method

UNIT-III: FINITE DIFFERENCES: ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

ODE: Numerical approximations, Runge-Kutta methods, Beyond Runge-Kutta, PDE: Hyperbolic equations-waves, Parabolic equations-diffusion, Elliptic equations-boundary values

CELLULAR AUTOMATA AND LATTICE GASES

Lattice gases and fluids, Cellular automata and computing

UNIT- IV: FUNCTION FITTING AND TRANSFORMS

Function fitting: Model estimation, Least squares, Linear least squares: Singular value decomposition, Non-linear least squares: Levenberg-Marquardt method, Estimation, Fisher information, and Cramer-Rao inequality, Transforms: Orthogonal transforms, Fourier transforms, Wavelets, Principal components

FUNCTION FITTING ARCHITECTURES

Polynomials: Pade approximants, Splines, Orthogonal functions, Radial basis functions, Over-fitting, Neural networks: Back propagation, Regularization

UNIT-V: OPTIMIZATION AND SEARCH

Multidimensional search, Local minima, Simulated annealing, Genetic algorithms

FILTERING AND STATE ESTIMATION

Matched filters, Wiener filters, Kalman filters, Non-linearity and entrainment, Hidden Markov models

TEXT BOOK

1. *The Nature of Mathematical Modeling*, Neil Gershenfeld, Cambridge University Press, 2006, ISBN 0-521-57095-6

REFERENCE BOOKS

1. *Mathematical Models in the Applied Sciences*, A. C. Fowler, Cambridge University Press, 1997, ISBN 0-521-46140-5
2. *A First Course in Mathematical Modeling*, F. R. Giordano, M.D. Weir and W.P. Fox, 2003, Thomson, Brooks/Cole Publishers
3. *Applied Numerical Modeling for Engineers*, Donald De Cogan, Anne De Cogan, Oxford University Press, 1997

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M. Tech – I Year – I Sem. (Systems & Signal Processing)

(R17D9381) ADVANCED SIGNAL PROCESSING LAB-I

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)

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9310) ADHOC -WIRELESS NETWORKS

UNIT -I:

Wireless LANS and PANS: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.

AD HOC Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks.

UNIT -II:

MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT -III:

Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT –IV:

Transport Layer Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT –V:

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press.

REFERENCE BOOKS:

1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , 1st Ed. Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9311) CODING THEORY AND TECHNIQUES

UNIT –I:

Coding for Reliable Digital Transmission and Storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:

Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:

Burst –Error-Correcting Codes: Decoding of Single-Burst error Correcting Cyclic codes, Single-Burst-Error-Correcting Cyclic codes, Burst-Error-Correcting Convolutional Codes, Bounds on Burst Error-Correcting Capability, Interleaved Cyclic and Convolutional Codes, Phased-Burst –Error-Correcting Cyclic and Convolutional codes.

UNIT -V:

BCH – Codes: BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello, Jr.Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill Publishing.

REFERENCE BOOKS:

1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
2. Digital Communications- John G. Proakis, 5th Ed., 2008, TMH.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
4. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9312) MULTIRATE SIGNAL PROCESSING

Unit-I

Fundamentals of Multirate Theory: The sampling theorem - sampling at sub-Nyquist rate - Basic Formulations and schemes. Basic Multirate operations- Decimation and Interpolation - Digital Filter Banks- DFT Filter Bank- Identities- Poly-phase representation (c) Maximally decimated filter banks: Poly-phase representation, Errors in the QMF bank, Perfect reconstruction (PR) QMF Bank, Design of an alias free QMF Bank.

Unit-II

M-channel perfect reconstruction filter banks: Uniform band and non uniform filter bank - tree structured filter bank- Errors created by filter bank system- Poly-phase representation- perfect reconstruction systems –

Unit-III

Perfect reconstruction (PR) filter banks: Para-unitary PR Filter Banks- Filter Bank Properties induced by para-unitarity- Two channel FIR para-unitary QMF Bank- Linear phase PR Filter banks- Necessary conditions for Linear phase property- Quantization Effects: -Types of quantization effects in filter banks. - coefficient sensitivity effects, dynamic range and scaling.

Unit-IV

Cosine Modulated filter banks: Cosine Modulated pseudo QMF Bank- Alias cancellation- phase - Phase distortion- Closed form expression- Poly-phase structure- PR System

Unit-V

Introduction to Wavelet Transforms: Short time Fourier Transform, Cabor Transform, Wavelet Transform, Recursive multi resolution decomposition, Haar wavelet, Digital Filter implementation of the Haar wavelet.

TEXT BOOKS:

1. Robert Cristi, "Modern Digital Signal Processing," Thomson Books, 2004.
2. F.J. Harris, "Multirate Signal Processing for Communication Systems," PHI, 2004.
3. N.J. Fliege, "Multirate Digital Signal Processing", John Wiley 1994.

REFERENCE BOOKS:

1. E.C. Ifeachor and B.W.Jervis, Digital Signal Processing: A Practical Approach, Addison-Wesley, 1993.
2. Sanjit K. Mitra, "Digital Signal Processing", TMH, 1998.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9313) HARDWARE- SOFTWARE CO- DESIGN
(ELECTIVE -III)

UNIT –I

CO- DESIGN ISSUES

Co- Design Models, Architectures, Languages, A Generic Co-design Methodology.

CO- SYNTHESIS ALGORITHMS :

Hardware software synthesis algorithms: hardware – software partitioning distributed system cosynthesis.

UNIT –II

PROTOTYPING AND EMULATION:

Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure

TARGET ARCHITECTURES:

Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT – III

COMPILATION TECHNIQUES AND TOOLS FOR EMBEDDED PROCESSOR

ARCHITECTURES:

Modern embedded architectures, embedded software development needs, compilation technologies practical consideration in a compiler development environment.

UNIT – IV

DESIGN SPECIFICATION AND VERIFICATION:

Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification

UNIT – V

LANGUAGES FOR SYSTEM – LEVEL SPECIFICATION AND DESIGN-I

System – level specification, design representation for system level synthesis, system level specification languages,

LANGUAGES FOR SYSTEM – LEVEL SPECIFICATION AND DESIGN-II

Heterogeneous specifications and multi language co-simulation the cosyma system and lycos system.

TEXT BOOKS :

1. Hardware / software co- design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.
2. Hardware / software co- design Principles and Practice, 2002, kluwer academic publishers

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9314) EMBEDDED REAL TIME OPERATING SYSTEMS
(ELECTIVE -III)

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, tasks 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, 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.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9315) WIRELESS CHANNEL CODING
(ELECTIVE -III)

Unit-I Overview of wireless communications. Characterization of wireless channels: Path Loss and shadowing models, Statistical fading models, Narrowband/Wideband fading models. Capacity of Wireless Channels. Performance of Digital Modulation. Diversity in Fading Channels.

Unit-II Multiple Antenna and Space-Time Communications: Narrowband MIMO Model, Parallel Decomposition of MIMO Channel, MIMO diversity Gain: Beam forming, Space-Time modulation and coding. Frequency-Selective MIMO communications, Smart Antennas, MIMO Channel Capacity.

Unit-III Coding for Wireless Channels: Channel Coding and its potential. Coding in a signal space. Coded modulation and coding with interleaving. Basic error control coding & concerned mathematics. Linear block codes, Cyclic codes, BCH and Reed-Solomon codes.

Unit-IV Trellis representation of codes, Coding on a trellis, Convolutional Codes, Trellis coded modulation. Codes on graphs and Concatenated codes. Turbo Codes and LDPC codes.

Unit-V Adaptive modulation and coding: Adaptive techniques, Variable-Rate Variable-Power MQAM: adaptive rate and power techniques, Adaptive coded modulation, adaptive techniques in combined fast and slow fading.

TEXT BOOKS:

1. Ezio Biglieri, "Coding for Wireless Channels," Springer, 2005.
2. D.Tse, and P. Viswanath, "Fundamentals of Wireless Communication," CUP, 2005.
3. A. Goldsmith, "Wireless Communications," CUP, 2005.
4. M.K. Simon and M.S. Alouini, "Digital Communication over Fading channels: A Unified approach to performance analysis," Wiley, 2000.
5. Theodore S. Rappaport, "Wireless Communications- Principles and practice," 2/e, PHI, 2002.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9316) MOBILE COMPUTING TECHNOLOGIES
(ELECTIVE -IV)

Unit – I: Introduction to Mobile Computing Architecture

Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture – Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.

Unit – II: Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G

Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

Unit – III: Wireless Application Protocol (WAP) and Wireless LAN

WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN

Intelligent Networks and Interworking

Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – softswitch – Programmable Networks – Technologies and Interfaces for IN

Unit – IV: Client Programming, Palm OS, Symbian OS, Win CE Architecture

Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture

J2ME

JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages

Unit – V: Voice over Internet Protocol and Convergence

Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparison between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP

Security Issues in Mobile Computing

Introduction – Information Security – Security Techniques and Algorithms – Security Protocols – Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile Environment

TEXT BOOKS:

1. Mobile Computing – Technology, Applications and Service Creation – Asoke K Talukder, Roopa R Yavagal, 2009, TATA McGraw Hill
2. Mobile Communications – Jochen Schiller – 2nd Edition – Pearson Education

REFERENCES:

1. The CDMA 2000 System for Mobile Communications – Vieri Vaughni, Alexander Damn Jaonvic – Pearson
2. ADALESTEIN : Fundamentals of Mobile & Parvasive Computing, 2008, TMH

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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17D9317) SYSTEM ON CHIP ARCHITECTURE
(ELECTIVE -IV)

UNIT –I:

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing, System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT –II:

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT –III:

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I , and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

UNIT -IV:

Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance-Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT –V:

Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiley India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

REFERENCE BOOKS:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM
3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

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(UGC AUTONOMOUS)
M. Tech – I Year –II Sem. (Systems & Signal Processing)
(R17D9318) ARRAY SIGNAL PROCESSING
(ELECTIVE -IV)

Unit-I Spatial Signals: Signals in space and time. Spatial frequency, Direction vs. frequency. Wave fields. Far field and Near field signals.

Unit-II Sensor Arrays: Spatial sampling, Nyquist criterion. Sensor arrays. Uniform linear arrays, planar and random arrays. Array transfer (steering) vector. Array steering vector for ULA. Broadband arrays.

Unit- III Spatial Frequency : Aliasing in spatial frequency domain. Spatial Frequency Transform, Spatial spectrum. Spatial Domain Filtering. Beam Forming. Spatially white signal.

Unit-IV Direction of Arrival Estimation : Non parametric methods - Beam forming and Capon methods. Resolution of Beam forming method

Unit-V Subspace methods: Subspace methods - MUSIC, Minimum Norm and ESPRIT techniques. Spatial Smoothing.

Text Books:

1. Don H. Johnson and Dan E. Dugon, "Array Signal Processing: Concepts and Techniques," PHI, 2010.
2. Prabhakar S. Naidu, "Sensor Array Signal Processing," 2/e, CRC Press, 2009.
3. Simon Haykin, "Array Signal Processing," PHI, 1984.
4. Petre Stoica and Randolph L. Moses, "Spectral Analysis of Signals," PHI, 2005.

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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17DEC52) INTERNET OF THINGS
(OPEN ELECTIVE –II)

Unit 1: The IoT Networking Core :

Technologies involved in IoT Development: Internet/Web and Networking Basics OSI Model, Data transfer referred with OSI Model, IP Addressing, Point to Point Data transfer, Point to Multi Point Data transfer & Network Topologies, Sub-netting, Network Topologies referred with Web, Introduction to Web Servers, Introduction to Cloud Computing IoT Platform overview Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.

Unit 2: Network Fundamentals:

Overview and working principle of Wired Networking equipment's – Router, Switches, Overview and working principle of Wireless Networking equipment's – Access Points, Hubs etc. Linux Network configuration Concepts: Networking configurations in Linux Accessing Hardware & Device Files interactions.

Unit 3: IoT Architecture:

History of IoT, M2M – Machine to Machine, Web of Things, IoT protocols Applications: Remote Monitoring & Sensing, Remote Controlling, Performance Analysis. The Architecture The Layering concepts , IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN Security aspects in IoT

Unit 4: IoT Application Development:

Application Protocols MQTT, REST/HTTP, CoAP, MySQL.

Back-end Application Designing

Apache for handling HTTP Requests, PHP & MySQL for data processing, MongoDB Object type Database, HTML, CSS & jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development, Application Development for mobile Platforms: Overview of Android / IOS App Development tools

Unit 5: Case Study & advanced IoT Applications:

IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

TEXT BOOKS:

1. 6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley
2. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers
3. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann

REFERENCES:

1. The Internet of Things: From RFID to the Next-Generation Pervasive Networked Lu Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning
2. Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga
3. Designing the Internet of Things , Adrian McEwen (Author), Hakim Cassimally
4. Asoke K Talukder and Roopa R Yavagal, "Mobile Computing," Tata McGraw Hill, 2010.
5. Computer Networks; By: Tanenbaum, Andrew S; Pearson Education Pte. Ltd., Delhi, 4th Edition

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

M. Tech – I Year –II Sem. (Systems & Signal Processing)

6. Data and Computer Communications; By: Stallings, William; Pearson Education Pte. Ltd., Delhi, 6th Edition
7. F. Adelstein and S.K.S. Gupta, "Fundamentals of Mobile and Pervasive Computing," McGraw Hill, 2009.
8. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
9. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

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M. Tech – I Year –II Sem. (Systems & Signal Processing)

(R17DCS52) INFORMATION SECURITY
(OPEN ELECTIVE – II)

UNIT I

A model for Internetwork security, Conventional Encryption Principles & Algorithms (DES, AES, RC4, Blowfish), Block Cipher Modes of Operation, Location of Encryption Devices, Key Distribution. Public key cryptography principles, public key cryptography algorithms (RSA, Diffie-Hellman, ECC), public Key Distribution.

UNIT II

Approaches of Message Authentication, Secure Hash Functions (SHA-512, MD5) and HMAC, Digital Signatures, Kerberos, X.509 Directory Authentication Service, Email Security: Pretty Good Privacy (PGP)

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT III

Web Security: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Firewalls: Firewall Design principles, Trusted Systems, Intrusion Detection Systems

UNIT IV

Auditing For Security: Introduction, Basic Terms Related to Audits, Security audits, The Need for Security Audits in Organization, Organizational Roles and Responsibilities for Security Audit, Auditors Responsibility In Security Audits, Types Of Security Audits.

UNIT V

Auditing For Security: Approaches to Audits, Technology Based Audits Vulnerability Scanning And Penetration Testing, Resistance to Security Audits, Phase in security audit, Security audit Engagement Costs and other aspects, Budgeting for security audits, Selecting external Security Consultants, Key Success factors for security audits.

TEXT BOOKS:

1. Cryptography and Network Security by William Stallings, Fourth Edition, Pearson Education 2007.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education, 2008.
3. Cryptography & Network Security by Behrouz A. Forouzan, TMH 2007.
4. Information Systems Security by Nina Godbole, WILEY 2008.

REFERENCE BOOKS:

1. Information Security by Mark Stamp, Wiley – INDIA, 2006.
2. Fundamentals of Computer Security, Springer.
3. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
4. Computer Security Basics by Rick Lehtinen, Deborah Russell & G.T.Gangemi Sr., SPD O'REILLY 2006.
5. Modern Cryptography by Wenbo Mao, Pearson Education 2007.
6. Principles of Information Security, Whitman, Thomson.

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(R17DME52) INDUSTRIAL MANAGEMENT
(OPEN ELECTIVE-II)

UNIT- I

Concepts of Management and Organisation - Functions of Management - Evolution of Management Thought : Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Mayo's Hawthorne Experiments, Herzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs - Systems Approach to Management.

UNIT –II

Designing Organisational Structures : Basic concepts related to Organisation - Departmentation and Decentralisation, Types of mechanistic and organic structures of organisation (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

UNIT –III

Plant location, definition, factors affecting the plant location, comparison of rural and urban sites- methods for selection of plant- Matrix approach. Plant Layout - definition, objectives, types of production, types of plant layout - various data analyzing forms-travel chart. Work study - Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-difference between micromotion and memomotion studies. Work measurement- definition,time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation. Work Sampling - definition, steps involved, standard time calculations, differences with time study.

UNIT –IV

Materials Management-Objectives, Inventory - functions, types, associated costs, inventory classification techniques-ABC and VED analysis. Inventory Control Systems-Continuous review system-periodical review system. Stores Management and Stores Records. Purchase management, duties of purchase of manager,associated forms.Introduction to PERT / CPM : Project management, network modeling-probabilistic model, various types of activity times estimation-programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method (CPM)-critical path calculation-crashing of simple of networks.

UNIT –V

Inspection and quality control, types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans-OC curves. Introduction to TQM-Quality Circles, ISO 9000 series procedures. Introduction to Human Resource Management, Functions of HRM, Job Evaluation, different types of evaluation methods. Job description, Merit Rating.- difference with job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. Marketing, marketing vs selling, marketing mix, product life-cycle.

TEXT BOOKS:

1. Amrine, Manufacturing Organization and Management, Pearson, 2nd Edition, 2004.
2. Industrial [Engineering](#) and Management O.P. Khanna Dhanpat Rai.

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3. A.R.Aryasri, Management Science , Tata McGraw-Hill, 2002.

REFERENCE BOOKS:

1. Panner Selvam, Production and Operations Management, PHI, 2004.
2. Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Reliability Engineering & Quality Engineering, Galgotia Publications, Pvt., Limited.
3. Phillip Kotler, Marketing Management, Pearson, 2004.

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(R17DCS53) RESEARCH METHODOLOGY
(OPEN ELECTIVE – II)

UNIT - I

Introduction: Research objective and motivation, Types of research, Research approaches, Significance, Research method vs. methodology, Research process.

UNIT - II

Formulating a research problem: Literature review, Formulation of objectives, Establishing Operational definitions, Identifying variables, constructing hypotheses.

UNIT - III

Research design and Data Collection: Need and Characteristics, Types of research design, Principles of Experimental research design, Method of data collection, Ethical issues in collecting data.

UNIT - IV

Sampling and Analysis of data: Need of Sampling, Sampling distributions, Central limit theorem, Estimation: mean and variance, Selection of sample size Statistics in research, Measures of Central tendency, Dispersion, asymmetry and relationships, Correlation and Regression analysis, Displaying data

UNIT - V

Hypothesis Testing: Procedure, Hypothesis testing for difference in mean, variance limitations, Chi-square test, Analysis of variance (ANOVA), Basic principles and techniques of writing a Research Proposal

Text Books:

1. R. C. Kothari, Research Methodology: Methods and Techniques, 2nd edition, New Age International Publisher, 2009
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005

References:

1. Trochim, William M. The Research Methods Knowledge Base, 2nd Edition. Internet WWW page, at URL: <<http://www.socialresearchmethods.net/kb/>>
2. (Electronic Version): StatSoft, Inc. (2012). Electronic Statistics Textbook. Tulsa, OK: StatSoft. WEB: <http://www.statsoft.com/textbook/>. (Printed Version): Hill, T. & Lewicki, P. (2007). STATISTICS: Methods and Applications. StatSoft, Tulsa, OK.

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(R17D9383) ADVANCED SIGNAL PROCESSING LAB - II

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 voiced & unvoiced detection for each frame of 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