JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech (Regular) – EMBEDDED SYSTEMS
(w. e. f 2016-17 Admitted Batch)

COURSE STRUCTURE

M. Tech I Semester

S.No	Sub. Code	Subject	Theory	Lab	Credits
1.	16D44101	Embedded System Concepts	4	-	4
2.	16D44102	Real Time Operating Systems	4	-	4
3.	16D44103	Embedded C	4	-	4
4.	16D44104	ARM Based Embedded System Design	4	-	4
5.		**Elective-I**	4	-	4
	16D43107	a) Linux Programming and Scripting Languages			
	15D41103	b) Advanced Computer Architecture			
	16D43101	c) Digital System Design			
6.		**Elective-II**	4	-	4
	15D41206	a) CPLD and FPGA Architectures and Applications			
	16D44105	b) Wireless Communications and Networks			
	15D41106	c) Network security & Cryptography			
7.	16D44106	Embedded Systems Lab	-	3	2
Contact periods/week			**24**	**03**	**26**
			Total/week	**27**	

M. Tech II Semester

S.No	Sub. Code	Subject	Theory	Lab	Credits
1.	16D44201	OOPs Through C++	4	-	4
2.	16D44202	Embedded Systems Design Approach	4	-	4
3.	16D44203	Embedded Networking	4	-	4
4.	16D44204	Sensors and Actuators	4	-	4
5.		**Elective-III**	4	-	4
	16D44205	a) DSP Processors and Architectures			
	15D41202	b) Image and Video Processing			
	16D44206	c) Soft computing Techniques			
6.		**Elective-IV**	4	-	4
	16D44207	a) Internet Protocols			
	15D41210	b) MEMs and its Applications			
	16D44208	c) SoC Design			
7.	15D54201	Research Methodology (Audit Course)	2	-	-
8.	16D44109	Embedded System Design Lab	-	3	2
			26	**03**	**26**

Contact periods/week	Total/Week	**29**	

M.Tech III & IV SEMESTERS

Code	Name of the Subject	C
	III Semester Seminar- I	2
	IV Semester Seminar- II	2
	III & IV Semester PROJECT WORK	44
	Total	**48**

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(16D44101) EMBEDDED SYSTEM CONCEPTS

Course Outcomes

After completion of the course students able to

- Know about the basic concepts of embedded systems
- Understand the different architectural features of embedded systems
- Understand the goal embedded systems in real time design applications
- Know about the RTOS based embedded system design concepts

UNIT -I

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

UNIT -II

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

UNIT –III

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

UNIT –IV

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

UNIT –V

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

TEXT BOOKS

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

REFERENCE BOOKS

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

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(16D44102) REAL TIME OPERATING SYSTEMS

Course Outcomes

After completion of the course students able to

- Know about the fundamentals of operating systems and their importance in real time applications
- Able describe how a real-time operating system designed and their importance in embedded system design.
- Explain how the real-time operating system implemented with their architectural features.
- Design simple embedded systems in RTOS environment.

UNIT - I

Operating System Introduction: Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, Opening System Design and Implementation, OS Structure, Virtual machines.

UNIT - II

Process and CPU Scheduling - Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Schedulers, Context Switch, Pre emptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling, Process Coordination - Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Memory Management and Virtual Memory and File System Interface.

UNIT – III

Real Time Operating Systems, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use, 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 Basic Concepts of Android OS.

TEXT BOOKS

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

REFERENCE BOOKS

1. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH. 2. Advanced UNIX Programming, Richard Stevens
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

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(16D44103) EMBEDDED C

Course Outcomes

After completion of the course students able to

- Know about programming concepts in embedded system design
- Understand features and concepts of embedded programming languages and
- Able describe how microcontroller based embedded systems are programmed and implemented in real time applications.
- Write simple programs and implement the same embedded hardware.

UNIT – I

Programming Embedded Systems in C Introduction ,What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions Introducing the 8051 Microcontroller Family Introduction, What's in a name, The external interface of the Standard 8051, Reset requirements ,Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption ,Conclusions

UNIT – II

Reading Switches Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT – III

Adding Structure to the Code Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT – IV

Meeting Real-Time Constraints Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2, The need for 'timeout' mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT – V

Compilation and linking, Compiling and Linking Multiple Source Files, Compiling Multifile Programs, Linking Multifile Programs, Using #include, External VariablesUsing an Object Library Manager Using MAKE Files.

Case Study: Intruder Alarm System Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions

TEXT BOOKS

1. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008
2. Advanced C - Peter D. Hipson, Sams Publishing, USA, 1992

REFERENCE BOOKS

1. PICmicro MCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel Gardner

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(16D44104) ARM BASED EMBEDDED SYSTEM DESIGN

Course Objectives

After completion of the course students able to

- Understand the advanced controllers used for embedded system design
- To study about current technologies, integration methods and hardware and software design concepts associated with 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

UNIT – I

ARM Embedded Systems:

An Embedded System-Definition, Embedded System Design and Development, Life Cycle, Embedded system Architecture, Embedded Systems classification, The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM processor Families, Core extensions, Architecture Revisions.

UNIT-II

ARM Processor Fundamentals:

Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts and Interrupt Vector Table, ARM Instruction set, Thumb instruction set, single register and multiple register load / store instructions. Stack, software interrupt instructions.

UNIT – III

ARM Programming using C and Assembly

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 - IV

Architecture of MSP430 Processor:

Central Processing Unit, registers, Instruction formats, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Resets, Clock System, Memory Organization, Interrupts and interrupt vector table,, Low-Power Modes, Parallel Ports, Digital Inputs, Switch Debounce, Digital Outputs, Pull up / down resistors, Timers - Watchdog Timer, Timer_A, Timer_A Modes, Timer_B,Timer_B Modes, Real-Time Clock. .

UNIT – V

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, AThermometer Using I^2C, Asynchronous Serial Communication, Asynchronous Communication with the USCI_A, A Software UART Using Timer_A, programming examples with MSP 430

TEXT BOOKS:

1. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM Systems Developer's Guide-Designing & Optimizing System Software", 2008, Elsevier
2. John H. Davies "MSP430 Microcontroller Basics",Elsevier Ltd Publications, Copyright 2008.

REFERENCES:

1. Tammy Noergaard "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", Elsevier(Singapore) Pvt.Ltd.Publications, 2005.
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.
6. Manuel Jiménez Rogelio,PalomeraIsidoroCouvertier "Introduction to Embedded Systems Using Microcontrollers and the MSP430" Springer Publications, 2014.

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(Elective – I)
(16D43107) LINUX PROGRAMMING AND SCRIPTING LANGUAGES

Course Outcomes

After completion of the course students able to

- Know the importance of Linux towards design of embedded systems
- Understand the principles of scripting languages and know about different scripting languages such as PERL, TCL/TK toolki.
- Creation of programs in the Linux environment
- The study of usage of scripting languages in real time applications

UNIT 1: Introduction Linux

Getting Started, Unix, Linux, Programming Linux, UNIX Programs, UNIX Philosophy, Shell Programming, The Shell as a Programming Language, Interactive Programs, Creating a Script, Making a Script Executable, Shell Syntax and examples.

UNIT II: Linux Environment

Working with Files, File and Directory Maintenance, Scanning Directories, Advanced Topics, The UNIX Environment, Program Arguments, Environment Variables, Time and Date, Processes and Signals, Inter−process Communication, Semaphores, Message Queues and Shared Memory.

UNIT III: Linux Programming

Advanced UNIX Programming with Linux, Getting Started, Writing Good GNU/Linux Software, Processes, Threads, Interprocess Communication, Mastering Linux, Devices, The /proc File System, Linux System Calls, Inline Assembly Code.

UNIT IV: The TCL Language

TCL language syntax, variables, Expressions, Lists, Control flow, Procedures, String manipulations, Accessing files, Processes

Writing scripts for TK

An introduction to tk, A tour of the tk widgets, Geometry manager: the packer, Bindings, Canvas and test widgets, The selection, the input focus, window managers, examples

UNIT V: PERL Scripting

An introduction to PERL, writing the string and numbers, scalar data and operators, Lists and arrays, hashes, conditionals and loops, examples.

TEXT BOOKS

1. Rechard Stones, Neil Mtthew "Beginning Linux Programming" Foreword Alen Cox, 2nd edition.
2. Mark Mitchell, Jeffrey Oldham, and Alex Samuel, "Advanced Linux Programming", New Riders Publishing, Publisher David Dwyer, 2001.
3. John K, Ousterhout "TCL and the tk toolkit", LPE, Pearson Education, 2007.
4. Laura Lemay " Teach yourself PERL" SAMs Techmedia publications, second edition, 2007.

REFERENCE BOOKS

1. Red Hat Enterprise Linux 4: System Administration Guide Copyright © 2005 Red Hat, Inc
2. Perl in 24 Hours – 3rd Ed., Clinton Pierce, 2005, Sams Publishing.
3. Learning Perl – 4th Ed. Randal Schwartz, Tom Phoenix and Brain d foy. 2005.
4. Jython Essentials – Samuele Pedroni and Noel Pappin.2002. O'Reilly.
5. Programming Perl – Larry Wall, Tom Christiansen and John Orwant, 3rd Edition, O'Reilly, 2000. (ISBN 0596000278)
6. Practical Programming in Tcl and Tk by Brent Welch , Updated for Tcl 7.4 and Tk 4.0 4.
7. Randal L Schwartz, Tom Phoenix & Braid D Foy "Learning PERL" O'Reilly, 5th edition.

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(Elective – I)
(15D41103) ADVANCED COMPUTER ARCHITECTURE

Course Outcomes

After completion of the course students able to

- Understand advanced computer architecture aspects
- Describe and explain instruction level parallelism with static scheduling, out-of-order execution and network-on-chip architectures
- Understand the operation of modern CPUs including pipelining, memory systems and busses.
- Design and emulate a single cycle or pipelined CPU by given specifications.

UNIT –I

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

UNIT –II

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

UNIT –III

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

UNIT –IV

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

UNIT –V

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

TEXT BOOKS

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

REFERENCE BOOKS

1. John P. Shen and Miikko H. Lipasti -, Modern Processor Design : Fundamentals of Super Scalar Processors
2. Computer Architecture and Parallel Processing - Kai Hwang, Faye A.Brigs., MC Graw Hill.

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(Elective – I)
(16D43101) DIGITAL SYSTEM DESIGN

Course Outcomes
After completion of the course students able to

- Know how to design complex digital systems using minimization techniques.
- Understand the design approaches using PAL's and PLA's.
- Design large scale digital systems using CPLDs and FPGAs.
- Design and identify the faults in digital systems and diagnosis method for minimization faults.

UNIT-I
Minimization Procedures and CAMP Algorithm Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs,, CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II
PLA Design, PLA Minimization and Folding Algorithms Introduction to PLDs, basic configurations and advantages of PLDs, PLA Introduction, Block diagram of PLA, size of PLA, LA design aspects, PLA minimization algorithm(IISc algorithm), PLA folding algorithm(COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT–III
Design of Large Scale Digital Systems Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV
Fault Diagnosis in Combinational Circuits Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V

Fault Diagnosis in Sequential Circuits Fault detection and location in sequential circuits, circuit test approach, initial state identification, Hamming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS

1. Logic Design Theory-N. N. Biswas, PHI
2. Switching and Finite Automata Theory-Z. Kohavi , 2nd Edition, 2001,TMH
3. Digital system Design using PLDd-Lala

REFERENCE 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.

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(Elective – II)
(15D41206) CPLD AND FPGA ARCHITECTURES AND APPLICATIONS

Course Outcomes

After completion of the course students able to

- Understand the features and architectures of industrial CPLDs with different families.
- Understand the features and architectures of industrial FPGAs with different families.
- Know the programming techniques used in FPGA design methodology.
- Design and implement complex real time digital circuits.

UNIT-I

Introduction to Programmable Logic Devices: Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT-II

Field Programmable Gate Arrays: Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT –III

SRAM Programmable FPGAs: Introduction, Programming Technology, Device Architecture, the Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT –IV

Anti-Fuse Programmed FPGAs: Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

UNIT –V

Design Applications: General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2. Digital Systems Design - Charles H. Roth Jr, Lizy Kurian John, Cengage Learning.

REFERENCE BOOKS

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha Mourad, Pearson Low Price Edition.
3. Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.
4. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

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(Elective – II)
(16D44105) WIRELESS COMMUNICATIONS AND 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 prefect 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, Non linear 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, Hiper Lan, WLL.

TEXT BOOKS

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 – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.

4. Wireless Communication – Upen Dalal, Oxford Univ. Press 5. Wireless Communications and Networking – Vijay K. Gary, Elsevier

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(Elective – II)
(15D41106) NETWORK SECURITY AND CRYPTOGRAPHY

Course Outcomes:

After completion of the course students able to

- Describe computer and network security fundamental concepts and principles
- Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities
- Describe the inner-workings of popular encryption algorithms, digital signatures, certificates, anti-cracking techniques, and copy-right protections
- Demonstrate the ability to select among available network security technology and protocols such as IDS, IPS, firewalls, SSL, SSH, IPSec, TLS, VPNs, etc.

UNIT- I: Introduction : Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.
Modern Techniques : Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT- II: Encryption : Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block cifers.
Conventional Encryption
Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT - III: Public Key Cryptography : Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptograpy.
Number Theory : Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT- IV: Message Authentication and Hash Functions
Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.
Hash and Mac Algorithms MD File, Message digest Algorithm, Secure Hash Algorithm.
Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

Authentication Applications Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT – V: IP Security Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.
Intruders, Viruses and Worms: Intruders, Viruses and Related threats.
Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5. Introduction to Cryptography, Buchmann, Springer.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
EMBEDDED SYSTEMS

M.Tech I Sem	**T**	**P**	**C**
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(16D44106) EMBEDDED SYSTEMS LAB

List of Experiments

PART – A

Using Embedded C

Note: Any 10 Programs form 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 hardward delay.
7. Write a c program to test loop time outs.
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 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

Equipments 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.

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(16D44201) OOPs THROUGH C++

UNIT-I.
Basics, Tokens, Expressions:
Software Crisis, Software Evolution, Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages, Features of OOP. How OOP Differ from POP. Applications of OOP, A Simple C++ Program, Structure of C++ Program. Tokens, Keywords, Identifiers and Constants, Basic Data Types, User Defined Data Types, Derived Data Types, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators.

UNIT-II.
Functions, Classes and Objects:
Introduction to Classes, Specifying a Class, Defining a Member Functions, A C++ Program with Class Access Specifiers, Inline functions, Nesting of Member Functions, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Default Arguments, Const Arguments, Function Overloading, Friend Functions

UNIT-III
Constructors, Destructors, Inheritance:
Introduction, Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic initialization of Objects, Copy Constructors, Dynamic Constructors, Destructors. Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi Level Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Abstract Classes, Constructors in Derived Classes, Containership, Operator overloading, Rules for Operator overloading, overloading of binary and unary operators .

UNIT-IV
Pointers, Virtual Functions and Polymorphism:
Introduction, Memory Management, new Operator and delete Operator, Pointers to Objects, this Pointer, Pointers to Derived Classes, Polymorphism, compile time polymorphism, Run time polymorphism, Virtual Functions, Pure Virtual Functions, Virtual Base Classes, Virtual Destructors.

UNIT-V.
Templates and Exception handling:
Introduction, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Member Function Templates. Basics of Exception Handling, Types of exceptions, Exception Handing Mechanism, Throwing and Catching Mechanism, Rethrowing an Exception, Specifying Exceptions.

Text Books:

Object Oriented Programming in C++ by E.Balagurusamy., published by Tata McGraw-Hill.

References:

1. Mastering C++ by K.R.Venugopal., published by Tata McGraw- Hill.
2. Computer Science A Structural Programming Approach Using C by Behrouz A Forouzan and Richard F. Gilberg, Thomson publishers

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(16D44202) EMBEDDED SYSTEM DESIGN APPROACH

UNIT-I

Introduction A review of embedded system concepts, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II

Embedded Hardware Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance. Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III

Embedded Software Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples. Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middle ware, Middleware examples, Application layer software examples.

UNIT-IV

Embedded System Design, Development, Implementation and Testing

Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design. Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.

UNIT-V

Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system – Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:

1. Tammy Noergaard “Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers”, Elsevier(Singapore) Pvt.Ltd.Publications, 2005.
2. Frank Vahid, Tony D. Givargis, “Embedded system Design: A Unified Hardware/Software Introduction”, John Wily & Sons Inc.2002.

REFERENCE BOOKS:

1. Peter Marwedel, “Embedded System Design”, Science Publishers, 2007.
2. Arnold S Burger, “Embedded System Design”, CMP.
3. Rajkamal, “Embedded Systems: Architecture, Programming and
4. Design”, TMH Publications, Second Edition, 2008.

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(16D44203) EMBEDDED NETWORKING

UNIT –I

Embedded Communication Protocols:

Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming - ISA/PCI Bus protocols – Firewire.

UNIT –II

USB and CAN Bus:

USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types –Enumeration –Descriptors –PIC 18 Microcontroller USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface –A simple application with CAN.

UNIT –III

Ethernet Basics:

Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables, Connections and network speed – Design choices: Selecting components –Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol.

UNIT –IV

Embedded Ethernet:

Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Email for Embedded Systems – Using FTP – Keeping Devices and Network secure.

UNIT –V

Wireless Embedded Networking:

Wireless sensor networks – Introduction – Applications – Network Topology – Localization –Time Synchronization - Energy efficient MAC protocols –SMAC – Energy efficient and robust routing – Data Centric routing.

TEXT BOOKS

1. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002
2. Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port - Jan Axelson, Penram Publications, 1996.

REFERENCE BOOKS:

1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series - Dogan Ibrahim, Elsevier 2008.
2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003.
3. Networking Wireless Sensors - Bhaskar Krishnamachari, Cambridge press 2005.

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(16D44204) SENSORS AND ACTUATORS

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 – Magneto-resistive 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 Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electro analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential - Standard Hydrogen Electrode (SHE) – Liquid Junction and Other Potentials – Polarization – Concentration Polarization-– Reference Electrodes - Sensor Electrodes – Electro ceramics 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 – Presure 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

TEXT BOOKS

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

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(Elective – 3)
(16D44205) DSP PROCESSORS AND ARCHITECTURES

UNIT –I

Introduction to Digital Signal Processing: Introduction, a Digital signal-processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation. Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT –III

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT –IV

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –V

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCE BOOKS

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
5. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997
6. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes , ISBN 0750679123, 2005

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(Elective – 3)
(15D41202) IMAGE AND VIDEO PROCESSING

Course Objectives

- To understand different transforms related to gray scale and color images.
- To get complete knowledge regarding different techniques associated with Image
- Enhancement, Image Restoration, Image Segmentation and Image Compression.
- To get clear knowledge regarding motion estimation, video filtering and video
- standards

Course Outcomes

After completion of this course the students will be able to

- Different transforms related to gray scale and color images.
- Complete knowledge regarding different techniques associated with Image
- Enhancement, Image Restoration, Image Segmentation and Image Compression.
- Understand basic concepts regarding to motion estimation, video filtering and video standards.

UNIT - I

Image Fundamentals & Transforms:

Gray scale and colour Images, image sampling and quantization. Two dimensional orthogonal transforms: DFT, WHT, Haar transform, KLT, DCT.

UNIT - II

Image Enhancement:

Filters in spatial and frequency domains, histogram-based processing, homomorphic filtering. Edge detection, non parametric and model based approaches, LOG filters, localization problem.

Image Restoration:

Degradation Models, PSF, circulant and block – circulant matrices, deconvolution, restoration using inverse filtering, Wiener filtering and maximum entropy-based methods.

UNIT - III

Image Segmentation:

Pixel classification, Bi-level Thresholding, Multi-level Thresholding, P-tile method, Adaptive Thresholding, Spectral & spatial classification, Edge detection, Hough transform, Region growing.

UNIT - IV

Image Compression:

Compression models, Information theoretic perspective, Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Lossy compression: Transform coding, Image compression standards.

UNIT - V

Video Processing:

Representation of Digital Video, Spatio-temporal sampling, Motion Estimation. Video Filtering, Video Compression, Video coding standards.

TEXTBOOKS

1. R. C. Gonzalez, R. E. Woods,"Digital Image Processing", Pearson Education. 2nd edition,2002
2. W. K. Pratt, "Digital image processing", Prentice Hall, 1989
3. Rosenfold and A. C. Kak, "Digital image processing", Vols. 1 and 2, Prentice Hall, 1986.

REFERENCE BOOKS

1. H. C. Andrew and B. R. Hunt, "Digital image restoration", Prentice Hall, 1977
2. R. Jain, R. Kasturi and B.G. Schunck, "Machine Vision", McGraw-Hill International Edition, 1995
3. M. Tekalp, "Digital Video Processing", Prentice-Hall, 1995
4. Bovik, "Handbook of Image & Video Processing", Academic Press, 2000

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(Elective – 3)
(16D44206) SOFT COMPUTING TECHNIQUES

UNIT –I

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Selforganizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –IV:

Genetic Algorithm:

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and Ant-colony search techniques for solving optimization problems.

UNIT –V

Applications:

GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural-Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

TEXT BOOKS

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5. Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
6. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
7. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(Elective – 4)
(16D44207) INTERNET PTOTOCOLS

UNIT -I

Internetworking Concepts: Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of thee Internet, Internet Architecture, Wired LANS, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.

IP Address: Classful Addressing: Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting

Classless Addressing: Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router.

ARP and RARP: ARP, ARP Package, RARP.

UNIT -II

Internet Protocol (IP): Datagram, Fragmentation, Options, Checksum, IP V.6.

Transmission Control Protocol (TCP): TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.

Stream Control Transmission Protocol (SCTP): SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.

Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/ Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT –III

Unicast Routing Protocols (RIP, OSPF, and BGP): Intra and Inter domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

Multicasting and Multicast Routing Protocols: Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT -IV:

Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.

Remote Login TELNET: Concept, Network Virtual Terminal (NVT).

File Transfer FTP and TFTP: File Transfer Protocol (FTP).

Electronic Mail: SMTP and POP.

Network Management-SNMP: Concept, Management Components, World Wide Web-HTTP Architecture.

UNIT –V

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

TEXT BOOKS:

1. TCP/IP Protocol Suite- Behrouz A. Forouzan, Third Edition, TMH
2. Internetworking with TCP/IP Comer 3 rd edition PHI

REFERENCE BOOKS:

1. High performance TCP/IP Networking- Mahbub Hassan, Raj Jain, PHI, 2005
2. Data Communications & Networking – B.A. Forouzan – 2nd Edition – TMH
3. High Speed Networks and Internets- William Stallings, Pearson Education, 2002.
4. Data and Computer Communications, William Stallings, 7th Edition., PEI.
5. The Internet and Its Protocols – Adrin Farrel, Elsevier, 2005.

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(Elective – 4)
(15D41210) MEMS AND ITS APPLICATIONS

UNIT - I

Introduction Basic structures of MEM devices – (Canti-Levers, Fixed Beams diaphragms). Broad Response of Micro electromechanical systems (MEMS) to Mechanical (Force, pressure etc.) Thermal, Electrical, optical and magnetic stimuli, compatibility of MEMS from the point of power dissipation, leakage etc.

UNIT - II

Review Review of mechanical concepts like stress, strain, bending moment, deflection curve. Differential equations describing the deflection under concentrated force, Distributed force, distributed force, Deflection curves for canti-levers- fixed beam. Electrostatic excitation – columbic force between the fixed and moving electrodes. Deflection with voltage in C.L, Deflection Vs Voltage curve, critical fringe field – field calculations using Laplace equation. Discussion on the approximate solutions – Transient response of the MEMS.

UNIT-III

Types Two terminal MEMS - capacitance Vs voltage Curve – Variable capacitor. Applications of variable capacitors. Two terminal MEM structures. Three terminal MEM structures – Controlled variable capacitors – MEM as a switch and possible applications. UNIT-IV MEM Circuits & Structures MEM circuits & structures for simple GATES- AND, OR, NAND, NOR, Exclusive OR, simple MEM configurations for flip-flops triggering applications to counters, converters. Applications for analog circuits like frequency converters, wave shaping. RF Switches for modulation. MEM Transducers for pressure, force temperature. Optical MEMS.

UNIT-V

MEM Technologies Silicon based MEMS- Process flow – Brief account of various processes and layers like fixed layer, moving layers spacers etc., and etching technologies. Metal Based MEMS: Thin and thick film technologies for MEMS. Process flow and description of the processes, Status of MEMS in the current electronics scenario.

TEXT BOOKS

1. MEMS Theory, Design and Technology - GABRIEL. M.Review, R.F.,2003, John wiley & Sons. .
2. Strength of Materials –Thimo Shenko, 2000, CBS publishers & Distributors. 3. MEMS and NEMS, Systems Devices; and Structures - Servey E.Lyshevski, 2002, CRC Press.

REFERENCE BOOKS

1. Sensor Technology and Devices - Ristic L. (Ed) , 1994, Artech House, London.

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(Elective – 4)
(16D44208) SOC DESIGN

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, Wiely 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.

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(15D54201) RESEARCH METHODOLOGY (Audit Course)

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:
1. Research Methodology:Methods and Techniques – C.R.Kothari, 2nd Edition,New Age International Publishers.
2. Research Methodology: A Step by Step Guide for Beginners- Ranjit Kumar, Sage Publications (Available as pdf on internet)
3. 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)

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
Department of Electronics & Communication Engineering

M. Tech I – Year II – Semester (ES)

(16D44109) EMBEDDED SYSTEM DESIGN LAB

- The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits and ARM-Cortex.
- The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.
- The students are required to perform at least SIX experiments from Part-I and TWO experiments from Part-II.

List of Experiments:

Part-I

Experiments using ARM-926 with PERFECT RTOS

1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER'S algorithm.
7. Synchronize two identical threads using MONITOR.
8. Reader's Writer's Problem for concurrent Tasks.

Part-II

Experiments on ARM-CORTEX processor using any open source RTOS. (Coo-Cox-Software-Platform)

1. Implement the interfacing of display with the ARM- CORTEX processor.
2. Interface ADC and DAC ports with the Input and Output sensitive devices.
3. Simulate the temperature DATA Logger with the SERIAL communication with PC.
4. Implement the developer board as a modem for data communication using serial port communication between two PC's.

Lab Requirements:

Software:

(i) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library, COO-COX Software Platform, YAGARTO TOOLS, and TFTP SERVER.
(ii) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.

Hardware:

(i) The development kits of ARM-926 Developer Kits and ARM-Cortex Boards.
(ii) Serial Cables, Network Cables and recommended power supply for the board.