JAYAMUKHI INSTITUE OF TECHNOLOGICALSCIENCES
(UGC-AUTONOMOUS)

M.Tech. (EmbeddedSystems)

COURSE STRUCTURE AND SYLLABUS

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
AJD551C01	Embedded System Design	30	70	3	--	3
AJD551C02	ARM Architectures	30	70	3	--	3
AJD551C03	Real Time Operating Systems	30	70	3	--	3
AJD551E01 AJD551E02 AJD551E03	**Advanced Computer Architecture** **VLSI Technology and Design** **Embedded Computing**	30	70	3	--	3
AJD551E04 AJD551E05 AJD551E06	**Digital System Design** **Embedded C** **Design for Testability**	30	70	3	--	3
AJD551L1	Embedded Systems Laboratory	30	70	--	2	1
AJD551RM	Research Methodology	100	--	2	0	2
Total Credits				**17**	**2**	**18**

I Year – IISemester

Category	Course Title	Int. Marks	Ext. marks	L	P	C
AJD552C04	Digital Signal Processors and Architectures	30	70	3	--	3
AJD552C05	Embedded Networking	30	70	3	--	3
AJD552C06	Sensors and Actuators	30	70	3	--	3
AJD552E07 AJD552E08 AJD552E09	CPLD and FPGA Architectures and Applications Wireless Communication and Networks System On Chip Architecture	30	70	3	--	3
AJD552E10 AJD552E11 AJD552E12	Multimedia and SignalCoding Network Security and Cryptography Hardware SoftwareCo-Design	30	70	3	--	3
AJD552L1	Advanced Embedded Systems Laboratory	30	70	--	2	1
AJD552IPR	Intellectual Property Rights	100	--	2	0	2
Total Credits				**17**	**4**	**18**

II Year - ISemester

Course Title	Int. marks	Ext. marks	L	P	C
Audit Course(Technical Seminar)	100		3	--	0
Project work Review I	100	--	--	32	16
Total Credits			--	32	**16**

II Year - II Semester

Course Title	Int. Marks	Ext. marks	L	P	C
Project work Review II	100	--	--	8	4
Project Evaluation (Viva-Voce)	--	100	--	24	12
Total Credits			--	**32**	**16**

JAYAMUKHI INSTITUE OF TECHNOLOGICAL SCIENCES
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M. Tech – I Year – I Sem. Embedded System

AJD551C01-EMBEDDED SYSTEM DESIGN

Course Objective:

For embedded systems, the course will enable the students to:

1. Understand the basics of an embedded system
2. Program of an embeddedsystem
3. To learn the method of designing an embedded system for any type ofapplications
4. To understand operating systems concepts, types and choosingRTOS
5. Design, implement and test an embeddedsystem.

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 GrawHill.

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

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Understand and design embeddedsystems
2. Learn basic of OS andRTOS
3. **Understand types of memory and interfacing to externalworld**
4. Understand embedded firmware designapproaches.
5. Understands different operating systems for EmbeddedSystems

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M. Tech – I Year – I Sem. Embedded System

(AJD551C02) ARM Architectures

UNIT – I:
ARM Architecture
ARM Design Philosophy, Registers, PSR, Pipeline, Interrupts and Vector Table, Architecture Revision, ARM ProcessorFamilies.

UNIT – II:
ARM Programming Model – I
Instruction Set: Data Processing Instructions, 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 :
ARMProgramming
Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution andLoops.

UNIT – V:
Memory Management
Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access
Permissions, Content Switch.

TEXT BOOKS:
1. ARM Systems Developer‟s Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.

REFERENCE BOOKS:
1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.

Course Outcome
1: Describe the programmer's model of ARM processor and create and test assembly levelprogramming
2: Analyze various types of co-processors and design suitable co-processor interface to ARM processor.
3: Analyze floating point processor architecture and its architectural support for higher level language.
4: Become aware of the Thumb mode of operation of ARM.
5: Identify the architectural support of ARM for operating system and analyze the function memory Management unit of ARM.

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M. Tech – I Year – I Sem. Embedded System

AJD551C03)REAL TIME OPERATING SYSTEMS

Course Objectives:

1.Real-time embedded systems are enabling technologies for many current and future generation applications and are increasingly becoming pervasive.

2.This course aims to provide a good understanding of both fundamental concepts and advanced topics in real-time systems and networks.

Pre-requisites: Programming and Data Structures, Operating Systems, Computer Architecture and Organization Computer Communication, Database Systems

UNIT – I:

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

UNIT - II:

Real Time Operating Systems

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency.

Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT - III:

Objects, Services and I/O

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, BasicI/O Concepts, I/OSubsystem

UNIT - IV:

Exceptions, Interrupts and Timers

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

UNIT - V:

Case Studies of RTOS

RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007,TMH.
2. Advanced UNIX Programming, RichardStevens
3. Embedded Linux: Hardware, Software and Interfacing – Dr. CraigHollabaugh

Course outcome:

1. Understand various Commands
2.Understand the Operation and use of OS
3.Analyse the Services and I/O
4.Apply the Timers and Interrupts in real world
5. Apply the concepts of OS

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M. Tech – I Year – I Sem. Embedded System

(AJD551E01)ADVANCED COMPUTER ARCHITECTURE
(Core Elective –I)

Course Objective

1.To make students know about the Parallelism concepts in Programming □

2.To give the students an elaborate idea about the different memory systems and buses. □

3.To introduce the advanced processor architectures to the students. □

4.To make the students know about the importance of multiprocessor and multicomputers. □

5.To study about data flow computer architectures

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 line for RISC processor, Basic performance issues in pipelining , Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design

Introduction, review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT - III: Instruction Level Parallelism the Hardware Approach

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasul'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 ScalarProcessors
2. Computer Architecture and Parallel Processing ,Kai Hwang, Faye A.Brigs., MC Graw Hill.,
3. Advanced Computer Architecture - A Design Space Approach, Dezso Sima, Terence Fountain, Peter Kacsuk ,Pearsoned.

Course Outcome

1: Demonstrate concepts of parallelism in hardware/software.
2 : Discuss memory organization and mapping techniques.
3 : Describe architectural features of advanced processors.
4 : Interpret performance of different pipelined processors.
5: Explain data flow in arithmetic algorithms
6 : Development of software to solve computationally intensive problems.

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M. Tech – I Year – I Sem. Embedded System

UNIT –I:(AJD551E03) EMBEDDED COMPUTING
(Core Elective –I)

Programming on Linux Platform:

System Calls, Scheduling, Memory Allocation, Timers, Embedded Linux, Root File System, Busy Box. **Operating System Overview**: Processes, Tasks, Threads, Multi-Threading, Semaphore, Message Queue.

UNIT –II:

Introduction to Software DevelopmentTools:

GNU GCC, make, gdb, static and dynamic linking, C libraries, compiler options, code optimization switches, lint, code profilingtools,.

UNIT –III: Interfacing

Modules:

Sensor and actuator interface, data transfer and control, GPS, GSM module interfacing with data processing and display, OpenCV for machine vision, Audio signal processing.

UNIT–IV:

NetworkingBasics:

Sockets, ports, UDP, TCP/IP, client server model, socket programming, 802.11, Bluetooth, ZigBee, SSH, firewalls, network security.

UNIT –V:

IA32 Instruction Set: application binary interface, exception and interrupt handling, interrupt latency, assemblers, assembler directives, macros, simulation and debuggingtools.

TEXT BOOKS:

1. Modern Embedded Computing - Peter Barry and Patrick Crowley, 1st Ed., Elsevier/Morgan Kaufmann,2012.
2. Linux Application Development - Michael K. Johnson, Erik W. Troan, Adission Wesley,1998.
3. Assembly Language for x86 Processors by Kip R.Irvine
4. Intel® 64 and IA-32 Architectures Software Developer Manuals

REFERENCE BOOKS:

1. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin and Greg Gagne.
2. The Design of the UNIX Operating System by Maurice J. BachPrentice-Hall
3. UNIX Network Programming by W. RichardStevens

Course Outcome:

1. Ability to acquire knowledge on Linux Programming skills.
2. Understand the concept of software development tools
3. Enhancing the skills with programming and system for interfacing modules like GSM.
4. Developing network from client and server with TCP/IP,UDP
5. Developing skills in programming thorough instruction set and verifying program from simulation and debugging tools.

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M. Tech – I Year – I Sem. Embedded System

(AJD551E04) DIGITAL SYSTEM DESIGN
(Core Elective –II)

UNNIT -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: State Machines

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 faultmodel.

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 & SonsInc.
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

Course outcomes:

1. Understand the minimization techniques of Finite state machine
2. To exposes the design approaches using ROM's, PAL's and PLA's.

3. To acquire knowledge on State machine and implementation of dice gamecontroller
4. Ability to design and identifying fault in sequential circuits and applying circuit to electronics industry

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M. Tech – I Year – I Sem. Embedded System

(AJD551E05) EMBEDDED C
(Core Elective –II)

UNIT-I

Programming Embedded Systems inC

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:Restructuringthe„HelloEmbeddedWorld‟example,Example: Restructuring the goat-counting example, Further examples,Conclusions

UNIT – IV:

Meeting Real-Time Constraints

Introduction,Creating„hardwaredelays‟usingTimer0andTimer1,Example:Generatinga 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:

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

REFERENCE BOOKS:

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

Course Outcomes:

1. Understanding the basic concepts of ‘C’ language and introduction to 8051 microcontroller .
2. Ability to understand the concepts of reading and writing data to switches from ports of microcontroller.
3. Programme interfacing from C-language (MAIN.H) to (PORT.H).
4. Acquiring knowledge on Real-Time Constraints and some case studies on real-time applications

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M. Tech – I Year – I Sem. Embedded System

(AJD551E06) DESIGN FOR TESTABILITY
(Core Elective –II)

UNIT -I:

Introduction to Testing:

Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

UNIT -II:

Logic and Fault Simulation:

Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for Fault Simulation, ATPG.

UNIT -III:

Testability Measures:

SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT -IV:

Built-In Self-Test:

The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

UNIT -V:

Boundary Scan Standard:

Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

TEXT BOOKS:

1. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits - M.L. Bushnell, V. D. Agrawal, Kluwer Academic Pulishers.

REFERENCE BOOKS:

1. Digital Systems and Testable Design - M. Abramovici, M.A.Breuer and A.D Friedman, Jaico PublishingHouse.
2. Digital Circuits Testing and Testability - P.K. Lala, AcademicPress.

Course Outcomes:

1. Ability to understand the concepts of testing.and identifying the faults in circuits.
2. Design and modeling circuits for simulation and Verifying the circuits
3. Analyzing and measuring the testability measure
4. Acquiring the knowledge on Built-in-Self Test and boundary scan standard.

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M. Tech – I Year – I Sem. Embedded System

AJD55E02-VLSI TECHNOLOGY AND DESIGN

(Core Elective –I)

UNIT –I:Review of Microelectronics and Introduction to MOS Technologies:

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

UNIT –II:

Layout Design and Tools:

Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.

Logic Gates & Layouts:

Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

UNIT –III:

Combinational Logic Networks:

Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.

UNIT –IV:

Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT –V:

Floor Planning:

Floor planning methods, Global Interconnect, Floor Plan Design, Off-chip connections.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Course Outcomes:

- Understand the fundamentals of VLSI design flow

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M. Tech – I Year – I Sem. Embedded System

(AJD551L1) EMBEDDED SYSTEMS LABORATORY

Note: Minimum of 10 Experiments have to be conducted

1. Write a simple program to print “helloworld”
2. Write a simple program to show adelay.
3. Write a loop application to copy values from P1 toP2
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 crystaldisplay.
6. Write a program to create a portable hardwaredelay.
7. Write a c program to test loop timeouts.
8. Write a c program to test hardware based timeoutloops.
9. Develop a simple EOS showing traffic lightsequencing.
10. Write a program to display elapsed time over RS-232link.
11. Write a program to drive SEOS using Timer0.
12. Develop software for milk pasteurizationsystem.

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M. Tech – I Year – II Sem. Embedded System

COURSE OBJECTIVES:

1. To introduce architectural features of programmable DSP Processors of TI and Analog Devices.
2. To recall digital transform techniques.
3. To give practical examples of DSP Processor architectures for better understanding.
4. To develop the programming knowledge using Instruction set of DSP Processors.
5. To understand interfacing techniques to memory and I/O devices.

(AJD552C04) DIGITAL SIGNAL PROCESSORS & 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 DSPDevices:

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. EmbeddedSignalProcessingwiththeMicroSignalArchitecture:Woon-SengGan,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, JohnWiley.
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.

Course Outcomes:

Upon completion of the course the student will be able to:

1. To distinguish between the architectural features of general purpose processors and DSPprocessors
2. Understand the architectures of TMS 320C54XX and ADSP2100 DSP devices
3. Able to write assembly language programs using instruction set of TMS320C54XX
4. Can interface various devices to DSP Processors

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M. Tech – I Year – II Sem. Embedded System

(AJD552C05)-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 withCAN.

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, Elsevier2008.
2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications,2003.

Networking Wireless Sensors - Bhaskar Krishnamachari , Cambridge press2005.

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M. Tech – I Year – II Sem. Embedded System

AJD552C06- SENSORS AND ACTUATOR

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 PrivateLimited.
2. W. Bolton – "Mechatronics" –Pearson EducationLimited.

REFERENCE BOOKS:

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

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UNIT-I:

(AJD552E07) CPLD & FPGA ARCHITECURES &APPLICATIONS
(Core Elective III)

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, 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, ACT2and ACT3Architectures.

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 InternationalEdition.
2. Digital Systems Design - Charles H. Roth Jr, Lizy Kurian John, CengageLearning.

REFERENCE BOOKS:

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

DesignSeries.

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Course Objectives:
The objectives of this course are to make the student
1. To study the Channel planning for Wireless Systems
2. To study the Mobile Radio Propagation
3. To study the Equalization and Diversity
4. To study the Wireless Networks

AJD552E08)WIRELESS COMMUNICATIONS & 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- Longley-Ryce 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, RAKEReceiver.

UNIT -V:

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN StandardIEEE 802.11,IEEE 802.11MediumAccessControl,ComparisionofIEEE802.11a,b,gandnstandards,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 UniversityPress.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCEBOOKS:

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.

Course Outcomes: At the end of this course, students will be able to

1. Understand Cellular communication concepts
2. Study the mobile radio propagation
3. Study the wireless network different type of MAC protocols

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UNIT –I:(AJD552E09) SYSTEM ON CHIP ARCHITECTURE
(CORE ELECTIVE -III)

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 AcademicPublishers.

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Unit-I:(AJD552E10) MULTI MEDIA AND SIGNAL CODING
(Core Elective-IV)

Introduction to Multimedia : Multimedia, World Wide Web, Overview of Multimedia Tools, Multimedia Authoring, Graphics/ Image Data Types, and File Formats.

Color in Image and Video : Color Science-Image Formation, Camera Systems, Gamma Correction, color Matching Functions, CIE Chromaticity Diagram, Color Monitor Specifications, Out-of-Gamut Colors, White Point Corrections, XYZ to RGB Transform, Transform with Gamma Correction, L*A*B Color Model. Color Model in Images-RGB Color Model for CRT Displays, Subtractive Color: CMYK System, Printer Gamuts, Color Models in Video-Video color Transforms, YUV Color Model, YIQ Color Model, Ycbcr Color Model.

Unit – II :

Video Concepts : Types of video Signals, Analog video, Digital Video
Audio Concepts: Digitization of Sound, Quantization and Transformation of Audio.

Unit-III :

Compression Algorithms :
Lossless CompressionAlgorithms : Run Length Coding, Variable Legnth Coding, Arithmatic Coding, Lossless JPEG, ImageCompression.
Lossy Image Compression Algorithms : Transform coding: KLT and DCT Coding, Wavelet BasedCoding.
Image Compression Standards: JPEG and JPEG2000.

Unit-IV
Video Compression Techniques : Introduction to video Compression, Video compression Based on Motion Compression, Search for Motion Vectors, H.261-Intra-Frame and Inter- Frame Coding, Quantization, Encode and Decoder, Overview of MPEG1 and MPEG2

Unit-V
Audio Compression Teachiques: ADPCM in speech coding,G.726 ADPCM, Vocoders- Phase insensitivity, Channel Vocoder,Formant vocoder,Linear predictive coding,CELP, Hybrid Excitation Vocoders, MPEG Audio-MPEG Layers, MPEG Audio strategy, MPEG Audio Compression Algorithms, MPEG-2 AAC, MPEG-4 Audio.

Text Books:

1. Fundametals of Multimedia-Ze-NianLi, Mark S.Drew,PHI,2010.
2. Multimedia Signals & Systems-Mrinal Kr.Mandal Springer International Edition 1st Edition,2009.

Reference Books:

1. Multimedia Communication Systems-Techniques, Stds & Networks K.R.Rao, Zorans.Bojkoric, Diagrond A Milovanovic, 1st Edition,2002.
2. Fundamentals of Multimedia Ze-Nian Li, Mark s.Drew, Pearson Eduction,ist Edition,2003.
3. Digital Video Processing-A.Murat Tekalp,PHI,1996.

Video Processing and Communications-Yaowand, Jorn Ostermann, Ya-QinZhang,Pearson,2002

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UNIT –I:(AJD552E11)NETWORK SECURITY AND CRYPTOGRAPHY
(CORE ELECTIVE – IV)

Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security.

Classical Techniques: Conventional Encryption model, Steganography, Classical EncryptionTechniques.

Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT –II:

Algorithms: Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST- 128, RC2, Characteristics of Advanced Symmetric block cifers.

Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

UNIT –III:

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.

Message authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

UNIT –IV:

Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.

Digital signatures and Authentication Protocols: Digital signatures, Authentication Protocols, Digital signature standards.

Authentication Applications: Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT –V:

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

Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure ElectronicTransaction.

Intruders, Viruses and Worms: Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOK:

Cryptography and Network Security: Principles and Practice - William Stallings, 2000, PE.

REFERENCE BOOK:

Principles of Network and Systems Administration, Mark Burgess, John Wiely

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:(AJD55E12) HARDWARE - SOFTWARE CO-DESIGN

(CORE ELECTIVE –IV)

Course Objectives:

1. Analyze and explain the control-flow and data-flow of a software program and a cycle-based hardware description,
2. Transform simple software programs into cycle-based hardware descriptions with equivalent behavior and vice versa,
3. Partition simple software programs into hardware and software components, and create appropriate hardware-software interfaces to reflect this partitioning,
4. Identify performance bottlenecks in a given hardware-software architecture and optimizethem by transformations on hardware and software components, and
5. Use simulation software to co-simulate software programs with cycle-based hardware descriptions.

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 co-synthesis.

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 lycossystem.

TEXT BOOKS:

1. Hardware / Software Co- Design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009,Springer.
2. Hardware / Software Co- Design - Giovanni De Micheli, Mariagiovanna Sami, 2002, Kluwer AcademicPublishers

REFERENCE BOOKS:

1. A Practical Introduction to Hardware/Software Co-design -Patrick R. Schaumont - 2010 –Springer

Course Outcomes:

1.Understand the Co-design issues and Hardware-Software Partitioning system
2.Analyse the Future developments in emulation and prototyping and itsArchitecture
3.Understand the Need for embedded software development
4.Apply Design specifications and Verification in real time applications
5.Use of Various system – level specifications and apply in industry

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UNIT -I:SCRIPTING LANGUAGES

(OPEN ELECTIVE -II)

ntroduction to Scripts and Scripting:

Characteristics and uses of scripting languages, Introduction to PERL, Names and values, Variables and assignment, Scalar expressions, Control structures, Built-in functions, Collections of Data, Working with arrays, Lists and hashes, Simple input and output, Strings, Patterns and regular expressions, Subroutines, Scripts with arguments.

UNIT -II:

Advanced PERL:

Finer points of Looping, Subroutines, Using Pack and Unpack, Working with files, Navigating the file system, Type globs, Eval, References, Data structures, Packages, Libraries and modules, Objects, Objects and modules in action, Tied variables, Interfacing to the operating systems, Securityissues.

UNIT -III: TCL:

The TCL phenomena, Philosophy, Structure, Syntax, Parser, Variables and data in TCL, Control flow, Data structures, Simple input/output, Procedures, Working with Strings, Patterns, Files and Pipes, Example code.

UNIT -IV:

Advanced

TCL:

The eval, source, exec and up-level commands, Libraries and packages, Namespaces, Trapping errors, Event-driven programs, Making applications 'Internet-aware', 'Nuts-and- bolts' internet programming, Security issues, running untrusted code, The C interface.

UNIT -V:

TK and JavaScript:

Visual tool kits, Fundamental concepts of TK, TK by example, Events and bindings, Geometry managers, PERL-TK.

JavaScript – Object models, Design Philosophy, Versions of JavaScript, The Java Script core language, Basic concepts of Pythan.

Object Oriented Programming Concepts (Qualitative Concepts Only): Objects, Classes, Encapsulation, Data Hierarchy.

TEXT BOOKS:

1. The World of Scripting Languages- David Barron, Wiley Student Edition,2010.
2. Practical Programming in Tcl and Tk - Brent Welch, Ken Jones and

Jeff Hobbs., Fourthedition.
3. Java the Complete Reference - Herbert Schildt, 7th Edition,TMH.

REFERENCE BOOKS:

1. Tcl/Tk: A Developer's Guide- Clif Flynt, 2003, Morgan KaufmannSerieS.
2. Tcl and the Tk Toolkit- John Ousterhout, 2nd Edition, 2009, KindelEdition.
3. Tcl 8.5 Network Programming book- Wojciech Kocjan and Piotr Beltowski, PacktPublishing.

Tcl/Tk 8.5 Programming Cookbook- BertWheele

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UNIT -I:DEVICE MODELLING

(ELECTIVE -I)

Introduction to Semiconductor Physics:
Review of Quantum Mechanics, Boltzman transport equation, Continuity equation, Poisson equation.

Integrated Passive Devices:
Types and Structures of resistors and capacitors in monolithic technology, Dependence of model parameters on structures

UNIT -II:

Integrated Diodes:
Junction and Schottky diodes in monolithic technologies – Static and Dynamic behavior – Small and large signal models – SPICE models

Integrated Bipolar Transistor:
Types and structures in monolithic technologies – Basic model (Eber-Moll) – Gunmel - Poon model-dynamic model, Parasitic effects – SPICE model –Parameter extraction

UNIT -III:

Integrated MOS Transistor:
NMOS and PMOS transistor – Threshold voltage – Threshold voltage equations – MOS device equations – Basic DC equations second order effects – MOS models – small signal AC characteristics– MOS FET SPICE model level 1, 2, 3 and4

UNIT -IV:

VLSI Fabrication Techniques: An overview of wafer fabrication, Wafer Processing – Oxidation – Patterning – Diffusion – Ion Implantation – Deposition – Silicon gate nMOS process – CMOS processes – n-well- p-well- twin tub- Silicon on insulator – CMOS process enhancements – Interconnects circuit elements

UNIT -V:

Modeling of Hetero Junction Devices: Band gap Engineering, Band gap Offset at abrupt Hetero Junction, Modified current continuity equations, Hetero Junction bipolar transistors (HBTs), SiGe

TEXT BOOKS:

1. Introduction to Semiconductor Materials and Devices – Tyagi M. S, 2008, John Wiley StudentEdition.
2. Solid State Circuits – Ben G. Streetman, Prentice Hall,1997

REFERENCE BOOKS:

1. Physics of Semiconductor Devices – Sze S. M, 2nd Edition, Mcgraw Hill,

New York,1981.
2. Introduction to Device Modeling and Circuit Simulation – Tor A. Fijedly, Wiley- Inter science,1997.

Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming- BO Lin, CRC Press, 2011

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Note:(AJD552L1) **ADVANCED EMBEDDED SYSTEMS LABORATORY**

The following programs are to be implemented on ARM basedProcessors/Equivalent.

1. Minimum of 10 programs from Part –I and 6 programs from Part -II are to beconducted.

PART- I:

The following Programs are to be implemented on ARM Processor

1. Simple Assembly Programfor
2. Addition | Subtraction | Multiplication |Division
3. Operating Modes, System Calls andInterrupts
4. Loops,Branches
5. Write an Assembly programs to configure and control General Purpose Input/Output (GPIO) port pins.
6. Write an Assembly programs to read digital values from external peripherals and execute them with the Targetboard.
7. Program for reading and writing of afile
8. Program to demonstrate Time delay program using built in Timer / Counter feature on IDE environment
9. Program to demonstrates a simple interrupt handler and setting up atimer
10. Program demonstrates setting up interrupt handlers. Press button to generate an interrupt and trace the program flow with debugterminal.
11. Program to Interface 8 Bit LED and SwitchInterface
12. Program to implement Buzzer Interface on IDEenvironment
13. Program to Displaying a message in a 2 line x 16 Characters LCD display and verify the result in debugterminal.
14. Program to demonstrate I2C Interface on IDEenvironment
15. Program to demonstrate I2C Interface – SerialEEPROM
16. Demonstration of Serial communication. Transmission from Kit and reception from PC using Serial Port on IDE environment use debug terminal to trace theprogram.
17. Generation of PWMSignal
18. Program to demonstrate SD-MMC CardInterface.

PART- II:

Write the following programs to understand the use of RTOS with ARM Processor on IDE Environment using ARM Tool chain and Library:

1. Create an application that creates two tasks that wait on a timer whilst the main taskloops.
2. Write an application that creates a task which is scheduled when a button is pressed, which illustrates the use of an event set between an ISR and atask
3. Write an application that Demonstrates the interruptible ISRs(Requires timer to have higher priority than external interruptbutton)
4. a).Write an application to Test message queues and memory blocks. b).Write an application to Test bytequeues
5. Write an application that creates two tasks of the same priority and sets the time slice period to illustrate timeslicing.

Interfacing Programs:

1. Write an application that creates a two task to Blinking two different LEDs at differenttimings
2. Write an application that creates a two task displaying two different messages in LCD display in twolines.
3. Sending messages to mailbox by one task and reading the message from mailbox by

another task.

4. Sending message to PC through serial port by three different tasks on priorityBasis.

Basic Audio Processing on IDEenvironment