Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.)

Scheme of Examination

Second Semester –M.Tech. (VLSI Design)

S.No.	Subject Code	Subject Name	Periods per week			Credits	Maximum marks (Theory Slot)			Maximum Marks (Practical Slot)		Total Marks
			L	T	P		End Sem. Exam.	Tests (Two)	Assignments/ Quiz	End Sem. Practical / Viva	Practical Record/ assignment/Quiz/ Presentation	
1.	MEVD-201	Design of Analog/Mixed Mode VLSI Circuits	3	1	-	4	70	20	10	-	-	100
2.	MEVD-202	ASIC Design And FPGAs	3	1	-	4	70	20	10	-	-	100
3.	MEVD-203	Embedded Real Time Operating Systems	3	1	-	4	70	20	10	-	-	100
4.	MEVD-204	Embedded Systems	3	1	-	4	70	20	10	-	-	100
5.	MEVD-205	System on Chip	3	1	-	4	70	20	10	-	-	100
6.	MEVD-206	Lab -1 : Designing with FPGAs	-	-	6	6	-	-	-	90	60	150
7.	MEVD-207	Lab -2 : Digital Signal Processing And Embedded System	-	-	6	6	-	-	-	90	60	150
		Total	15	5	12	32	350	100	50	180	120	800

L: Lecture- T: Tutorial- P: Practical

w.e.f. July- 2014

MEVD-201 CMOS Mixed Signal Circuit Design

UNIT -I: Switched Capacitor Circuits:
Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT -II: Phased Lock Loop (PLL):
Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications

UNIT -III: Data Converter Fundamentals:
DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT -IV: Nyquist Rate A/D Converters:
Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT -V: Oversampling Converters:
Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A

Reference Books:
1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013
4. CMOS Integrated Analog-to- Digital and Digital-to-Analog converters-Rudy Van De Plassche, Kluwer Academic Publishers, 2003
5. Understanding Delta-Sigma Data converters-Richard Schreier, Wiley Interscience, 2005.
6. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

MEVD 202 : ASIC Design and FPGA

UNIT -I: Introduction To ASICS

Introduction to ASICS, CMOS Logic And ASIC Library Design, Types of ASICs - Design flow - CMOS transistors CMOS Design rules - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance- Logical effort -Library cell design - Library architecture.

Unit -II: Programmable Asics

Programmable Asics, Programmable ASIC Logic Cells And Programmable ASIC I/O Cells, Anti fuse - static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA - Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.

Unit -III: Interconnect

Programmable ASIC Interconnect, Programmable ASIC Design Software And Low Level Design Entry Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000,- Altera FLEX - Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language - PLA tools - EDIF-CFI design representation.

Unit -IV: Construction

ASIC Construction, Floor Planning, Placement And Routing, System partition - FPGA partitioning - partitioning methods - floor planning - placement - physical design flow - global routing - detailed routing - special routing - circuit extraction - DRC.

UNIT -V: PLDs

Design using Xilinx family FPGA, Review of VHDL/Verilog: Entities and architectures.

Reference Books:

1. M.J.S .Smith, - " Application - Specific Integrated Circuits " - Addison -Wesley Longman Inc., 1997
2. Skahill, Kevin," VHDL for Programmable Logic", Addison-Wesley, 1996
3. John F. Wakherly, " Digital Design: Principles and Practices", 2nd Edn 1994, Prentice Hall International Edn
4. Charles W. Mckay, "Digital Circuits a proportion for microprocessors", Prentice Hall

MEVD -203 Embedded Real Time Operating Systems

UNIT – I: Introduction

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

UNIT - II: Real Time Operating Systems

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

UNIT - III: Objects, Services and I/O

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT - IV: Exceptions, Interrupts and Timers

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

UNIT - V: Case Studies of RTOS

RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS, and Basic Concepts of Android OS.

Reference Books:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
3. Advanced UNIX Programming, Richard Stevens
4. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

MEVD 204 Embedded System Design

UNIT - I: Embedded Processing:
Introduction to Embedded Computing, Difference between Embedded and General-Purpose Computing, Characterizing Embedded Computing, Design Philosophies, RISC, CISC, VLIW versus superscalar, VLIW versus DSP Processors, Role of the Compiler, Architectural structures, The datapath, Registers and Clusters, Memory Architecture, Branch architecture, Speculation and prediction, Prediction in the embedded domain, Register File Design, Pipeline Design, the control unit, control registers.

UNIT - II: Embedded Processors:
Microprocessor versus Microcontroller architecture, ARM architecture, Embedded Cores, Soft and Hard Cores, Architecture of Configurable Microblaze soft core, Instruction set, Stacks and Subroutines, Microblaze Assembly Programming, Input-Output interfacing, GPIO, LCD interfacing, Peripherals, DDR Memory, SDRAM, Microblaze interrupts, Timers, Exceptions, Bus Interfacing, DMA, On-chip Peripheral bus (OPB), OPB Arbitration, OPB DMA.

UNIT -III: RTOS and Application design:
Programming language choices, Traditional C and ANSI C, C++ and Embedded C++, matlab, Embedded JAVA, Embedded C extensions, Real time operating systems, Embedded RTOS, Real time process scheduling, structure of real time operating system, Memory management in Embedded operating system, operating system overhead, interprocess communication mechanisms, File systems in Embedded devices, Different types of locks, Semaphores, Application studies with Vxworks, Montavista Linux etc.

UNIT -IV System Design and Simulation:
System-on-a-Chip (SoC), IP Blocks and Design Reuse, Processor Cores and SoC, Non-programmable accelerators, reconfigurable logic, multiprocessing on a chip, symmetric multiprocessing, heterogeneous multiprocessing, use of simulators, Compilers, Loaders, Linkers, locators, assemblers, Libraries, post run optimizer, debuggers, profiling techniques, binary utilities, linker script, system simulation, In Circuit Emulation, Validation and verification, Hardware Software partitioning, Co-design.

UNIT - V: Laboratory Work
Embedded System design using Embedded Development Kit Software and implementation on FPGA hardware, Practicals on Xilkernel, Vxworks and montavista Linux Real Time Operating Platforms.

Reference Books::

1. Wolf, W., High-Performance Embedded Computing Architectures, Applications,
2. and Methodologies, Morgan Kaufman Publishers (2007).
3. Heath, S., Embedded Systems Design, Elsevier Science (2003).
4. Fisher, J.A., Faraboschi, P. and Young, C., Embedded Computing - A VLIW
5. Approach to Architecture, Compilers and Tools, Morgan Kaufman (2005).
6. Simon, D.E., An Embedded Software Primer, Dorling Kindersley (2005).

MEVD-205 System on Chip

Unit I - Introduction
Introduction to SoC Design., Platform-Based SoC Design., Multiprocessor SoC and Network on Chip, Low-Power SoC Design

Unit II - System Design With Model Of Computation And Co-Design
System Models, Validation and Verification, Hardware/Software Codesign Application Analysis, Synthesis.

Unit III - Computation–Communication Partitioning And Network On Chip-Based Soc
Communication System: Current Trend, Separation of Communication and Computation. Communication-Centric SoC Design, Communication Synthesis, Network-Based Design, Network on Chip, Architecture of NoC

Unit IV - Noc Design
Practical Design of NoC, NoC Topology-Analysis Methodology, Energy Exploration, NoC Protocol Design, Low-Power Design for NoC: Low-Power Signaling, On-Chip Serialization, Low-Power Clocking, Low-Power Channel Coding, Low-Power Switch, Low-Power Network on Chip Protocol

Unit V - Noc /Soc Case Studies
Real Chip Implementation-BONE Series-,BONE 1-4, Industrial Implementations-,Intel's Tera-FLOP 80-Core NoC, Intel's Scalable 31,Communication Architecture, Academic Implementations-FAUST, RAW; design case study of SoC –digital camera

Reference Books:

1. Hoi-jun yoo, Kangmin Lee, Jun Kyoung kim, "Low power NoC for high performance SoC desing",CRC press, 2008.
2. Vijay K. Madisetti Chonlameth Arpikanondt, "A Platform-Centric Approach to System-on-Chip (SOC) Design", Springer, 2005.