

## **Paper -VA (MIT305A/MCA-551):Embedded System Design**

### **Unit I Overview and General Purpose Processor**

Overview: Overview of embedded systems, Design challenges, common design metrics, processor technologies: general purpose processors, single-purpose processors, application specific instruction set processors, IC technologies- full custom/VLSI, semicustom ASIC, PLD , Design Technologies- compilation/ synthesis, libraries/ IP, test/ verification.

General-Purpose Processors: Basic architecture, datapath, control unit, memory, operation, instruction execution, pipelining, superscalar and VLIW architectures, programmers view, instruction set, program and memory data space, registers, I/O, interrupts, development environment, design flow and tools, debugging and testing, selecting a microprocessor.

### **Unit II Custom Processors**

Custom-Single purpose processors: Custom single purpose processor design, optimizing custom single processors.

Standard single-purpose processors: peripherals Timers, counters, watchdog timers, UART, Pulse width modulator, LCD controller, Keypad controller, ADC, Real time clocks.

### **Unit III Application Specific Instruction Set Processors**

Application Specific Instruction Set Processor (ASIP) Design: ASIP Design methodologies, steps involved in ASIP design: application analysis, design space exploration, generation of software tools like compiler, debugger, instruction set simulator etc., synthesizing processor. Simulation based and scheduler based design space exploration techniques and their comparison.

### **Unit IV Memory and Interfacing**

Memory: Memory write ability and storage performance, Common memory types, composing memories, memory hierarchy and cache, advanced RAM: DRAM, FPM DRAM, EDO DRAM, SDRAM, RDRAM, Memory management Unit.

Interfacing: Arbitration, Multi-level bus architectures, Serial protocols: I2C bus, CAN bus, Fire Wire bus, USB, Parallel protocols: PCI and ARM bus, Wireless Protocols: IrDA, Bluetooth, IEEE802.11.

### **Unit V Case Study**

Case study of embedded system (Digital Camera): Introduction to a simple digital camera- user's perspective and designer's perspective, requirements specification- non functional requirements, informal functional specification, refined functional specification. Design

alternatives- microcontroller alone, microcontroller and CCDPP, microcontroller and CCDPP/  
Fixed-Point DCT, microcontroller and CCDPP/DCT.

**Text Book:**

1. Frank Vahid & Tony Givargi s: Embedded system design: A unified hardware/software  
Introduction, John Wiley & Sons Inc. 2002.