

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.

Recommended Books

1. Frank Vahid & Tony Givargis: Embedded system design: A unified hardware/software Introduction, John Wiley & Sons Inc. 2002.
2. Denial D. Gajski, Frank Vahid: Specification and design of embedded systems, PH
3. Jonathan W. Valvano: Embedded Microcomputer Systems, Thomson Learning
4. Myke Predko: Programming and Customizing the 8051 Micro Controller, TMH
5. Ayala: 8051 Micro controllers, Penram Press