EMBEDDED SYSTEM
CT 655

Lecture : 3 **Year : III**
Tutorial : 1 **Part : II**
Practical : 3/2

Course Objective:
To introduce students to understand and familiarization on applied computing principles in emerging technologies and applications for embedded systems

1. Introduction to Embedded System **(3 Hours)**
- 1.1 Embedded Systems overview
- 1.2 Classification of Embedded Systems
- 1.3 Hardware and Software in a system
- 1.4 Purpose and Application of Embedded Systems

2. Hardware Design Issues **(4 Hours)**
- 2.1 Combination Logic
- 2.2 Sequential Logic
- 2.3 Custom Single-Purpose Processor Design
- 2.4 Optimizing Custom Single-Purpose Processors

3. Software Design Issues **(6 Hours)**
- 3.1 Basic Architecture
- 3.2 Operation
- 3.3 Programmer's View
- 3.4 Development Environment
- 3.5 Application-Specific Instruction-Set Processors
- 3.6 Selecting a Microprocessor
- 3.7 General-Purpose Processor Design

4. Memory **(5 Hours)**
- 4.1 Memory Write Ability and Storage Permanence
- 4.2 Types of Memory
- 4.3 Composing Memory
- 4.4 Memory Hierarchy and Cache

5. Interfacing **(6 Hours)**
- 5.1 Communication Basics
- 5.2 Microprocessor Interfacing: I/O Addressing, Interrupts, DMA
- 5.3 Arbitration
- 5.4 Multilevel Bus Architectures
- 5.5 Advanced Communication Principles

6. Real-Time Operating System (RTOS) **(8 Hours)**
- 6.1 Operating System Basics

6.2 Task, Process, and Thread
6.3 Multiprocessing and Multitasking
6.4 Task Scheduling
6.5 Task Synchronization
6.6 Device Drivers

7. Control System **(3 Hours)**

7.1 Open-loop and Close-Loop control System overview
7.2 Control System and PID Controllers
7.3 Software coding of a PID Controller
7.4 PID Tuning

8. IC Technology **(3 Hours)**

8.1 Full-Custom (VLSI) IC Technology
8.2 Semi-Custom (ASIC) IC Technology
8.3 Programming Logic Device (PLD) IC Technology

9. Microcontrollers in Embedded Systems **(3 Hours)**

9.1 Intel 8051 microcontroller family, its architecture and instruction sets
9.2 Programming in Assembly Language
9.3 A simple interfacing example with 7 segment display

10. VHDL **(4 Hours)**

10.1 VHDL overview
10.2 Finite state machine design with VHDL

Practical:

Student should be complete lab works and project work in practical classes.

Reference Books:

1. David E. Simon, "An Embedded Software Primer", Addison-Wesley
2. Muhammad Ali Mazidi, "8051 Microcontroller and Embedded Systems", Prentice Hall
3. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley & Sons
4. Douglas L. Perry, "VHDL Programming by example", McGraw Hill