**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. Embedded Systems overview
   2. Classification of Embedded Systems
   3. Hardware and Software in a system
   4. Purpose and Application of Embedded Systems
2. **Hardware Design Issues [4 Hours]**
   1. Combination Logic
   2. Sequential Logic
   3. Custom Single-Purpose Processor Design
   4. Optimizing Custom Single-Purpose Processors
3. **Software Design Issues [6 Hours]**
   1. Basic Architecture
   2. Operation
   3. Programmer’s View
   4. Development Environment
   5. Application-Specific Instruction-Set Processors
   6. Selecting a Microprocessor
   7. General-Purpose Processor Design
4. **Memory [5 Hours]**
   1. Memory Write Ability and Storage Permanence
   2. Types of Memory
   3. Composing Memory
   4. Memory Hierarchy and Cache
5. **Interfacing [6 Hours]**
   1. Communication Basics
   2. Microprocessor Interfacing: I/O Addressing, Interrupts,  DMA
   3. Arbitration
   4. Multilevel Bus Architectures
   5. Advanced Communication Principles
6. **Real-Time Operating System (RTOS) [8 Hours]**
   1. Operating System Basics
   2. Task, Process, and Threads
   3. Multiprocessing and Multitasking
   4. Task Scheduling
   5. Task Synchronization
   6. Device Drivers
7. **Control System     [3 Hours]**
   1. Open-loop and Close-Loop control System overview
   2. Control System and PID Controllers
   3. Software coding of a PID Controller
   4. PID Tuning
8. **IC Technology [3 Hours]**
   1. Full-Custom (VLSI) IC Technology
   2. Semi-Custom (ASIC) IC Technology
   3. Programming Logic Device (PLD) IC Technology
9. **Microcontrollers in Embedded Systems [3 Hours]**
   1. Intel 8051 microcontroller family, its architecture and instruction sets
   2. Programming in Assembly Language
   3. A simple interfacing example with 7 segment display
10. **VHDL [4 Hours]**
    1. VHDL overview
    2. Finite state machine design with VHDL

**Practical:**  
Student should be complete project work related to this subject.  
**Reference Books:**

1. David E. Simon, “An Embedded Software Primer”, Addison-Wesley, 2005
2. Muhammad Ali Mazidi, “8051 Microcontroller and Embedded Systems”, Prentice Hall, 2006
3. Frank Vahid, Tony Givargis, “Embedded System Design”,  John Wiley & Sons, 2008
4. Douglas L. Perry, “VHDL Programming by example”, McGraw Hill, 2002

**Evaluation Scheme:**  
The question will cover all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below:

|  |  |  |
| --- | --- | --- |
| **Chapter** | **Hour** | **Mark Distribution\*** |
| 1 | 3 | 4 |
| 2 | 4 | 8 |
| 3 | 6 | 8 |
| 4 | 5 | 8 |
| 5 | 6 | 8 |
| 6 | 8 | 12 |
| 7 | 3 | 8 |
| 8 | 3 | 8 |
| 9 | 3 | 8 |
| 10 | 4 | 8 |
| **Total** | **45** | **80** |

**\*Note: There may be minor deviation in marks distribution.**