3/3 MCA First Semester

CA5T4C **EMBEDDED SYSTEMS** **Credits : 4**

Lecture Hours : 4 periods / week Internal assessment : 30 Marks

Semester and Examination: 70 Marks

Course Description:

Introduction to Embedded Systems, Processor technology used in embedded system, Real time operating system (RTOS), Programming embedded system, Techniques of connectivity and networking, Interrupt service routines, Embedded Application Development, they will learn advanced technologies like ARM and SHARC Processors with real time environment.

Course Objective:

- Student will learn usage of Embedded Systems in real environment world
- Student will learn 8051 Micro controller and ports, Counters and Timers.
- Student will learn Assembly language programming and tolls for programming in assembly language.
- Student will learn Interrupt Service routines
- Student will learn Real Time Operating Systems
- Student will learn Advanced Technologies like ARM and SHARC Processors

UNIT I:

Embedded Computing: Introduction, Complex Systems and Microprocessor, The Embedded System Design Process, Formalisms for System Design, Design Examples.

UNIT II:

The 8051 Architecture : Introduction, 8051 Micro controller Hardware, Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT III:

Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051. Data Transfer and Logical Instructions.

UNIT – IV:

Operations: Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Further Details on Interrupts.

UNIT V:

Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication. (Chapter 10 and 11 from Text Book 2, Ayala)

UNIT VI:

Introduction to Real – Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment (Chapter 6 and 7 from Text Book 3, Simon)

UNIT VII:

Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source); Embedded Software Development Tools: Host and Target machines, Linker/ Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques:

Testing on Host Machine, Using Laboratory Tools.

UNIT VIII:

Introduction to advanced architectures: ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus; Internet-Enabled Systems, Design Example-Elevator Controller.

Learning Resources

Text Books:

1. Computers and Components, Wayne Wolf, Elseveir, 1/e, 2009.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson, 3/e, 2007.
3. An Embedded Software Primer, David E. Simon, Pearson Education. 2002.

Reference Books:

1. Embedding system building blocks, Labrosse, via CMP publishers. 2/e, 1999.
2. Embedded Systems, Raj Kamal, TMH, 2/e, 2008.
3. Micro Controllers, Ajay V Deshmukhi, TMH, 1/e, 2005.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley, 1/e, 2006.
5. Microcontrollers, Raj kamal, Pearson Education, 2/e, 2011.