

CS7T5A

**4/4 B.Tech. FIRST SEMESTER
EMBEDDED SYSTEMS
(Common to CSE/IT)
Elective – II**

Credits: 4

**Lecture: 4 periods/week
Tutorial: 1 period /week**

**Internal assessment: 30 marks
Semester end examination: 70 marks**

Course Context and Overview: This course provides an introduction to Embedded Systems. Through the use of simulation software, real devices interfaced to a PC and with embedded devices, you will develop competence in microprocessor based digital system design and interfacing.

Prerequisite: C Language, I/O, Analog and Digital interfacing, and peripherals.

Objectives:

On successful completion of this syllabus the student can able to learn:

1. List the Difference between microcontrollers and microprocessors.
2. Describe the prominent standard features of a typical microcontroller.
3. Identify the major components of a microcontroller development system.
4. Understanding the 8051 Architecture.
5. Describe the hardware features of the 8051 microcontroller.
6. Learning the Basic Assembly Language Programming Concepts.
7. Describe the standards of Real-Time Operating System (RTOS).
8. Basic Design Using a Real-Time Operating System.

Learning Outcomes:

Ability to:

1. **Understand the microprocessor architecture and its components used in embedded systems.**
2. **Write the 8051 assembly language code for specific purposes.**
3. **Implement various devices interfacing code.**
4. **Develop simple embedded systems for real time operations.**
5. **Compose simple embedded system with error free software to obtain target system.**

UNIT I

Embedded Systems Basics:

Introduction to Embedded systems, Examples of embedded systems, Typical Hardware, Gates, Timing Diagrams, Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, Interrupt Basics.

UNIT II

The 8051 Architecture : Introduction, 8051 Micro controller Hardware, Input/output PinPorts and Circuits, External Memory, Serial data Input/output, Interrupts.

UNIT III

Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

UNIT IV

Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory Read-Only Data Moves, Push and Pop Opcodes, Data Exchanges.

UNIT V

Applications: Introduction, keyboards, Human Factor, Key Switch Factors, Keyboard Configurations, Displays, Seven-Segment Numeric Display, D/A and A/D Conversions.

UNIT VI

Introduction to Real – Time Operating Systems: Survey of software Architectures: RoundRobin, Round Robin with Interrupts, Function Queue Scheduling Architecture, Real Time Operating System Architecture, Selecting an Architecture, Tasks and Task States, Tasks and Data, Semaphores, and Shared Data;

UNIT VII

Basic Design Using a Real-Time Operating System: Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment, Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source);

UNIT VIII

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, An Example System.

Learning Resources

Text Books:

1. An Embedded Software Primer, David E. Simon, Pearson Education.
2. The 8051 Microcontroller, Third Edition, Kenneth J. Ayala, Thomson.

Reference Books:

1. 8051 Microcontrollers, Satish Shah, Oxford Higher Education.
2. Embedded Microcomputer Systems Real Time Interfacing, Jonathan W. Valvano, Cengage Learning.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley. Microcontrollers, Raj kamal, Pearson Education.