

4/4 B.Tech. FIRST SEMESTER

EE7T4

EMBEDDED SYSTEMS

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Objectives:

Understand the meaning of embedded system and applications in which they are used. Familiar with Hardware, Software architecture of ES and architecture of Real Time Operating Systems (RTOS)

Learning Outcomes

On completion of the class, a student should be able :

- to understand and to apply design methodologies for embedded systems
- to appreciate the considerations of embedded systems design – specification; technological choice; the development process; technical, economic, environmental and manufacturing constraints; reliability, security and safety issues, power and performance analysis
- to appreciate the fundamental building blocks of such systems (sensors, actuators, convertors, processors, intra- and inter-communication networks and interfaces, hardware and software co-design and related implementation and testing environments and techniques) and their inter-relationships
- to be familiar with modern hardware/software tools for building prototypes of embedded systems
- to demonstrate practical competence in these areas.

UNIT – I

INTRODUCTION: Introduction to Embedded Systems, application areas, categories of embedded systems, Overview of Embedded system architecture, Specialities of embedded systems, recent trends in embedded systems.

UNIT - II

ARCHITECTURE OF EMBEDDED SYSTEMS: Hardware architecture, software architecture, application software, communication software, process of generating executable image, hardware and software system development tools.

UNIT - III

Hardware Platforms: Types of Hardware Platforms, 89C51 Microcontroller development board, AVR Microcontroller development boards.

UNIT – IV

Communication Interfaces: Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

UNIT – V

EMBEDDED / RTOS CONCEPTS – I : Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex.

UNIT – VI

Embedded Software Development on 89C51 Microcontroller Platform: Development Environment, Cross platform development tools – using SDCC, Application Development – To toggle the LEDs, to glow LED when a switch is pressed, Communication through UART port, Further Experimentation.

UNIT – VII

Embedded Software Development on AVR Microcontroller Platform: Development Environment, Cross platform development tools – Using the tools & Parallel In system Programming, Application Development – To toggle the LEDs, to glow LED based on input through a switch, Serial Communication Programming, Further Experimentation.

UNIT - VIII

Embedded Systems Applications Using Intel® Strong ARM Platform: Architecture of Prayog, Applications – Programming the flash memory using JTAG, Parallel communication on Prayog, Interfacing stepper motor to prayog, Advanced applications.

TEXT BOOKS :

1. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.
2. Embedded System Design – A Unified Hardware/Software Introduction - Frank Vahid, Tony D. Givargis, John Wiley, 2002.

REFERENCES :

1. Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks / Cole, Thompson Learning.
2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.
3. Introduction to Embedded Systems – Raj Kamal, TMS, 2002.
4. Embedded Real Time Systems Programming – Sri Ram V Iyer, Pankaj Gupta, TMH, 2004.