

4/4 B.Tech- SEVENTH SEMESTER

EC7T4A

Embedded & Real Time Systems

Credits: 3

Lecture: 3 periods/week

Internal Assessment: 30 Marks

Tutorial: 1 period /week

Semester End Examination: 70 Marks

Prerequisites: Microprocessors & Microcontrollers (EC6T2)

Course objectives:

- To design and develop the process for embedded (dedicated) computer systems in relation to the environment in which they operate.
- To integrate embedded hardware, software, and operating systems to meet the functional requirements of embedded applications.

Learning outcomes:

Student will be able to

- Apply design methodologies for embedded systems
- Implement embedded systems design with specifications and technological choice.
- Build fundamental systems such as sensors, actuators, converters, processors, intra- and inter-communication networks and interfaces,
- Use modern hardware/software tools for building prototypes of embedded systems

UNIT I:

Introduction: History of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of Embedded Systems, Core of the Embedded System, Sensors and Actuators, Communication Interface, Embedded Firmware.

UNIT II:

Hardware Software Co-Design And Programme Modeling: Characteristics of an Embedded System, Quality Attributes of Embedded Systems, Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Hardware Software Trade-offs.

UNIT III:

Devices in Embedded Systems: Types of supporting devices for an embedded system – various forms of ROM, RAM devices, interrupt sources and their controlling in various families of processors, serial port devices, parallel port devices, timers and counting devices.

UNIT IV:

Communication Buses for Device Networks: Interfacing Features in Device Ports, Wireless Devices, Networked Embedded Systems, Serial Bus Communication Protocols,

Parallel Bus Device Protocols- Parallel Communication Network Using ISA, PCI, PCI-X and Advanced Buses, Internet Enabled Systems- Network Protocols, Wireless and Mobile System Protocols.

UNIT V:

Design of Real Time Systems: processors in complex embedded systems, design process in embedded system, optimizing design metrics, Case study for adaptive cruise control system in car, Case study of coding for sending application layer byte streams on a TCP/IP networks.

Learning Resources

Text Books:

1. Embedded Systems Architecture, Programming and Design- Raj Kamal, Second Edition, McGrawHill Companies.
2. Introduction to Embedded System- Shibu KV, Mc-Graw Hill Higher Edition.

References:

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

Web Resources:

1. <http://users.ece.utexas.edu/~bevans/courses/ee382c/resources/>
2. <http://www.windriver.com/vxworks/reinvented/?gclid=CJ7ApdaD2MQCFYUmjgodcVUApA>
3. http://www.eventhelix.com/realtimemantra/issuesinrealtimesystemdesign.htm#.VR1s5_yUdqU
4. <ftp://ftp.bupt.edu.cn/pub/Documents/so-many-notsorted/linux%20for%20embedded%20and%20realtime%20app.pdf>