

New Scheme Based On AICTE Flexible Curricula

Computer Science & Information Technology, VI-Semester

Open Elective CSIT- 604 (B) Embedded Systems

Course Objectives:

1. To introduce students with knowledge about the basic functions and applications of embedded systems.
2. To introduce the architecture of embedded systems.
3. To introduce the various communication protocols.
4. To enable students to have knowledge of the memory types and supporting technologies of embedded systems.
5. To enable students to have knowledge about the development of embedded software.

Course Outcomes:

1. Explain the embedded system concepts and architecture of embedded systems.
2. Describe the architecture of 8051 microcontroller and write embedded program for 8051 microcontroller.
3. Select elements for an embedded systems tool.
4. Understand the memory types used in embedded systems.
5. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Course Contents:

UNIT I:

Introduction to Embedded Systems: Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems, common design metrics, and processor technology: general purpose processor, application specific processor, single purpose processor.

UNIT II:

Embedded System Architecture: Von Neumann v/s Harvard architecture, instruction set architecture, CISC and RISC instructions set architecture, basic embedded processor, microcontroller architecture, CISC & RISC examples: 8051, ARM, DSP processors.

UNIT III:

Input Output and Peripheral Devices Timers and counters, watchdog timers, interrupt controllers, PWM, keyboard controller, analog to digital converters, real time clock. Introduction to communication protocols: basic terminologies, concepts, serial protocol:

I2C, CAN, firewire, USB. Parallel protocols: PCI bus, IrDA, bluetooth, IEEE 802.11, wireless protocols.

UNIT IV:

Memory System Architecture Caches, virtual memory, MMU, address translation, memory and interfacing, memory write ability and storage performance. Memory types, composing memory – advance RAM interfacing, microprocessor interfacing I/O addressing, interrupts, direct memory access, arbitration multilevel bus architecture.

UNIT V:

Embedded System Supporting Technologies Difference between normal OS and RTOS, scheduling algorithms. Case study: Tiny OS, VxWorks, QNX. Overview of VLSI technology, introduction to device drivers. Case studies: washing machine, air-conditioning, auto focus camera.

Recommended Books:

1. F Vahid, T Goggarvis, Embedded systems: A unified hardware/software approach, Wiley, 1999.
2. Raj Kamal, Embedded Systems Introduction, 2nd Ed., TMH publication, 2015.
3. David E Simons, An Embedded Software Primer, Pearson, 1999.