



C. U. SHAH UNIVERSITY

Wadhwan City

FACULTY OF: - Technology and Engineering

DEPARTMENT OF: - Electronics & Communication Engineering

SEMESTER: - VII

CODE: - 4TE07ESY1

NAME: – Embedded Systems (ESY)

Teaching & Evaluation Scheme:-

| Subject Code | Subject Name | Teaching Schemes (Hours) | | | | Credits | Evaluation Schemes | | | | | | | |
|--------------|------------------------|--------------------------|----|----|----|---------|--------------------|-------|-----------------|-------|-------------------|----|-------|------------|
| | | Th | Tu | Pr | To | | Theory | | | | Practical (Marks) | | Total | |
| | | | | | | | Sessional Exam | | University Exam | | Internal | | | University |
| | | | | | | | Marks | Hours | Marks | Hours | Pr | TW | | Pr |
| 4TE07ESY1 | Embedded Systems (ESY) | 04 | 00 | 02 | 06 | 05 | 30 | 1.5 | 70 | 3.0 | --- | 20 | | 30 |

Objectives:-

- In this course, student will study about embedded systems, different ARM processor architectures, and assembly language programming using ARM / Thumb instruction set.

Prerequisite:-

- Student should have knowledge of digital electronics, microprocessor architecture and assembly language programming.

Course Outline:-

| Sr. No. | Course Content | Hours |
|---------|---|-------|
| 1 | Introduction to Embedded systems: An embedded system, processor in the system, other hardware units, software embedded into a system, examples of embedded systems, embedded systems – on-chip (SOC) and in VLSI circuit. | 05 |
| 2 | Processor and Memory organisation: Structural units in a processor, processor selection for an embedded system, memory devices and selection for an embedded system, allocation of memory to program segments and blocks and memory map of a system, direct memory access, interfacing processor, memories and I/O devices. | 06 |
| 3 | Devices and buses for device networks: I/O devices, timer and counting devices, serial communication using I ² C, CAN and advanced I/O between the networked multiple devices, Host system communication between the networked I/O multiple devices using ISA, PCI, PCI-X and advanced buses. | 06 |
| 4 | Interrupts servicing mechanisms: Interrupt handling mechanism, context and the periods for context switching, deadline and interrupt latency. | 03 |

| | | |
|---|---|----|
| 5 | The ARM processor architecture, fundamentals and organization: The Acorn RISC Machine, architectural inheritance, the ARM programmer's model, ARM development tools, registers, CPSR, pipeline, exceptions, interrupts and, the vector table, core extensions, architecture revisions, ARM processor families. 3-stage pipeline ARM organization, 5-stage pipeline ARM organization, ARM instruction execution. | 08 |
| 6 | The ARM instruction Set: Introduction, Exceptions, Conditional execution, Branch and Branch with Link (B, BL), Branch, Branch with Link and exchange (BX, BLX), Software Interrupt (SWI), Data processing instructions Multiply instructions, Single word and unsigned byte data transfer instructions, Half-word and signed byte data transfer instructions, Multiple register transfer instructions, Swap memory and register instructions (SWP), Status register to general register transfer instructions, General register to status register transfer instructions, simple assembly language programming. | 12 |
| 7 | The Thumb Instruction Set: The Thumb bit in the CPSR, The Thumb programmer's model, Thumb branch instructions, Thumb software interrupt instruction, Thumb data processing instructions, Thumb single register data transfer instructions, Thumb multiple register data transfer instructions, Thumb implementation, Thumb applications, simple assembly language programming. | 10 |

Learning Outcomes:-

After the successful completion of the course, students will be able to

- understand basics of embedded systems.
- distinguish various noises available.
- programming of ARM processor in assembly
- understand an applications of ARM processors / microcontrollers

Books Recommended:-

1. Embedded Systems Architecture, Programming and Design, **Raj Kamal**, McGraw Hill Publications, 2nd Edition.
2. ARM System Developer's Guide, Designing and Optimizing System Software, **Andrew N. Sloss, Dominic Symes and Chris Wright**, Morgan Kaufmann Publishers.
3. ARM System on Chip Architecture, **Steve Furber**, Pearson Education.
4. Computer as Components: Principles of Embedded Computing System Design, **Wayne Wolf**, Morgan Kaufmann Publishers.