EMBEDDED SYSTEMS - 2

(Common to CSE & IT)

Course Code :13CT1129

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Pre requisites: Embedded Systems - 1

Course Educational Objectives:

To present to the student the computational devices, peripherals and networks along with software and hardware description languages.

- To provide students fundamental concept and insight for advance ARM7 and PIC32 Processor based architecture and programming Embedded System based on ARM
- PIC32 powered MCU for application in control, multimedia, Mobiles, wireless communication.
- It exposes students to the field of Embedded Systems and gives them a chance to hear and read about embedded system topics, and then put those concepts to work by developing and debugging embedded system hardware and firmware.
- The students will have the opportunity to develop various Embedded Systems from the ground up, starting with electronic components and data sheets.
- Progressing through construction of hardware and implementation of firmware.

Course Outcomes:

At the end of the course the student will be able to

- Understand the essentials of the ARM7 instruction set and its registers and able to write programs in assembly language for real time problems.

- ✤ Understand the essentials of the PIC32 instruction set and its registers and able to write programs in assembly language for real time problems.
- ✤ Design their application by interfacing System Peripherals and external sensors.
- ✤ Understand modern communication protocols starting with addressable USART, SPI bus, 12C bus and USB; their characteristics protocols and usage in high speed communication.
- ✤ Know the basics of In Circuit Emulation techniques using JTAG.

UNIT-I **(12 Lectures)**

The ARM Architecture: ARM / THUMB register organization, Modes of operations, The bus structure and the peripherals, memory organization, load store instruction set, addressing modes. Basic assembly language programming (64 bit addition, string operations, block transfer).

UNIT-II **(12 Lectures)**

ARM interfacing programs: GPIO, Timers, Counters, PWM, ADC. Application coding examples: Measurement and control of time, frequency velocity acceleration, power control and touch monitoring.

UNIT-III **(12 Lectures)**

Introduction to MIPS processor architecture in PIC 32 bit family, CPU architecture and a detailed introduction to peripherals, present. GPIO, timers, capture control and PWM features. Instruction set usage with application examples.

(http://ww1.microchip.com/downloadsEditionn/DeviceDoc/61146B.pdf)

UNIT-IV **(12 Lectures)**

PIC 32 Interrupts, modes and vectored interrupt priority processing using the many shadow registers. Interfacing programs using interrupts. Measurement of time, frequency, velocity & acceleration.

UNIT-V **(12 Lectures)**

Modern communication protocols starting with addressable USART, SPI bus, 12C bus and USB; their characteristics protocols and usage in high speed communication. Introduction to In

TEXT BOOKS:

1. B.Kanta Rao, *"Embedded Systems"*, 1st Edition, PHI Learning Private Limited, 2011. (Units 1, 2, 5)
2. Trevor Martin, *"Introduction to the LPC2000"*, 1st Edition, Hitex (UK) Ltd, 2005. (Units 1, 2, 5)
3. Lucio Di Jasio, *"Programming 32-bit Microcontrollers in C Exploring the PIC 32"*, 1st Edition, Newnes, 2008. (Units3, 4)

REFERENCES:

1. A.N.Sloss, D.Symes and C. Wright, *"RM system's Developer Guide, Designing an Optimizing system software"*, 1st Edition, Morgann Kaufmann Publishers, 2004.
2. Steve Furber, *"ARM system on Chip Architecture"*, 2nd Edition, Adison Wesley Publishers, 2000.
3. David Seal, *"ARM Architecture reference Manual"*, 2nd Edition, Adison Wesley Publishers, 2001.
4. http://ww1.microchip.com/downloadsEdition/DeviceDoc/61146B.pdf (Unit 5)

WEB REFERENCES:

1. http://www.nptel.iitm.ac.in/video.php?subjectId=108102045