

Subject: CS-337 Embedded Systems

Credit hours: 3-0

Contact hours: 3 Hours (3 Lectures) per week

Text Book:

- Computer Architecture, A Quantitative approach by Dr. David A. Patterson and Dr. Paul Hennessey, - Digital Computer Electronics by Malvino & Brown.
- Embedded System Design: A unified Hardware/Software Introduction. By Frank Vahid & Tony D. Givarigis,
- FPGA programming for Beginners, Frank Bruno
- FPGA prototyping by VHDL examples: Xilinx Spartan-3 version, By Pong P. Chu - Wiley-Interscience.

Reference Book:

- Embedded System Design. Hardware/ Software System, by P. Marwedel
- Logic Design and Verification Using System Verilog, Donald Thomas

Prerequisite: Nill

Mode of teaching: Lectures

Course description: Embedded Systems is a course that introduces the topic of Embedded Systems. The students are taught different type of processor technologies in detail. The software and hardware embedded is taken in parallel. The main component of Embedded Systems inclusive of Processing, Storage and Interfacing is explored in detail. On the software side students are introduced to Verilog coding and practical examples are also performed to enhance learning.

Course Objectives:- The main objectives of this course are to

1. Understand various types of embedded systems and their application
2. Learn how to design single purpose, application specific and general purpose processors
3. Verilog coding – converting embedded design to HDL

Topics Covered:

Topic	Week No
Introduction, PLA, PAL, Processor and IC Technologies	Week 1
Types of ICs, Combinational Logic Circuits	Week 2
Single Purpose Processors	Week 3
General Purpose Processors	Week 4

Assembly for GPPs with example	Week 5
Designing General Purpose Processors	Week 6
Single Purpose Processors - Peripherals	Week 7
Memory	Week 8
Cache, Cache Mapping, MMUs	Week 9
Interfacing, Interrupts	Week 10
DMAs, Arbitration, Communication Mediums	Week 11
Introduction to Verilog	Week 12
Verilog coding on 4 levels of abstraction	Week 13
Introduction to ISE, Soft coding	Week 14
Introduction to Spartan 6, Practical implementation	Week 15
Verilog practice	Week 16

Course Targets:

Course Learning Outcome (CLOs)		PLOs	Learning Level
CLO 1	Understanding the concepts of embedded systems and its applications towards environment/sustainable solutions	PLO 7	C2
CLO 2	Design of embedded elements – Single purpose processor, memory, peripherals etc	PLO 3	C6
CLO 3	Implement/apply embedded design using Verilog HDL through investigation of engineering problems and breaking them down into modules.	PLO 4	C3