Embedded Hardware Design

Learning Objectives and Topics

The objective of the Embedded Hardware Design course is to present to the student the computation devices, peripherals and networks along with software (C) and hardware description language (Verilog HDL), which are used in the design of a modern day embedded system.

Since peripherals and networks are independent of the computing device used, the course would first only consider the Microcontroller as a computing device and build up the concept of peripherals and networks around it. Standard peripherals like Analog to Digital and Digital to Analog Converters (ADC and DAC), Universal Asynchronous Receiver Transmitter (UART), Interrupt Controller, Programmable Peripheral Interface, Real Time Clock are discussed.

Many computing devices that are used in an embedded system such as General Purpose Processors, Microcontrollers, Digital Signal Processors and Programmable Logic Devices are introduced. Different serial communication standards and protocols such as RS 232, RS 485, I2C, Controller Area Network along with input output devices such as keyboard, keypad and LCD are explained.

In the laboratory, the AVR microcontroller is programmed for various applications using ‘C’. Digital circuit design is carried out using Verilog HDL and Field Programmable Gate Array (FPGA).

Reference Books (In alphabetical order)

1. Barnett, O’Cull, Cox, Embedded C programming and the Atmel AVR (Cengage Learning)
2. John Catsoulis - Designing Embedded Hardware (O’Reilly)
3. Samir Palnitkar – Digital Design using Verilog HDL (Pearson India)
4. Vendor Data sheets and application notes