

Introduction

Peripherals, Interfacing and Embedded Systems

Course Teacher:

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Course ID: CSE - 4619

Course Title: Peripherals, Interfacing and Embedded Systems
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Does Earlier Knowledge Require ??

- ▶ You should have the knowledge about –
 - ▶ **Microprocessor** and
 - ▶ **Microcontroller (in detail will be covered in this course).**
 - ▶ Basics of “**Digital Logic Design**” course.
- ▶ Knowledge of **Microprocessors and Assembly Language Course:**
 - ▶ *Intel 8086 Microprocessor : internal architecture, register structure, programming model, addressing modes, instruction set, Interrupts.*
 - ▶ *Assembly language programming.*
- ▶ **Should we learn from the very basic? Most of them already done !! Right?**

Recommended Texts and Lectures

- ▶ *Microprocessors and Interfacing: Programming and Hardware*,
Author: Douglas V. Hall
- ▶ *Microprocessor Architecture, Programming and Applications with the 8085* **Author:** Ramesh Gaonkor
- ▶ *Embedded Systems Design* **Author:** Steve Heath
- ▶ *Computer Organization and Embedded Systems* **Author:** Carl Hemacher, Safwat Zaky
- ▶ *Embedded System Design: An Introduction to Processes, Tools and Techniques* **Author:** Arnold Berger, Arnold S. Berger
- ▶ **Additionally, Lecture materials will be provided .. ☺**

Earlier Terminologies!!

Microprocessor and Microcontroller

- ▶ Two terms to be used mostly in this course

- ▶ Microprocessor
- ▶ Microcontroller

- ▶ **Microprocessor**

- ▶ A microprocessor (abbreviated as μP or uP) is a Silicon Chip that contains an electronic central processing unit (CPU). In the world uP or CPU used interchangeably, which is made from miniaturized transistors and other circuit elements on a single semiconductor integrated circuit (IC).
- ▶ **Examples:** Intel Pentium, Intel 80x86, 8086, 8085 etc.

Earlier Terminologies!!

Microprocessor and Microcontroller

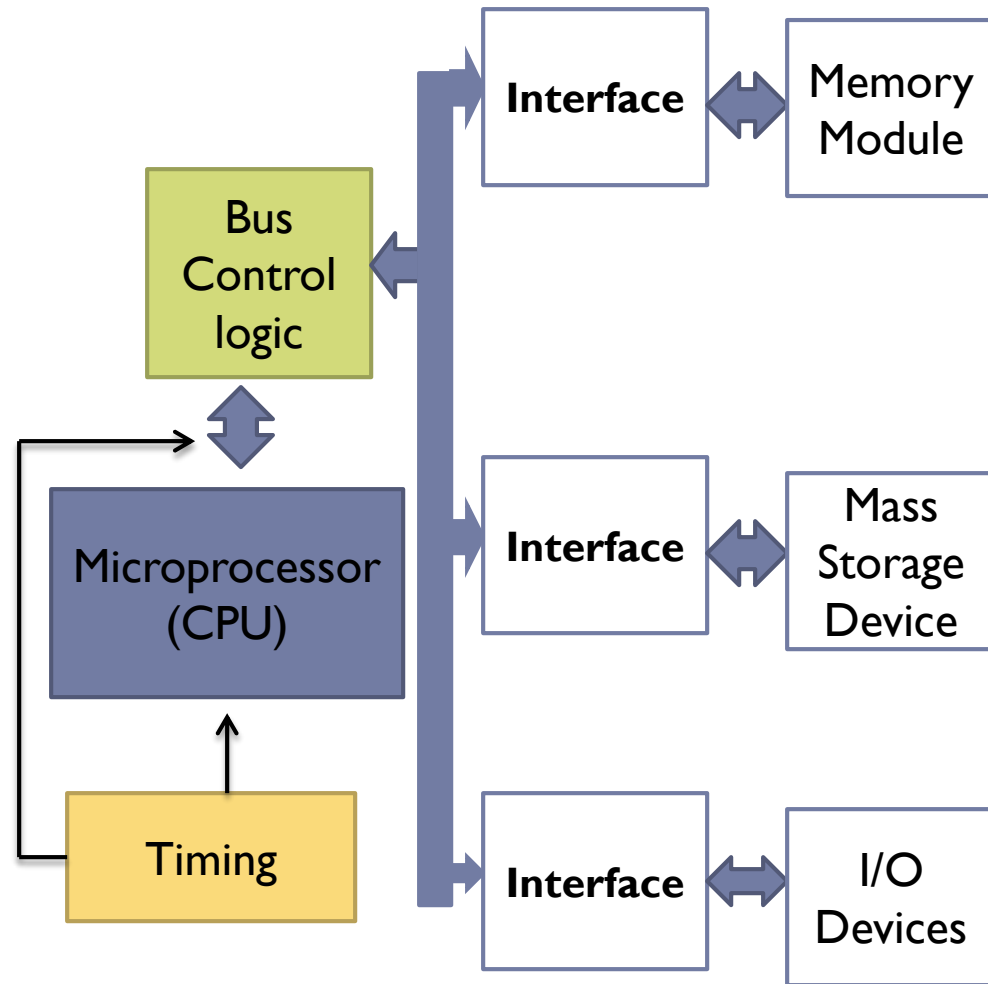
▶ Microcontroller

- ▶ Dedicated to perform one task.
- ▶ Integrates the memory and other features of a microprocessor.
- ▶ A microcontroller is the integration of
 - ▶ Microprocessor
 - ▶ Memory
 - ROM types – commonly flash PROM
 - RAM – Static ram
 - ▶ Peripherals
 - Parallel input and output
 - Serial input and output (UART, USART, etc.)
 - Analogue to digital convertors
 - Timers and Counters
- ▶ **Examples:** ATmega8A, Atmega32A, ATmega328 etc.

New Terminologies !!

Peripherals and Interfaces

- ▶ Computer **peripherals** such as disk drives, display, keyboard, printers etc. work in different ways and linking a peripheral to the processor is a difficult task.
- ▶ An **interface** is the hardware and software needed between a processor and a peripheral device in order to compensate for differences in their operating characteristics.
- ▶ The interface allows the two devices to communicate correctly.



New Terminologies !!

Embedded Systems

- ▶ **Embedded Systems** embeds devices/applications of daily life based on the demand or necessity.
- ▶ Example: Smart Phones, Bio-Sensors etc.



Finally !!

Summary of Terminologies

- ▶ **Microprocessor** = CPU
- ▶ **Microcontroller** = CPU + Peripherals + Memory
- ▶ **Peripherals** = Ports + Clock + Timers + USART + ADC Converters + LCD drivers + DAC + other stuff
- ▶ **Memory** = EEPROM + SRAM + EPROM + Flash
- ▶ A **microcontroller** has a combination of all this stuff.
- ▶ A **microprocessor** is just a CPU.
- ▶ An **embedded system** includes everything.

Let's See What We Will Learn in this Course !!

Topics to be Covered in this Course

▶ ***Peripherals and Interfacing Part:***

- ▶ Interrupts,
- ▶ Address space partitioning,
- ▶ A-to-D and D-to-A converters and some related chips.
- ▶ Interfacing ICs of I/O devices – I/O ports,
- ▶ Programmable peripheral interface,
- ▶ DMA controller, interrupt controller, communication interface, interval time, etc.
- ▶ IEEE 488 and other buses, interfacing with microcomputer.
- ▶ Interfacing I/O devices – floppy disk, hard disk, tape, CD-ROM & other optical memory, keyboard, mouse, monitor, plotter, scanner, etc.
- ▶ Microprocessor in Scientific Instruments and other applications – Display, Protective Relays.

Topics to be Covered in this Course

▶ ***Embedded System Part:***

- ▶ Introduction to Embedded system,
- ▶ The Embedded Design Life Cycle,
- ▶ Models of Computation,
- ▶ State Charts,
- ▶ General language Characteristics (SDL, Petri nets, Message Sequence Charts, UML, JAVA, HDL),
- ▶ Embedded System Hardware, (Input, Communication, Processing Unit, Memories, output)
- ▶ Embedded operating systems, middleware & Scheduling,
- ▶ Implementing Embedded Systems Hardware/Software co-design.

Topics to be Covered in this Course

▶ ***Practical (Lab) Tasks:***

- ▶ Measurements of Electrical quantities (e.g., voltage),
- ▶ Temperature monitoring system,
- ▶ Water level indicator,
- ▶ Motor speed controller,
- ▶ Traffic light controller, etc.
- ▶ -
- ▶ -
- ▶ -
- ▶ And many more on Microprocessor and Microcontroller based interface design.

Thank You !! and

- ▶ Wish you Good Luck with this Course 😊

