Microcontrollers and Industrial Applications 1
KOM3722

Asst. Prof. Bahadır Çatalbaş

Syllabus

Recommended Texts:

- PIC Microcontrollers: An Introduction to Microelectronics, Tim Wilmshurst,
- Beginner's Guide To Embedded C Programming: The PIC Microcontroller, Chuch Hellebuyck

Grading:

- 60% Midterm + 2nd Midterm or Homework
- 40% Final

Attendance

- At least 70%

Course Coverage

1. Introduction to microcontroller systems, microcontroller architecture
2. PIC architecture
3. Registers, digital inputs and outputs (Ports)
4. C operands and assignments
5. Timers
6. Seven segment displays and its applications
7. Analogue Inputs and Interrupts
8. Midterm Exam

Course Coverage

9. HD44780 Compatible Character LCD
10. PWM Signal and its use in Microcontrollers
11. EEPROM applications
12. Application examples
13. Application examples, Midterm exam II
14. Application examples
15. Final

Course Learning Outcomes

- The students shall design and implement a simple microcontroller system.
- Can program a microcontroller in C language.
- The students shall interface a microprocessor to various devices.
- The students shall have understanding of the wide range of peripherals integrated into a contemporary microcontroller.
- They will be able to solve a given problem by using microcontroller.

Hardware and Software To Be Used in The Course

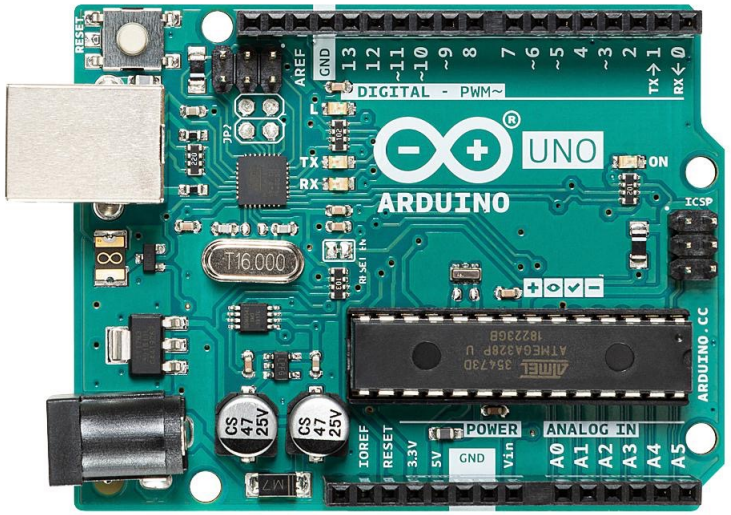
- PIC18(L)F45K22
- MPLAB® X IDE v6.00
- MPLAB® XC8 v2.36 C Compiler
- Proteus ISIS

Embedded Systems

- Combination of computer hardware and software designed for a specific and generally repeating tasks.
- May also serve within a larger system such as personal computer and its fan controller.
- The systems can be programmable or have a fixed functionality.
- Industrial machines, consumer electronics, agricultural and processing industry devices, automobiles, medical equipment, cameras, digital watches, household appliances, airplanes, vending machines and toys, as well as mobile devices, are possible locations for an embedded system.

Reference: https://www.techtarget.com/iotagenda/definition/embedded-system

Embedded Systems

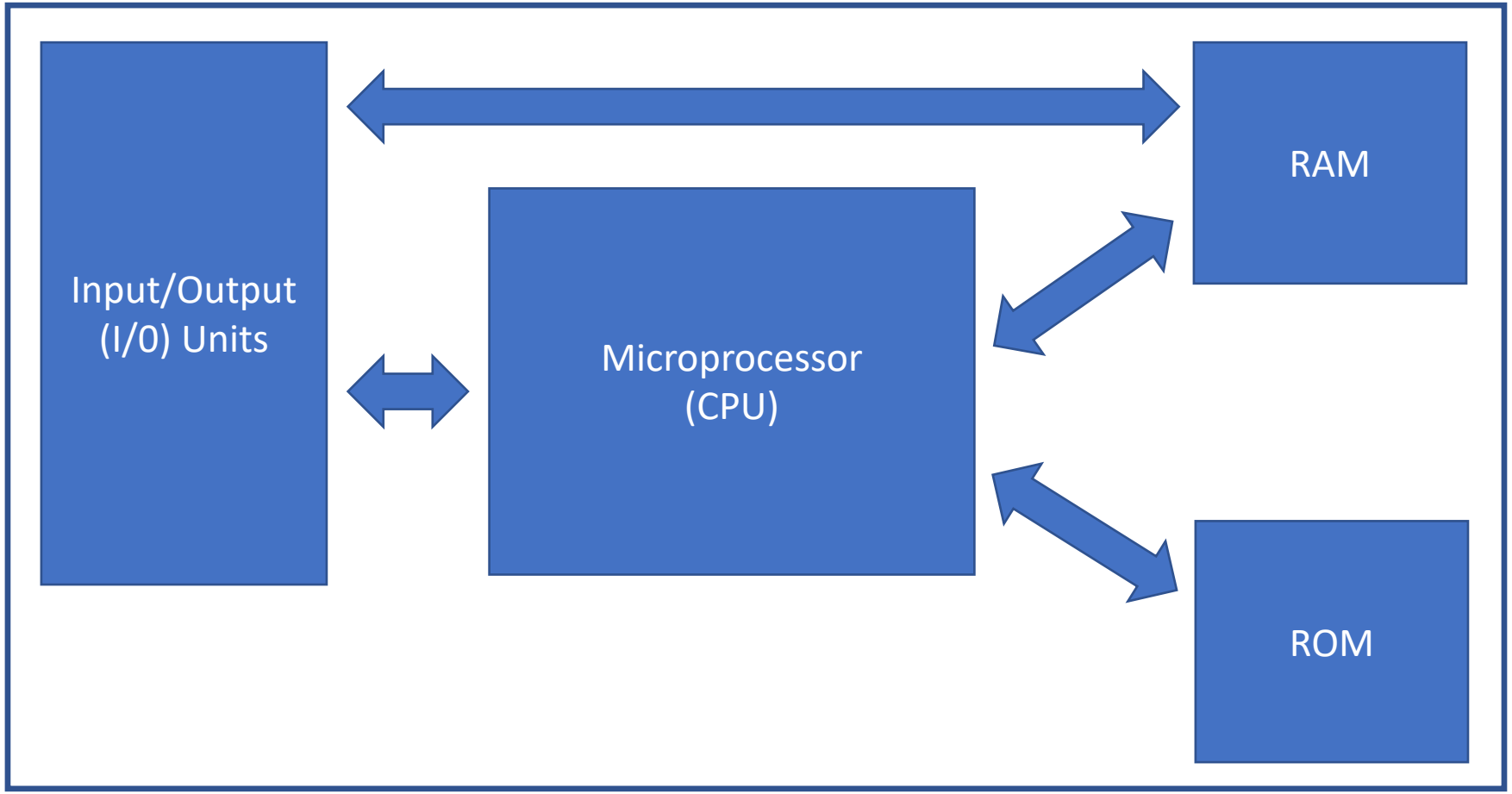


- Embedded systems can be designed to include only microcontrollers, only microprocessors or both.

Microprocessors

- Intel 80386, 80486, i3/i5/i7/i9 series processors and AMD Ryzen 3/5/7 series processors are in the class of microprocessor.
- Microprocessors are often called as the central processing unit (CPU) because they perform all the operations.
- Microprocessor works by connecting external peripherals such as random access memory, data storage unit, inputs/output ports such as in personal computers.
- When microprocessors are utilized in personal computers, it may serve for different purposes so resulting system is not to be considered as embedded system.
- When microprocessors are utilized in automation control systems, resulting system considered as embedded systems.

Microprocessors

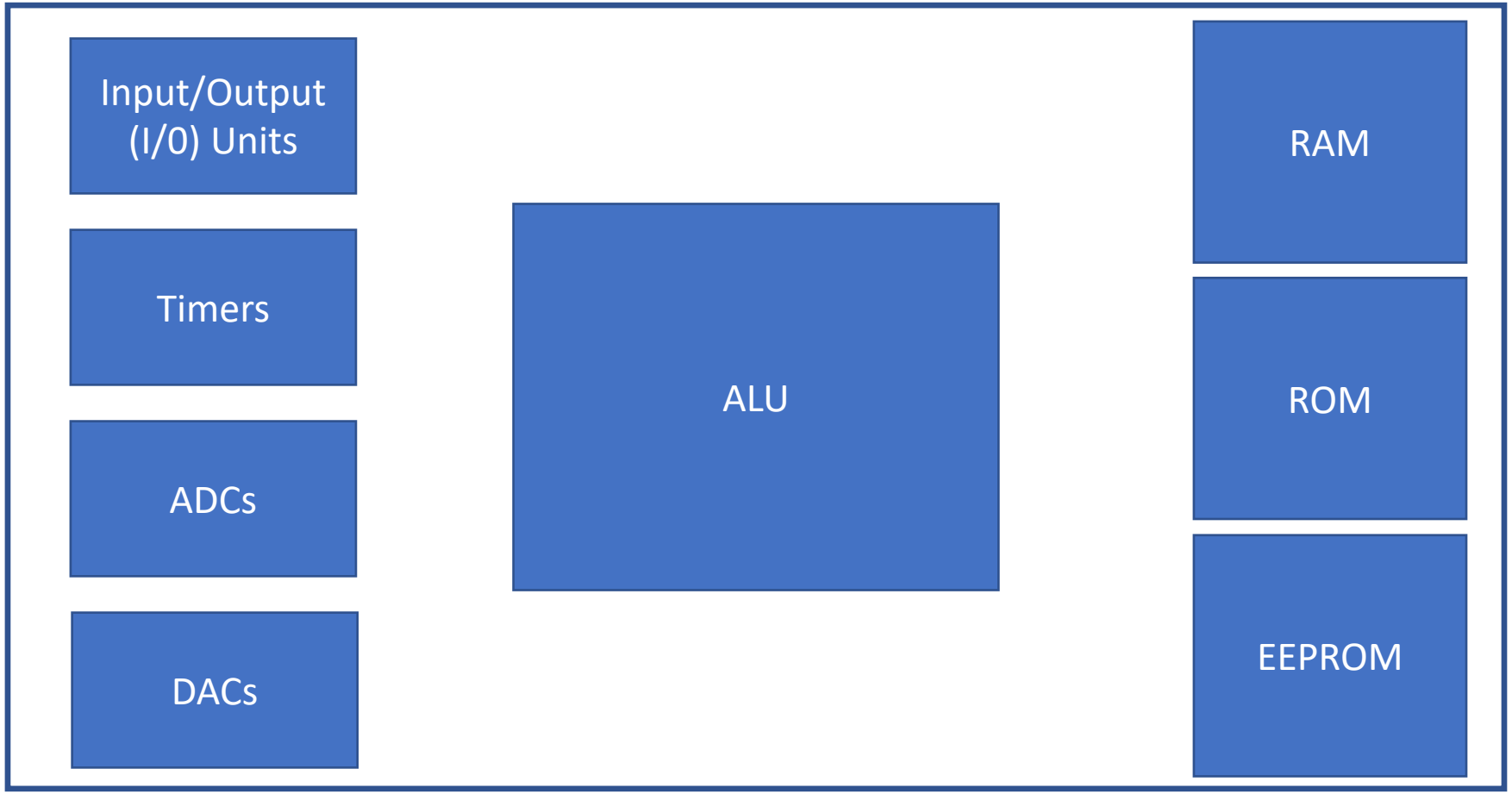


Embedded system design with microprocessor

Microcontrollers

- PIC16F677A, PIC18F45K22, ATMEGA328P, Intel 8051, Texas Instruments C2000
- They are miniaturized computer on a single chip by including arithmetic logic unit (ALU), Ready Only Memory (ROM), Random Access Memory (RAM) and Universal Synchronous Asynchronous Receiver Transmitter (USART) other I/O ports etc.
- Low-cost solutions for embedded system
- Power efficient functioning
- Small form factor electronic design
- Limited computation capability

Microcontrollers



Inside of a generic microcontroller

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CPU Type	Program Memory Size (KB)	RAM (KB)	Max I/O Pi
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