SEMESTER Seventh	DEPARTMENT Control Engineering	COURSE TITLE Microcontrollers
COURSE CODE EC705	HOURS 3 UNITS 3	COURSE SPECIFICATIONS Theoretical Content

1. Computer Systems:

➢ PC systems.

➢ Microprocessor systems.

➢ Microcontroller systems.

➢ Basic Architecture of MCU.

➢ Von Neumann and Harvard architectures.

➢ CISC and RISC architectures.

2. Information Coding:

➢ Overview in number systems.

➢ Levels of programming languages.

➢ Structure of assembly language.

3. PIC Microcontroller:

➢ PIC microcontroller families.

➢ The arithmetic and logic unit (ALU) and the Working register in PIC MCU.

➢ Machine cycles and execution of instructions.

➢ Pipelining for instruction execution.

➢ Oscillators.

➢ Watchdog.

4. Memory in PIC MCU:

➢ Logic organization of memory.

➢ Types of memory.

➢ Memory in Medium- End PIC MCU:

• Program memory.

• RAM data memory.

5. *Instruction Set in Medium-End PIC Microcontrollers (from PIC16F628 datasheet):*

➤ Data transfer instructions.

➤ Arithmetic and logic instructions.

➤ Control transfer instructions: including subroutine, calls and returns.

➤ Bit manipulation instructions.

➤ Arithmetic operators.

6. *Parallel Input/ Output in PIC MCU:*

➤ Basic concepts: peripheral, port, etc.

➤ Data transfer techniques.

➤ Input / Output Techniques.

➤ Parallel Ports in Medium-End PIC Microcontrollers: (Port A – G and parallel slave port).

➤ Connection of commonly used peripherals: (Switches, LEDs, 7 segment display, etc).

7. *Timers and Counters:*

➤ Timers and counters in PIC MCU.

➤ Types of counters.

➤ Timer modules:

- Timer0 module.

- Timer1 module.

- Timer2 module.

➤ The CCP module: capture mode; compare mode; and PWM mode.

8. *Interrupts:*

➤ General structure of an interrupt service subroutine.

➤ Interrupt sources and associated registers in PIC MCU.

➤ Interrupt service subroutine structure in PIC MCU.

➤ An example of interrupt Applications: real time clock.

9. *Serial Input and Output:*

➤ Introduction to serial data transmission.

➤ Asynchronous communication.

> ➤ Synchronous communication.

References:
1. Fernando E. Valdes-Perez, Ramon Pallas-Areny, *Microcontrollers, Fundamentals, and Applications with PIC*, CSC Press.
2. PIC16F628 datasheet.
3. www.microchip.com
4. MPLAB IDE (free versions can be downloaded from Microchip)