

SEMESTER <i>Eighth</i>	DEPARTMENT <i>Telecommunications Engineering</i>	COURSE TITLE <i>Microcontrollers</i>
COURSE CODE <i>EC705</i>	HOURS 3 UNITS 3	COURSE SPECIFICATIONS <i>Theoretical Content</i>
1. Computer Systems: <ul style="list-style-type: none"> ➤ PC systems. ➤ Microprocessor systems. ➤ Microcontroller systems. ➤ Basic Architecture of MCU. ➤ Von Neumann and Harvard architectures. ➤ CISC and RISC architectures. 		
2. Information Coding: <ul style="list-style-type: none"> ➤ Overview in number systems. ➤ Levels of programming languages. ➤ Structure of assembly language. 		
3. PIC Microcontroller: <ul style="list-style-type: none"> ➤ 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: <ul style="list-style-type: none"> ➤ Logic organization of memory. ➤ Types of memory. ➤ Memory in Medium- End PIC MCU: <ul style="list-style-type: none"> • 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)