



College	Engineering and Technology		
Department	Electrical Engineering Department		
Program			
Course Title	Microcontrollers	Course Number:	12120305
Year	2019/2020	Semester:	Spring
Prerequisite(s)	Digital Electronics		
Instructor	Dr. Jafar Jallad		
Instructor's e-mail	J.Jallad@ptuk.edu.ps		
Office Hours	SUN, TUE, THU (9-10)		MON, WED (8-9)
Class Time	SUN/TUE/THU: (8-9) MON, WED (9.30-11) MON, WED(12.30-2.00)	Class Room:	H108
Course description	<p>Microprocessors and microcontroller systems: microprocessors, microcontrollers, memory, input/output, busses (Data, address, control). Microcontroller architecture: internal structure, ALU, registers, flags, interrupts, ports I/O, timers and counters, analog to digital converters. Programming: instruction set, assembly language, programming techniques. Subroutines, addressing modes, Examples of and microcontrollers in engineering applications.</p>		
Course Intended Learning Outcomes (CILOs)	<p>A) Knowledge and understanding</p> <ol style="list-style-type: none"> 1- Demonstrate knowledge of the fundamental and constituent of electronics and their applications. 2- Apply engineering principles including design, analysis, and validation. <p>B) Intellectual/Cognitive skills</p> <ol style="list-style-type: none"> 1- Design an effective electronics circuit based on simulation, components, and sub-system. 2- Evaluate specifications, define and solve problems. 3- Work effectively as part of a team and learn independently. 4- Organize works and apply project management. <p>C) Subject specialization and practical skills</p> <ol style="list-style-type: none"> 1- Consider and assess a variety of methods and tools in the electronics world. 2- Know state-of-the-art-in this area. <p>D) General and transferable skills</p>		



	1- Resolving problems, issues, challenges, and be able to troubleshoot successfully.
Textbook(s)	"The PIC Microcontroller and Embedded systems - Using Assembly and C for PIC18," Muhammad Ali Mazidi, Rolin D. McKinlay, and Danny Causey, Prentice Hall, 2007
Other required material (References):	<p>(1) Design reference notes and data sheets of Microchips.</p> <p>(2) Lecture notes on Moodle</p>
Other Resources used (e.g. e-learning, field visits, periodicals, software, etc.)	Mplab Software, PIC C COMPILIER, PROTEUS SIMULATION.

Academic Quality Assurance Department

Course Syllabus Form

Course Teaching Methods	
Teaching Method	CILOs
Interactive lectures	Knowledge and understanding
Discussion + Problem based learning	Intellectual/Cognitive skills
Tutorials + Simulations	Subject specialization and practical skills
Problem solving	General and transferable skills

Assessment Type	Details/Explanation of assessment in relation to CILOs	Weight	Date(s)
First Exam		30	5 th – 7 th Week
Second Exam		30	9 th – 11 th Week
Quizzes			
Assignments			
Project			
Laboratory/Practical			
Final Exam		40	16 th Week
Total		100%	



Course Intended Learning Outcomes (CILOs)				
CILOs	Mapping to Program ILOs			
	a	b	c	d
On successful completion of the course, students will be able to:				
Get the basic knowledge of Microcontroller and Microprocessor.	√			
Get the basic knowledge of different instructions in assembly language.	√	√	√	√
Get the basic knowledge of different types of memories and addressing modes.	√	√	√	√
Get the basic knowledge of the architecture of CPU.	√	√	√	√
Get the basic knowledge of Timers, PWM, ADC.	√	√	√	√
Get the basic knowledge of Interrupt process in programming.	√	√	√	√

Course Weekly Breakdown					
Week	Date	Topics Covered	CILOs	Lab	Assessment
1		Introduction: World of Microcontrollers <ul style="list-style-type: none"> ✓ Microelectronic systems, microcontrollers and microprocessors in everyday life and in industry. Differences between microprocessors and microcontrollers. Microcontrollers examples, pinout and general features. ✓ Architecture of the system. Data ,address and control busses, system clock. 	A		First Exam
1		Microcontroller Basics: <ul style="list-style-type: none"> ✓ Memory: Random access memory (RAM), Read Only memory (ROM), Masked programmed ROM, PROM, EPROM, addressing memory. 	A,B,C, D		



		<ul style="list-style-type: none"> ✓ Inside the CPU: Control unit, internal bus, ALU ✓ Instructions, fetch and execute Cycle. Writing to memory, assembler. ✓ Transfer instructions, Instructions-branch, mnemonics arithmetical, logical, bit shift, flags, looping, directives, subroutines, delay. 			
3,4,5		<p>Special Purpose Register:</p> <ul style="list-style-type: none"> ✓ Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM. 8051 Addressing Modes. 	A,B,C, D		
6,7,8,9		<ul style="list-style-type: none"> ✓ Assembly programming and instruction of PIC16F87A: Introduction to PIC16F87A assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming. 	A,B,C, D		
10,11, 12,13		<p>PIC16F87A programming in C: Data types and time delay in PIC16F87A, IO programming in PIC16F87A, Logic operations in PIC16F87A, Data conversion program in PIC16F87A, accessing code ROM space in PIC16F87A, Data serialization using PIC16F87A</p> <ul style="list-style-type: none"> ✓ PIC16F87A Timer programming in Assembly and C: Programming PIC16F87A timers, Counter programming, Programming timers 0 and 1 in PIC16F87A. 	A,B,C, D		Second Exam
		PIC16F87A serial port programming in assembly and C: Basics of serial communication, PIC16F87A	A,B,C, D		Final Exam



		<p>connection to RS232, PIC16F87A serial port programming in assembly, serial port programming in PIC16F87A C.</p> <p>✓ PIC16F87A Interrupt programming in assembly and C: PIC16F87A interrupts, Programming timer, external hardware, serial communication interrupt, Interrupt priority in PIC16F87A, Interrupt programming in C.</p>			
		<p>Interfacing: LCD interfacing, Keyboard interfacing.</p> <p>ADC, DAC and sensor interfacing: ADC 0808 interfacing to PIC16F87A, Serial ADC Max1112 ADC interfacing to 8051, DAC interfacing, Sensor interfacing and signal conditioning.</p> <p>Motor control: Relay, PWM, DC and stepper motor: Relays and opt isolators, stepper motor interfacing, DC motor interfacing and PWM.</p> <p>✓ PIC16F87A interfacing with 8255: Programming the 8255, 8255 interfacing, C programming for 8255.</p>	A, B, C, D		
		<p>GUI in Matlap One lecture briefing</p>	A		

Prepared by:	Dr. Jafar Jallad	Signature	
Head of Department	Dr. Jafar Jallad	Signature	
Date	2020.2.2		