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Department offering the program: Electronics and Electrical Communications Engineering
Department offering the course: Industrial electronics and Control Engineering

Course Specification

1. Course basic information :		
Course Code: ACE 225	**Course Title: Microcontrollers**	Academic year: 2015-2016 **Level (2) – Semester : 2nd**
Department requirement	**Teaching hours: Lecture [2] -Tutorial [1]- Lab [1]**	

2. Course objectives	1. To provide students with the several ways of accomplishing , utilizing and manipulating the different types of a microcontrollers. 2. Programming the microcontroller with high efficiency and reliability using different embedded languages. 3. Having acquired a good knowledge of improving interfacing of the microcontroller with the outer media. And to connect with the PC. 4. To analyze embedded devices and analyze the microcontroller different units.

3. Intended Learning Outcomes: (ARS)		**Course (ILOs)**
A- Knowledge and Understanding	a4) Demonstrate Principles of design including elements design, process and/or a system related to microcontrollers.	a4-1) Demonstrate the principles of design including elements design, process and/or a system related to logic design. a4-2) Demonstrate the principles of design including elements design, process and/or a system related to microprocessor architecture
	a8) Describe Current engineering technologies as related to microcontrollers	a8-1) Describe the current engineering technology as related to microcontroller's applications. a8-2) Describe the current engineering technologies as related to microprocessor architecture.
	a15) Interpret Principles of Analyzing and design of electronic circuits and components.	a15-1) Interpret the principles of analyzing and design of interfacing circuits.
	a20) Demonstrate The principles of sustainable design and development.	a20- 1) Demonstrate the principles of sustainable design of Microcontroller applications.

B- Intellectual Skills	b1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems. b12) Create systematic and methodic approaches when dealing with new and advancing technology . b16) Identify at an appropriate level the design, production, interfacing and software needs of different parts of Microcontrollers.	b1-1) Select appropriate mathematical and computer-based method for modeling and analyzing problems based on arithmetic logic unit using microcontrollers. b12-1) Create systematic and methodic approaches when dealing with microcontroller's technology. b12-2) Create systematic and methodic approaches when dealing with arithmetic logic unit. b16-1) Identify at an appropriate level the design, production, interfacing and software needs of different parts of microcontroller applications.
C- Professional Skills	c3) Create and/or re-design a process, component or system, and carry out specialized engineering designs. c14) Practice computer programming for the design of digital control systems using microcontrollers. c20) Apply the principles of sustainable design and development.	c3-1) Create and/or re-design a process, component or system, and carry out specialized engineering designs based on Arithmetic logic unit. c14-1) Practice computer programming for the design of digital control systems using microcontrollers. c20-1) Apply the principles of sustainable design and development using ports operation
D- General Skills	d1) Collaborate effectively within multidisciplinary team. d3)Communicate effectively. d6) Effectively manage tasks, time, and resources. d9) Refer to relevant literatures.	d1-1) Collaborate effectively within multidisciplinary team. d3-1)Communicate effectively. d6-1) Effectively manage tasks, time, and resources. d9-1) Refer to literatures relevant to microcontrollers.
4. (a) Course Contents	Introduction to Microcontrollers - Microcontrollers versus microprocessors - Logic design - Microprocessor architecture (RISK, CISC) - Memory unit - Central Processing Unit – Bus system - Input-output unit (Ports operation Pin operation) - Serial communication interface - Timer unit – Watchdog - Interrupts -Analog to Digital Converter - Programming (assembly language, Basic language, C language) -microcontroller interfacing circuits – Case study and applications.	

(b) Lab Experiments	Experiment 1	Writing header, configuration I/O pins using delay function
	Experiment 2	TMR0 as a counter
	Experiment 3	TMR0 as a timer
	Experiment 4	Watchdog timer
	Experiment 5	Interrupt by changes on pin RB0
	Experiment 6	Interrupt by changes on pin RB4: RB7
	Experiment 7	PWM signal generator
	Experiment 8	EEPROM memory
	Experiment 9	Two-digit LED counter
	Experiment 10	UART with RS232 serial communication
	Experiment 11	A/D converter
	Experiment 12	Temperature Measurement using LM35

5- Teaching and Learning Methods	- Lectures - Labs and/or case studies - Research assignments
6- Teaching and Learning Methods for disable students	• Give the students specific tasks. • Assign a teaching assistance to follow up the performance of this group of students. • Scheduled time in order to improve their skills.
7- Student Assessment	
a- Assessment Methods	- Weekly sheet exercises at Lab. room - Quizzes - Labs and/or case study for more demonstration. - Mid term, and final exams
b- Assessment Schedule	- Exercise sheet/ Lab assignment : Weekly - Quizz-1: Week no 5 - Mid-Term exam: Week no 8 - Quizz-2: Week no 10 - Lab exam: Week no 15 - Final – term examination: Week no 16 to 18
c- Weighting of Assessment	- Lab. tutorial and quizzes : 5 % - Mid-term examination: 15 % - Case study and/or practical exam: 20 % - Final – term examination: 60 % - Other types of assessment: % Total 100 %
8- List of text books and references:	
a- Course notes	There are lectures notes prepared in the form of a book authorized by

	the department
b- Text books	Frederick M Cady "Microcontrollers and Microcomputers Principles of Software and Hardware Engineering", Prentice Hall, Jun 19, 2009.
c- Recommended books	[1] Myhe paedho, Handbook of microcontrollers, McGraw Hill,1999. [2] Fundamentals and Applications with PIC , Fernando E. Valdes-Perez and Ramon Pallas-Areny , Feb 11, 2009
d- Periodicals, Web sites ……etc	http://www.qariya.info/vb/forumdisplay

9-Course contents - ILOs Matrix

Content Topics	Week	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
1. Introduction and review • Logic design	1	a4			d3,d9
2. Introduction and review • Microcomputer architecture	2	a4,a8	b12		
3. Memory • program memory • data memory • external memory	3			c14	
4. Arithmetic logic unit • Control unit • time control • timers • interrupt	4-5		b1,b12	c3	
5. PIN/PORT operation • Ports operation • Pin operation	6	a4		c20	d9
6. Programming • assembly • language • Basic language	7-8			c14	d9
7. interfacing methods • Digital interface • Protection.	9-11	a15			d9

• keypad					
8. Applications • Connecting opto-couplers, transistors, relays. • LED-7segment-LCD. • **Timer** • **Real time clock** • **ADC** • **PWM** • **Flash memory**	12-14	a8,a20	b16		d1,d3,d6,d9

10-Teaching and Learning Methods - ILOs Matrix

Teaching and Learning Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Lectures	a4,a8, a15, a20	b1,b12, b16		d3
Tutorials.				
Exercises		b1,b12, b16		d1,d3,d6,d9
Labs and/or case studies	a4,a8, a15, a20	b1,b12, b16	c3,c14,c20	
Reports and assignments	a4,a8, a15, a20	b1,b12, b16		d1,d6,d9

11-Assessment Methods - ILOs Matrix

Assessment Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Weekly sheet exercises		b1,b12, b16		
Reports	a4,a8, a15, a20			d9
Quizzes	a4,a8, a15, a20	b1,b12, b16		
Laboratory exam			c3,c14,c20	d9
Midterm, and final **Written exams**	a4,a8, a15, a20	b1,b12, b16		

Authorized from department board at 15/05/2016
Authorized from college board at 05/06/2016

Course coordinator: Dr. Salwa Galal Elnashar

Head of Department: Prof. Fathi El-Sayed Abd El-Samie