Modern Academy for Engineering & Technology

Computer Engineering and Information Technology Department

Course Specification
CMP 433: Embedded Systems

A- Affiliation

Relevant program: Computer Engineering and Information Technology BSc Program
Department offering the program: Computer Engineering and Information Technology Department
Department offering the course: Computer Engineering and Information Technology Department
Date of specifications approval: September 2015

B - Basic information

Title: Embedded Systems **Code:** CMP 433 **Level:** Senior-2, 7th OR 8th Semester
Credit Hours: 3 **Lectures:** 2 **Tutorial/Exercise:** 2 **Practical**: -
 Pre-requisite: CMP 211

C - Professional information

1 – Course Learning Objectives:

By the end of this course, the students should demonstrate the knowledge and understanding of the microcomputer architecture; C and assembly language programming; I/O methods and interface techniques in parallel and serial connections, synchronous and asynchronous systems; different I/O interrupts, and DMA; interface examples involving standard and non-standard microcomputer interface. By the end of this course, the students will be able to develop the techniques used in microcomputer design, interfacing and applications.

2 - Intended Learning Outcomes (ILOS)

a - Knowledge and understanding:

On successful completion of the course, the student should demonstrate knowledge and understanding of:

a1- Embedded systems descriptions, definitions, and vocabulary (A1, A14) .
a2- Embedded system design considerations and requirements, processor selection and tradeoffs. (A4)
a3- The phases of embedded system development and familiarity with hardware and software development and debugging tools. (A6, A15)
a4- Designing input/output hardware to meet the requirements of specific applications. (A12)
a5- Comparison and evaluation of alternative systems to handle multiple interrupts. (A5)

b - Intellectual skills:

On successful completion of the course, the student should be able to:

b1- Focus on the basic embedded system concepts. (B4)
b2- Solve engineering design based on microcontroller in mini-project (B12).
b3- Expose the 8051 instruction set, and learn how to use a cross assembler and simulator to develop code. (B3).
b4- Select a microprocessor appropriate to a particular application. (B8)
b5- Design, create, validate and document structured programs and software solutions to problems. (B2, B3, B13).
b6- Select and use appropriate hardware and software development tools (B14).
b7- Design an embedded microcomputer system to specification (B15).
b8- Present designs for microprocessor-based solutions (B15).

c - Professional and practical skills:
On successful completion of the course, the student should be able to:
c1- Use a cross assembler and simulator to develop code (C14).
c2- Develop code in assembly and C to control the basic hardware (C15).
c3- Design an embedded system in a manner similar to that practiced in industry (C1,C3).
c4- Solve limited operational problems using microcontroller (C4, C5, C6, C13).

d - General and transferable skills:
On successful completion of the course, the student should be able to:
d1- Work in a team and involve in group discussion (D1, D3).
d2- Communicate effectively and present data and results orally and in written form (D3).
d3- Use ICT facilities in presentations (D4).
d4- Search for information's in references and in internet (D7).
d5- Practice self-learning (D7, D9).

Course Contribution in the Program ILO's

ILO's		Program ILO's
A	Knowledge and understanding	A1, A4, A5, A6, A12, A14, A15, A16
B	Professional and practical skills	B2,B3, B4, B8, B12, B13, B14, B15
C	Intellectual skills	C1, C3, C4, C5, C6, C13, C14, C15
D	General and transferable skills	D1, D3, D4, D7, D9

3 – Contents

Topic	Lecture hours	Tutorial hours	Practical hours
➢ Embedded system design process	2	2	
➢ Introducing Microcontrollers training kit for simulation software	2	2	
➢ The Microcontrollers Architecture	2	2	
➢ I/ O ports of microcontroller and its Timers.	4	4	
➢ Addressing modes.-Instruction set of microcontroller.	4	4	
➢ Interrupts.-Serial communication.-Memory decoding.	4	4	
➢ Embedded system based on VHDL and FPGA	4	4	
➢ Embedded computing platform – distributed embedded architectures – system analysis and architecture design – design example – Programming project.	4	4	
➢ Real time interfacing with LCD, ADC, sensors , stepper motors, keyboard , DAC	4	4	
Total hours	30	30	

4 - Teaching and Learning and Assessment methods:

Course ILO's		Lecture	Presentations and Movies	Discussions and seminars	Tutorials	Problem solving	Laboratory & Experiments	Researches and Reports	Modeling and Simulation	Written Exam	Practical Exam	Quizzes	Term papers	Assignments
Knowledge & Understanding	a1	1	1	1	1			1		1		1	1	
	a2	1			1					1		1	1	1
	a3	1			1					1		1	1	1
	a4	1	1	1	1	1		1		1		1	1	1
	a5	1								1		1	1	1
Intellectual Skills	b1	1			1					1		1		1
	b2	1			1	1				1		1	1	1
	b3	1	1	1	1			1		1			1	
	b4	1	1		1			1		1		1	1	1
	b5	1			1					1				1
	b6	1			1	1				1		1	1	1
	b7	1	1	1	1			1		1			1	
	b8	1	1		1			1		1		1	1	1
Applied Professional Skills	c1	1			1					1		1		1
	c2	1			1	1				1		1	1	1
	c3	1	1	1	1			1		1			1	
	c4	1	1		1			1		1		1	1	1
General Tran. Skills	d1			1		1		1					1	
	d2		1	1				1	1				1	
	d3	1	1					1					1	1
	d4	1	1	1				1						
	d5							1	1				1	

5- Assessment Timing and Grading:

Assessment Method	Timing	Degrees
Semester Work: seminars, quizzes assignments and reports	By Weekly	20
Mid-Term Exam	6-th Week	10
Written Exam	Sixteenth week	70
Total		100

6- List of references:

6-1 Course notes:
Rolin D. McKinlay, Janice G. Mazidi, Danny Causey and Muhammad Ali Mazidi, The 8051 Microcontroller, Prentice Hall, 2012

6-2 Required books:
Elecia White, Making Embedded Systems: Design Patterns for Great Software, O'Reilly Media, Inc., 2012.

6-3 Recommended books:
Robert Oshana, Mark Kraeling, Software Engineering for Embedded Systems: Methods, Practical Techniques, Newnes, 2013.

6-4 Periodicals, Web sites, etc.
- http://www.8052.com
- http://www.keil.com/
- http://www.mikroe.com/

7- Facilities required for teaching and learning:
- Computer, Data show and Computer programs.
- Microprocessor and microcontroller Lab.
- VHDL lab.

Course Coordinator: Dr. Assem Badr

Head of the Department: Prof. Dr. Saied Gawish

Date: September 2015