Sana'a University
Faculty of Engineering
Department: Electrical Engineering
Title of the Program: Communication Engineering and Networks

27. Course Specification of Microprocessors & Assembly Language

I. Course Identification and General Information:

1.	Course Title:	Microprocessors & Assembly Language				
2.	Course Code & Number:	CCE214				
3.	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	3
4.	Study level/ semester at which this course is offered:	Third Year/ First Semester				
5.	Pre –requisite (if any):	Programming Language 2 (C/C++) (CCE143), Logic Circuits 2 (CCE112), Electronics1(PME113)				
6.	Co –requisite (if any):	None				
7.	Program (s) in which the course is offered:	Computer Engineering and Control Program				
8.	Language of teaching the course:	English				
9.	Location of teaching the course:	Faculty of Engineering				
10.	Prepared By:	Asst. Prof. Dr. Mohammed Abdullah Al-olofi				
11.	Date of Approval					

II. Course Description:

This course provides students the basic fundamentals and advanced concepts related to microprocessors and microcontrollers organizations & architectures, programming, and their functionalities and applications to the field of computer engineering & control industrially. Topics in this course include the 8086/8088-Mps internal organizations and assembly programming, the 8086/8088-Mps Chip and interfacing with I/O devices, and an introduction to the 8051-Mc interfacing, internal features, and programming using assembly. Lab experiments will cover the 8086/8088-Mps and the 8051-Mc programming and interfacing to I/O devices, and the design and implementation of simple human interfacing applications. By the end of the course, students – in groups- will be asked to

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submit a project in which they reflect their learned skills by this course to design, simulate and implement of real world applications.

III. Course Intended learning outcomes (CILOs) of the course		**Referenced PILOs**
a1	Demonstrate fundamentals, basic concepts and principles related to the microprocessors/microcontrollers and their assembly programming.	A1
a2	Describe theories and the internal organization of the microprocessors and microcontrollers.	A2
b1	Analyze problems related to microcomputer-based systems using appropriate software and hardware tools.	B1
b2	Develop innovative microprocessor/microcontroller and application-based system solutions for overcoming practical industrial problems.	B3
c1	Apply standard approaches and sustainability principles while constructing microcomputer-based systems using appropriate hardware and software tools.	C1
c2	Form creative microcomputer-based solutions to engineering problems using standard/modern hardware, techniques, and programming language considering industrial and commercial constraints.	C2
d1	Work productively as an individual and as a member of a team / multi-disciplinary team.	D1
d2	Engage in independent lifelong learning.	D2

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1 Demonstrate fundamentals, basic concepts and principles related to the microprocessors/microcontrollers and their assembly programming.	Active lectures Interactive class discussions	▪ Written Tests ▪ Coursework Activities ▪ Homework and Assignments ▪ Case Studies
a2 Describe theories and the internal organization of the microprocessors and microcontrollers.	Active lectures Project Interactive class discussions	▪ Written tests ▪ Coursework Activities ▪ Homework and Assignments ▪ Case Studies

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1 Analyze problems related to microcomputer-based systems using appropriate software and hardware tools.	▪ Active lectures ▪ Interactive class discussions ▪ Computer-based Lab Works, ▪ Laboratory based session (hands on laboratory work) ▪ Project. ▪ Case Studies	▪ Written tests ▪ Coursework Activities ▪ Laboratory reports ▪ Practical Lab assessment ▪ Homework and assignments ▪ Case studies
b2 Develop innovative microprocessor/ microcontroller and application-based system solutions for overcoming	▪ Active lectures ▪ Interactive class discussions ▪ Computer-based Lab Works,	▪ Written tests ▪ Coursework Activities ▪ Laboratory reports ▪ Practical Lab assessment

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practical industrial problems.	▪ Laboratory based session (hands on laboratory work)Project. ▪ Case Studies.	▪ Homework and assignments ▪ Case studies

© **Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:**		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1 Apply standard approaches and sustainability principles while constructing microcomputer- based systems using appropriate hardware and software tools.	▪ Active lectures ▪ Problem based learning ▪ Case study ▪ Directed self- study ▪ Laboratory based session (hands on laboratory work), ▪ Computer-based Lab Works,	▪ Coursework activities ▪ Laboratory reports ▪ Practical Lab assessment ▪ Case studies
c2 Form creative microcomputer- based solutions to engineering problems using standard/modern hardware, techniques, and programming language considering industrial and commercial constraints.	▪ Active lectures ▪ Problem based learning ▪ Case study ▪ Directed self- study ▪ Laboratory based session (hands on laboratory work), ▪ Computer-based Lab Works,	▪ Coursework activities ▪ Laboratory reports ▪ Practical Lab assessment ▪ Case studies

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1 a Work productively as an individual and as a member of team / multi-disciplinary team.	▪ Group Learning.	▪ Project Reports. ▪ Presentations.
d2 Engage in independent lifelong learning.	▪ Homework & Assignments, ▪ Use of Information and Communications technology.	▪ Project Reports. ▪ Presentations.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction to computing	a1, a2	Course Orientations Introduction to Microprocessors & Microcontrollers, Numbering systems, coding systems.	1	2
2.	Internal organization of computer	a1, a2, b1, c1	Introduction to internal organization of computer, relation between internal organization, internal working of computer.	1	2
3.	The 80x86 Microprocessor	a1, a2, b1, b2, c1	Brief history of the 80x86 family, Inside the 8088/8086, Introduction to the assembly programming, Introduction to program segments, and 80x86 addressing modes	1	2

4.	assembly language Programming	a1, a2, b1, b2, c1	Directives & A sample program, Assemble, link, and run a program, Examples of assembly programs, Control transfer instructions, Data types and definitions	1	2
5.	Arithmetic and Logic Instructions and Programs	a1, a2, b1, b2, c1	Unsigned addition & subtraction, Unsigned multiplication & division, Logic instructions and sample programs, BCD & ASCII operands and instructions, Rotate instructions.	1	2
6.	Bios, Dos programming in assembly and Macro	a1, a2, b1, b2, c1	Bios INT 10H programming: using INT 10H, Dos interrupt IN 21H: using INT 21H, Define macro and how to use in assembly, How macro expanding by assembler, How to control the expanded of macro in list file, Define the local variable in macro, How to include the macro in another file	1	2
7.	Strings & Tables and Modules & Modular Programming	a1, a2, b1, b2, c1	Code string instructions, Tables processing, Advantages of modular programming, Break a large program into modules and code the modules and calling the program, EXTRN directive, PUBLIC directive, Link a subprograms into one executable program.	1	2
8.	The 8086/8088 Mp IC and Interfacing	a1, a2, b1, b2, c1	The 8086/8088-Mp IC, Pins functions, Modes of Operations, Memory & I/O	2	4

			Ports Addressing & Address Decoding Circuits, Interfacing and Programming of the 8088-Mp with I/O peripherals Like Switch, LEDs, and Sensors		
9.	Introduction to 8051 Microcontroller family & Programming	a1, a2, b1, b2, c1	Introduction to 8051 family microcontroller, IC for 8051, features like ports, Timers, and Serial Modules, Internal RAM, General Purpose Registers (GPRs), Special Function Registers (SFRs), Assembly Language Programming, Flowchart standard symbols.	1	2
10.	8051 Programming	a1, a2, b1, b2, c1, c2	Assembly Language Programming, Data Transfer Instructions, Addressing Modes, Data Processing Instructions, Program Branching instructions, stack, TIME DELAY FOR VARIOUS 8051 CHIPS.	1	2
11.	8051 Programming (I/O Ports)	a1, a2, b1, b2, c1, c2	LEDs, Seven-segments, Switches, Keypad, PWM, DC-motor, Stepper motor, ADC, DAC, I/O Ports Expansion, Alphanumeric LCD, GLCD..	2	4
12.	8051 Interrupts	a1, a2, b1, b2, c1, c2	Interrupts Programming, Steps in executing an interrupt, Interrupt Sources, Interrupt Vectors, Interrupt Enable (IE) register, External interrupt, Interrupt Priorities.	1	2

Number of Weeks /and Units Per Semester	**14**	**28**

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B - Practical Aspect:				
Order	**Tasks/ Experiments**	**Number of Weeks**	**Contact hours**	**Learning Outcomes**
1.	Lap equipment and simulation Tools orientations Installation of 8086/8088-Mps simulators and Proetus Simulator.	1	2	a2, c2
2.	MOV and ADD assembly instructions illustrating memory addressing modes	1	2	b2, c2
3.	Arithmetic, Shift & Logic Assembly Instructions	2	4	b2, c2
4.	Assembly programming with subroutines (Procedures)	1	4	c2
5.	String assembly instructions	1	2	b2, c2
6.	The 8086/8088-Mps interfacing with LEDs and Switches	1	2	c1, c2, d1
7.	The 8086/8088-Mps interfacing with Keypad and LCD using 8255	2	4	c1, c2, d1
8.	The 8051-Mc interfacing and programming with LEDs and Switches	1	2	c1, c2, d1, d2
9.	The 8051-Mc interfacing and programming with Keypad and LCDs	1	2	c1, c2, d1, d2
10.	Interrupt handling in 8051-Mc while interfacing to I/O devices and Measuring elements	1	2	c1, c2, d1, d2
11.	Review	1	2	a1, a2, b1, b2, c1, c2, d1, d2
12.	Projects presentation	1	2	a1, a2, b1, b2, c1, c2, d1, d2
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

In general, teaching and learning in undergraduate engineering education programs should use a variety of teaching methods, such as:

- Active Lectures (supported with discussions).
- Interactive class discussions
- Projects,
- Case Studies.
- Problem based learning
- Directed self- study
- Laboratory based session (hands on laboratory work)Computer-based Lab Works,
- Group Learning.

VI. Assignments & Reports:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Memory addressing modes and Assembly instructions (Arithmetic & Logic)	a1, a2, b2, c2, d1	3rd & 4th	1
2.	Jump & Loops and mapping of high-level language code to assembly code	a2, c2, , d1	5th	1
3.	Subroutines in assembly	a2, c2, d1	6th and 7th	1
4.	Interfacing 8086/8088-Mps	a1, a2, b1, b2, c1, d1	9th to 11th	2.5
5.	Interfacing 8051-Mc	a1, a2, b1, b2, c1, d1, d2	12th to 14th	2.5
6.	Lab Reports	a1, a2, b1, b2, c1, c2, d1, d2	3rd to 12th	7
Total				**15**

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignments & Reports	3rd to 14th	15	10%	a1, a2, b1, b2, c1, c2, d1, d2
2.	Quizzes	5th, 10th & 14th	10	6.67%	a1, a2, b1, b2, c1, d1
3.	Midterm Exam (Theory)	8th	20	13.33%	a1, a2, b1, b2, c1
4.	Final Lab. Exam (including Course Project Evaluation)	13th & 14th	30	20%	a1, a2, c1, c2, c2, d1, d2
5.	Final Exam (Theory)	16th	75	50%	a1, a2, b1, b2, c1, c2
Total			**150**	**100%**	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. Richard C. Detmer, 2014, Introduction to 80x86 Assembly Language and Computer Architecture, 3rd edition, UK, Jones & Bartlett Learning.
2. M. Mazidi, and J. Mazidi, 2002, the 80x86 IBM PC and Compatible Computers Assembly Language, Design and Interfacing 4th Edition, UK, Prentice Hall
3. M. Mazidi, and J. Mazidi, 2002, the 8051 Microcontroller, Design and Interfacing 4th Edition, UK, Prentice Hall

2- Essential References.

1. John E. Uffenbeck, The 80x86 Family: Design, Programming, and Interfacing.
2. Lyla B Das, 2010, The X86 Microprocessors: Architecture and Programming (8086 to Pentium), 2nd Edition, New Delhi india, Dorling Kindersley

3- Electronic Materials and Web Sites *etc*.

1. http://nptel.iitm.ac.in

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	2. https://ocw.mit.edu/courses. 3. Lectures that may be prepared by the lecturer 4. http://www.sciencedirect.com/ 5. http://dl.acm.org/dl.cfm 6. http://ieeexplore.ieee.org/Xplore/guesthome.jsp 7. http://www.emeraldinsight.com 8. http://www.scopus.com/home.url 9. http://link.springer.com/

IX. Course Policies:

1.	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
2.	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam-
4.	**Assignments & Projects:** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time-
5.	**Cheating:** For cheating in exam, a student will be considered as failure. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty-
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:**

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	- Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Assoc. Prof. Dr. Farouk Al-Fuhaidy**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

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