QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Computer Science Department

Study plan No.	**2021/2022**		**University Specialization**		**Computer Science**	
Course No.	**0112 434**		**Course name**		**Embedded Systems**	
Credit Hours	**3 hours**		**Prerequisite Co-requisite**		Operating Systems	
Course type	☐ **MANDATORY UNIVERSITY REQUIREMENT**	☐ **UNIVERSITY ELECTIVE REQUIREMENTS**	**FACULTY MANDATORY REQUIREMENT**	☑ **Support course family requirements**	☐ **Mandatory requirements**	☐ **Elective requirements**
Teaching style	☐ **Full online learning**		☑ **Blended learning**		**Traditional learning**	
Teaching model	☐ **2 Synchronous: 1asynchronous**		☑ **2 face to face : 1synchronous**		**3 Traditional**	

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Dr. Maher Nabelsi	**Associate professor**	**9332**	**-**	**nabulsi@zuj.edu.jo**	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**
				Blended	**2:1**

Brief description

Embedded systems is concerned with computer architecture, design, organization, operating systems, microcontrollers, and many other materials. This course introduces the following topics: **PC- Design, Organization, and Architecture, Embedded Systems (ES)-Overview and Applications, ES-Architecture Types, ES-Tools and Peripherals, ES-Microcontrollers (8051 and PIC), ES-I/O Programming, ES-Assembly Language, ES-Registers Bank / Stack, ES-Addressing Modes, ES-Timer / Counter, ES-Interrupts.**

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Perry Xiao, "**Designing Embedded Systems and the Internet of Things"**, 1st ed., Wiley, 2018.			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1- Muhammad Ali Mazidi, Janice Gillispie Mazidi, "**The 8051 Microcontroller and Embedded Systems Using Assembly and C",** 2nd ed., 2008. 2- Tim Wilmshurst, "**Designing Embedded Systems with PIC Microcontrollers: Principles and applications**", 1st ed., Newnes, 2007. 3- Steve Heath, '**Embedded Systems Design**", 2nd ed., Newnes, 2003.			
Supporting websites	https://elearning.zuj.edu.jo			
The physical environment for teaching	☑ Class room	☐ labs	☐ Virtual educational platform	☐ Others
Necessary equipment and software	----------			
Supporting people with special needs	----------			

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For technical support	----------

Course learning outcomes (S= *Skills, C= Competences K= Knowledge,)*

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Learning about PC design, organization, and architecture.	**MK3**
K2	Providing knowledge about embedded system's (ES) components, applications, and architecture.	**MK5**
K3	Learning about microcontrollers and I / O programming of ES.	**MK4**
K4	Providing knowledge about registers bank / stack, timer / counter, and interrupts.	**MK5**
	Skills	
S1	Understand digital circuits and execution components. Define the instruction code and I / O Fundamentals. Programming in assembly language I / O operations.	**MS2**
S2	Define the structure and components of ES. Get to know the applications of ES. Understand the differences between architecture types of ES.	**MS2**
S3	Recognize the features and block diagram of 8051 microcontroller. Understand I / O ports, their functions and how to program.	**MS2**
S4	Recognize registers bank in 8051, flags and PSW register. Understand Timer/counter and TMOD register, ISR, and how to program.	**MS2**
	Competences	
C1	The ability to understand the instruction code and I / O Fundamentals.	**MC3**
C2	The ability to define the structure and components of ES.	**MC3**
C3	The ability to understand I / O ports, their functions and how to program.	**MC4**
C4	The ability to understand Timer/counter and how to program.	**MC4**

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
First exam	–	**-**	-	0
Second / midterm exam	%30	**%30**	%30	30%
Participation / practical applications	0	**0**	%20	30%
Asynchronous interactive activities	%30	**%20**	0	0
final exam	%40	**%50**	%50	40%

Note: Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, and work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

Schedule of simultaneous / face-to-face encounters and their topics

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Week	Subject	learning style*	Reference **
1	**PC- Design, Organization, and Architecture** Digital circuits Execution components	Lectures	5-30
2	Storage systems Instruction set completeness I / O operations	Lectures	
3	Stack and subroutines Instruction code I / O Fundamentals	Lectures	
4	Parallel processing and Pipelining **Embedded Systems (ES)-Overview** Applications of ES	Lectures	50-57
5	ES- Real time operating system (RTOS) Basic structure of ES (sensor, CPU, mem., actuator) **ES-Architecture Types**	Lectures	58-65
6	Harvard, Von Neumann architecture CISC and RISC architecture	Lectures	
7	**ES-Tools and Peripherals** Compiler, assembler, I / O devices **ES-Microcontrollers (8051 and PIC)**	Lectures	66-75 76-80
8	Features and block diagram of 8051 microcontroller **ES-I/O Programming** Pin diagram (PDIP) **Midterm exam**	Lectures	85-110
9	I / O ports and their functions **ES-Assembly Language** Instructions and directives	Lectures	111-126
10	Editing, assembling, linking **ES-Registers Bank / Stack** AC, R-registers, DPTR, PC, SP	Lectures	132-156
11	ROM and RAM memory space in 8051 Flags and PSW register Registers bank in 8051	Lectures	
12	Stack and call instructions in 8051 **ES-Addressing Modes**	Lectures	160-166
13	Types of addressing modes **ES-Timer / Counter** Timer / counter and TMOD register	Lectures	167-178
14	Modes of timers and initializing a timer **ES-Interrupts** Interrupts and polling	Lectures	190-205
15	Interrupt service routine (ISR) IE (interrupt enable) register	Lectures	

	Control programs and applications		
16	**Final Exam**		

*** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.**
**** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.**

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	PC-Execution components.	https://elearning.zuj.edu.jo	Understanding
2	Instruction set completeness.	https://elearning.zuj.edu.jo	Understanding
3	I / O Fundamentals	https://elearning.zuj.edu.jo	Understanding
4	Programming in assembly language I / O operations.	https://elearning.zuj.edu.jo	Understanding and developing
5	Get some applications of embedded systems (ES).	https://elearning.zuj.edu.jo	Understanding
6	ES- Real time operating system (RTOS).	https://elearning.zuj.edu.jo	Understanding
7	Basic structure of ES (sensor, CPU, mem., actuator).	https://elearning.zuj.edu.jo	Understanding
8	Features and block diagram of 8051 microcontroller.	https://elearning.zuj.edu.jo	Understanding
9	I / O ports and their functions.	https://elearning.zuj.edu.jo	Understanding
10	Provide the differences between directives and instructions.	https://elearning.zuj.edu.jo	Understanding
11	Programming I / O ports.	https://elearning.zuj.edu.jo	Understanding and developing
12	Programming Timer / counter.	https://elearning.zuj.edu.jo	Understanding and developing
13	Programming some interrupt service routines.	https://elearning.zuj.edu.jo	Understanding and developing
14	Programming an application of ES (cooling conditioner).	https://elearning.zuj.edu.jo	Understanding and developing
15			
16			