Module specification

1. Factual information			
Module title	**TM103: Computer Organization and Architecture**		
Module tutor	Dr. Ahmad Mikati	**Level**	1 (AOU) = 4 (OU)
Module type	Taught	**Credit value/point**	4/15
Mode of delivery	25% face-to-face, 75% self-learning		
Notional learning hours	Lectures, tutorials, and independent learning		

2. Rationale for the module and its links with other modules

This module offers a clear and comprehensive survey about computer organization and architecture. It introduces the inner workings of a modern digital computer through an integrated presentation of fundamental concepts and principles.

3. Aims of the module

This module aims to:

- Emphasize on the concept of computer organization.
- Emphasize on the concept computer architecture.
- Comprehend the different core concepts behind the hardware layer of a computer system.
- Recognize the mathematical concepts of the low-level computer structure (circuits and gates).
- Know the processor's instruction sets architecture and implementation.
- Recognize the memory organization concept and methods.

4. Pre-requisite modules or specified entry requirements

EL111

5. Is the module compensatable?

Not applicable

6. Are there any PSRB requirements regarding the module?

No

7. Intended learning outcomes		
A. Knowledge and understanding	**Programme Learning Outcome(s) this maps against**	**Learning and teaching strategy**
The module provides student with an understanding of: **A1.** Historical developments of computers. **A2.** The Von-Neumann Model. **A3.** Data representation and arithmetic in Computer Systems. **A4.** Boolean Algebra and Digital Logic. **A5.** Assembly language of an intuitive architecture (MARIE). **A6.** Memory organization and addressing modes. **A7.** Cache memory mapping Schemes.	<table><tr><th>ITC</th><th>CS</th><th>N&S</th><th>WD</th><th>CwB</th><th>AI</th></tr><tr><td>A1</td><td>A1</td><td>A2</td><td>A1</td><td>A1</td><td>A2</td></tr><tr><td>A3</td><td>A3</td><td>A5</td><td>A3</td><td>A2</td><td>A5</td></tr><tr><td>A4</td><td>A5</td><td></td><td></td><td>A5</td><td></td></tr><tr><td></td><td>A6</td><td></td><td></td><td>A6</td><td></td></tr></table>	• 25% face-to-face tutorial sessions • Provide challenging TMA to stimulate the students' capabilities. • Encourage independent study by supporting blended learning methodology. • Provide supportive materials and video tutorials on LMS • Feedback on formative assessment

B. Cognitive skills	Programme Learning Outcome(s) this maps against	Learning and teaching strategy
At the end of the module learners will have developed the following cognitive skills: **B1.** Identify the different parts of any computer system and understand their roles. **B2.** Understand the instruction set of any modern computer system. **B3.** Evaluate the performance of modern computer systems. **B4.** Carry out a project in computing and IT that applies and extends student's knowledge and understanding, and critically reflect on the processes involved and the outcomes of student's work.	<table><tr><th>ITC</th><th>CS</th><th>N&S</th><th>WD</th><th>CwB</th><th>AI</th></tr><tr><td>B1</td><td>B1</td><td>B2</td><td>B5</td><td>B1</td><td>B2</td></tr><tr><td>B2</td><td>B3</td><td>B3</td><td></td><td>B2</td><td></td></tr><tr><td>B3</td><td>B6</td><td>B5</td><td></td><td></td><td></td></tr><tr><td>B4</td><td></td><td></td><td></td><td></td><td></td></tr></table>	• 25% face-to-face tutorial sessions • Focus on critical thinking rather than memorization. • Introduce learning activities to cover the required skills and understanding. • Feedback on formative assessment.

C. Practical and professional skills	Programme Learning Outcome(s) this maps against	Learning and teaching strategy
At the end of the module, learners will be able to: **C1.** Have an awareness of the process of designing, writing, and testing MARIE assembly programs. **C2.** Use low level programming skills appropriate to a task. **C3.** Ability to use the MARIE and data path simulator software. **C4.** Demonstrate study skills at a level appropriate to higher education, such as study planning, learning from feedback and reading actively	<table><tr><th>ITC</th><th>CS</th><th>N&S</th><th>WD</th><th>CwB</th><th>AI</th></tr><tr><td>C1</td><td>C1</td><td>C1</td><td>C3</td><td>C1</td><td>C5</td></tr><tr><td>C3</td><td>C2</td><td>C2</td><td>C5</td><td>C3</td><td></td></tr><tr><td>C4</td><td>C4</td><td></td><td>C6</td><td></td><td></td></tr><tr><td></td><td>C5</td><td></td><td></td><td></td><td></td></tr></table>	• 25% face-to-face tutorial sessions • Provide supportive materials and video tutorials on LMS. • Engage in discussions with students through LMS Forums regularly and other electronic forms. • Use available electronic resources to help the students for practical implementation. Feedback on formative assessment.

D Key transferable skills	Programme Learning Outcome(s) this maps against	Learning and teaching strategy
At the end of the module, learners will be able to: **D1.** Interact effectively within a group using electronic conferencing techniques. **D2.** Contribute to discussions on a conference. **D3.** Improve own learning and performance. **D4.** Communicate effectively about testing strategies, design and low-level codes. **D5.** Use electronic media (the web and electronic conferencing) for information retrieval and communication	<table><tr><th>ITC</th><th>CS</th><th>N&S</th><th>WD</th><th>CwB</th><th>AI</th></tr><tr><td>D1</td><td>D1</td><td>D1</td><td>D1</td><td>D1</td><td>D1</td></tr><tr><td>D3</td><td>D2</td><td>D3</td><td>D2</td><td>D5</td><td>D2</td></tr><tr><td>D5</td><td>D4</td><td>D4</td><td>D3</td><td></td><td>D3</td></tr><tr><td>D6</td><td>D5</td><td></td><td>D4</td><td></td><td>D4</td></tr></table>	• Highlight entrepreneurship spaces and opportunities in relation to the field of the module. • Discuss current and future market needs in the field of specialization. • Focus on critical thinking rather than memorization.

8. Indicative content.

CHAPTER 1: Introduction to Computer Organization & Architecture:

- **Overview**
- **Standard Organization**
- **The Computer Level Hierarchy**

CHAPTER 2: Data Representation in Computer Systems:

- **Introduction**
- **Positional Numbering System**
- **Converting between bases**
- **Signed Integer Representation**
- **Floating - Point Representation**
- **A simple model**
- **Floating point arithmetic**

CHAPTER 3: Boolean Algebra and Digital Logic:

- **Introduction**
- **Boolean Algebra**
- **Boolean Expressions**
- **truth table; minterms; Sum of Products**
- **Complements**
- **Representing Boolean Functions**
- **Logic gates**
- **Symbols for logic Gates**
- **Universal Gates**
- **Multiple input gates**
- **Digital Components**
- **Digital Circuits and Their Relationship to Boolean Algebra**
- **Integrated Circuits**
- **Combinational Circuits**
- **Basic Concepts**
- **Examples Of Typical**
- **Sequential Circuits**
- **A K-maps**

CHAPTER 4: MARIE - An Introduction to a Simple Computer:

- **Von Neuman Architecture**

8. Indicative content.

- **Memory Organization and Addressing 4.8- MARIE**
- **The Architecture**
- **Registers and Buses**
- **Instruction Set Architecture**
- **Register Transfer Notation**
- **Instruction Processing**
- **MARIE's I/O**
- **A Simple Program**
- **Discussion**
- **Extended our IS**

CHAPTER 5: A Closer Look at Instruction Set Architectures (short summary):

Addressing Modes

CHAPTER 6: Memory:

- **Introduction**
- **Types of Memory**
- **The Memory Hierarchy**
- **CACHE Memory**
- **Cache Mapping Schemes**

9. Assessment strategy, assessment methods, their relative weightings and mapping to module learning outcomes

Assessment Strategy:

weighting of the assessment components is as follow:

- TMA: 20 %
- MTA: 30 %
- Final Exam: 50 %

To pass this module the following conditions should take place:

- Continuous assessment (TMA + MTA): at least 30%
- Final Exam: at least 40%

In total at least 50% of the overall mark (TMA + MTA + Final).

Assessment Task	Weighting	Week submitted	Grading (Pass / Fail / %)	Module Learning Outcome(s) the assessment task maps to

9. Assessment strategy, assessment methods, their relative weightings and mapping to module learning outcomes				
TMA:	20%	Week 10	Min 15/50	A1, A2, A3, A4, A5, B1, B2, B3, C1, C2, C3, D1, D2, D3, D4, D5
MTA:	30%	Week 7		A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, D3, D4
Exam:	50%	At the end of the semester	Min 20/50	A1, A2, A3, A4, A5, A6, B1, B2, B3, C2, C4, D3, D4

10. Teaching staff associated with the module
Name and contact details
Dr. Ahmad Mikati, amikati@aou.edu.lb

11. Key reading list				
Author	**Year**	**Title**	**Publisher**	**Location**
Linda Null & Julia Lobur	2015	The essentials of computer organization and architecture	Jones and Bartlett Publishers	UK
Smruti Ranjan Sarangi	2015	Computer Organisation and Architecture, First Edition	McGraw-Hill	India

12. Other indicative text (e.g. websites)
https://mdl.arabou.edu.kw/

13. List of amendments since last (re)validation		
Area amended	**Details**	**Date Central Quality informed**
Validation 2021		