Zarqa University
Faculty: Information Technology
Department: Computer Science
Course title: Computer Organization and Architecture (1501231)

Instructor:
Lecture's time:
Semester:
Office Hours:

Course description:
This course includes the organization and architecture of computer systems. Main topics include: computer level hierarchy, Von Neumann model, data representation in computer systems, instruction set architecture, register transfer notation, memory organization and addressing, I/O subsystem, a simple computer architecture (MARIE), instruction formats and types and introduction to cache memory structure.

Aims of the course:

students are expected to:

1. Recognize the concepts and principles of Computer Organization and Architecture.
2. Understand how computing systems are structured. We mainly focus on the processor, cache, memory and system buses. We examine single-cycle and pipelined uniprocessors.
3. Understand the operations of the memory system and its relationship with the processor.
4. Understand the relationship between the processor and input/output devices.
5. Understand the relationship between hardware and software and how they work together.
6. Learn how to write Assembly Language programs and work on Projects.

Intended Learning Outcomes: (ILOs)

Students are expected to:

A. Knowledge and Understanding	
A1	**Concepts and Theories:** • Understand how computing systems are structured. • Mainly focus on the processor, cache, memory and system buses. • Examine single-cycle and pipelined uniprocessors. • Learn to write Assembly Language programs and work on Projects
A2	**Contemporary Trends, Problems and Research:** • Try to learn new micro-processors types and compare with old one.
A3	**Professional Responsibility:** • Abide by laws and regulations of hardware development.

B. Subject-specific skills	
B1	**Problem solving skills:** • Implement a variety of Data Representation in Computer Systems. • Boolean algebra and Digital Logic. • Use different ways in converting to Boolean. • Use types of character representation
B2	**Modeling and Design:** • Use a simple simulator(Marie machine) to understand a simple processor.
B3	**Application of Methods and Tools**:

	• Implement small Marie code to understand a simple assembly language.

C. Critical-Thinking Skills	
C1	**Analytic skills:** • Understand the operations of the memory system and its relationship with the processor • Understand the relationship between the processor and Input/Output devices • Understand the relationship between hardware and software and how they work together.
C2	**Strategic Thinking:** • Learn how to write Assembly Language programs and work on Projects.
C3	**Creative thinking and innovation**: • Use creative thinking and innovation to understand how memory mapping done between main memory and cache memory.

D. General and Transferable Skills (other skills relevant to employability and personal development)	
D1	**Communication:** • Express and communicate ideas in written and oral forms.
D2	**Teamwork and Leadership:** • Be cooperative members of a team
D3	**Organizational and Developmental Skills:** • plan, prioritize, and achieve defined goals
D4	**Ethical and Social Responsibility:** • Understand that they are accountable for their actions and there must be a balance between economic growth and the welfare of the society and environment**.**

Course Structure:

Week	Hours	ILOs	Topics	Teaching Procedure	Assessment methods
1st 2nd	6	A1, B1	**Course Description** **1. Introduction** **1.1 Overview** **1.2 Computer Components** **1.3 An Example System** **1.4 Standards Organizations** **1.5 Historical Development** **1.6 The Computer Level Hierarchy** **1.7 The von Neumann Model** **1.8 Non-von Neumann Models**	**Lecturing with active participation, quizzes, team learning.**	**Homework, quizzes, reports**
3rd 4th 5th	9	A1,B1,C1	**2. Data Representation in Computer Systems** **2.1 Introduction** **2.2 Positional Numbering Systems** **2.3 Decimal to Binary Conversions** **2.4 Signed Integer Representation** **2.5 Floating-Point Representation** **2.6 Character Codes** **2.8 Error Detection and Correction**	=	=

6th 7th 8th	**9**	**B2,B3,C2, D1,D2**	**4. MARIE, An introduction to a Simple Computer** **4.1 Introduction** **4.2 CPU Basics** **4.3 The Bus** **4.4 Clocks** **4.5 The Input / Output Subsystem** **4.6 Memory Organization** **4.7 Interrupts** **4.8 MARIE** **4.9 Instruction Processing** **4.10 A Simple Program** **4.11 A Discussion on Assemblers** **4.12 Extending Our Instruction Set** **4.13 A Discussion on Decoding** **4.14 Real World Architectures**	=	=
9th 10th 11th	**9**	**A1,A2,A3, C1,C2, D1,D2**	**5. A Closer Look at Instruction Set Architectures** **5.1 Introduction** **5.2 Instruction Formats** **5.3 Instruction types** **5.4 Addressing** **5.5 Instruction-Level Pipelining** **5.6 Real-World Examples of ISA**	=	=
12th 13th	**6**	**A1,C1,C2, C3, D1, D2, D3,D4**	**6. Memory** **6.1 Introduction** **6.2 Types of Memory** **6.3 The Memory Hierarchy** **6.4 Cache Memory**	=	=
14th	**3**		**Projects / Revision**		
15th	**3**		**Final exam**		

References:

A. Main Textbook:

1. The Essentials of Computer Organization and Architecture by Linda Null and Julia Lobur 2nd edition 2006

B. Supplementary Textbook(s):

1. William Stallings, "Computer Organization AND Architecture", Prentice Hall, Fifth Edition, 2000.
2. Blaauw, G., and Brooks, F. "Computer Architecture: Concepts and Evolution", Reading, MA: Addison-Wesley, 1997.
3.

Assessment Methods:

Methods	Grade	Date
1st	**20**	
2nd	**20**	
Activities & Participation	**10**	
Final Exam	**50**	