Course Specification

(Postgraduate Programs)

Course Title:	Computer Architecture
Course Code:	CE6000
Program:	Master of Science in Computer Engineering
Department:	Computer and Network Engineering
College:	College of Computing
Institution:	Umm Al-Qura University
Version:	2.0
Last Revision Date:	12/4/2025

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A. General information about the course:

1. Course Identification:

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 1					
4. Course General Description:					
Computer architecture is the science and art of selecting and interconnecting hardware components to create a computer that meets functional, performance and cost goals. This course not only introduces the core concepts of computer architecture but also comprehensively reviews the modern computer architecture trends in various application domains.					
5. Pre-requirements for this course (if any)**:**					
The fundamental knowledgeof the following is needed: • Fundamentals of Digital System Design • Programming in C or Java • Fundamentals of Computer Architecture					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					
This course qualitatively and quantitatively examines uniprocessor computer design trade-offs. We will learn, for example, how uniprocessors execute many instructions concurrently and why state-of-the-art memory systems are nearly as complex as processors.					

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Identify challenges in the design of computer architecture	K1	Lectures, and reading assignments	Written exams, assignments, projects and oral presentations
1.2	Explain fundamentals and advanced concepts of computer architecture deign concepts, terminologies and characteristics	K2		
2.0	**Skills**			
2.1	Design and implement modern computer systems	S1	Lectures, project, discussions, tutorials	Written exams, assignments, projects and oral presentations
2.2	Apply principles of computer architecture to solve complex problems	S2		
2.3	Communicate effectively through a written report embodying the design, implementation, evaluation of computer systems	S3		
2.4	Evaluate the performance of computer systems	S4		

Code	Course Learning Outcomes	Code of PLOs	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	Demonstrate commitment to ethical and professional responsibilities in computer architecture	V1	Lectures, project, discussions, assignments and projects	Group assignments and projects
3.2	Work in a team to implement a project in computer architecture	V2	Group assignments and projects	Group assignments and projects

C. Course Content:

No	List of Topics	Contact Hours
1.	Review of Instruction-set Architecture (MIPS and RISC-V)	4
2.	Review of Datapath and Control (single cycle and multicycle)	4
3.	Fundamentals of Quantitative Design and Analysis	3
4.	Memory Hierarchy Design	3
5.	Instruction-level parallelism	6
6.	Data Level Parallelism in Vector and SIMD Architectures	4
7.	GPU Architectures	4
8.	Multicores and Multiprocessors systems on chip	7
9.	Current Trends in Computer Architecture	10
Total		45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid-Term Exam	9	20
2.	Assessment through assignment	4 and 9	20
3.	Assessment through projects	11	15
4.	Presentation of scientific article	13	15
5.	Final Exam	15	30

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Computer Architecture - A Quantitative Approach, 7th Edition, John L. Hennessy, and David A. Patterson, Christos Kozyrakis, Elsevier Science, 2025, ISBN 9780443154065.
Supportive References	RISC-V Microprocessor System-On-Chip Design by David Harris, James Stine, Sarah Harris, and Rose Thompson, 2025, ISBN: 9780323994989 Computer Architecture: Fundamentals and Principles of Computer Design, Second Edition, Joseph D. Dumas, CRC Press, 2021, ISBN-10: 1032097337, ISBN-13 : 978-1032097336 Readings in Computer Architecture by Mark Hill, Norman Jouppi and and Gurindar Sohi, Morgan Kaufmann Publishers, 2000, ISBN:978-1-55860-539-8 The instructor provides recent research papers in the area of computer architecture for students to present during class
Electronic Materials	The instructor may provide as per requirements.
Other Learning Materials	The instructor may provide as per requirements.

2. Educational and Research Facilities and Equipment Required:

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (Projector, smart board, software)	Projector
Other equipment (Depending on the nature of the specialty)	

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Program Leaders	Indirect
Effectiveness of students' assessment	Program Leaders	Direct
Quality of learning resources	Students, Faculty	Indirect
The extent to which CLOs have been achieved	Students, Faculty, Program Leaders	Direct and Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Computer and Network Engineering Department Council**
REFERENCE NO.	**The 18th Session Of The Academic Year 1446**
DATE	**15/4/2025**