Course Specification
(Bachelor)

Course Title:	Computer Organization and Architecture
Course Code:	231CCS-4
Program:	Bachelor of Science
Department:	Department of Computer Science
College:	College of Computer Science and Information Systems
Institution:	Najran University
Version:	2.0
Last Revision Date:	15 February 2023

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A. General information about the course:

1. Course Identification

1. Credit hours: (4)					
4 (3, 2, 1) [Theory, Lab, Tutorial]					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 4/Year 2)					
4. Course General Description:					
This course introduces the basic structure of computers relating to the computer basic unit organization and design such as interconnection, memory, input/output, operating systems, arithmetic and logic unit, and registers with computer instructions and addressing modes. It also discusses machine instructions, MIPS and programs, performance enhancements, floating-point operations, basic processing units, multiprocessing, pipeline concepts and distributed architectures and the latest technologies in computing.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					

The main objective of this course is to make the students be able to :

- Describe the basic processing units of the computer.
- Recognize the current architecture of computer systems (data representation, performance enhancement, CPU, memory hierarchy design, I/O design).
- Discuss the latest technology in computer science with Modern Architecture.
- Apply conversion formula among different number systems used in digital computers.
- Compare different types of instruction set architectures and addressing modes.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	90	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		90

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Recognize the current architecture of computer systems (data representation, performance enhancement, CPU, memory hierarchy design, I/O design).	K_1	TS-1: Relate Course Learning Outcomes (CLOs) to the topics in each chapter TS-2: Lectures: using PPT presentation to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed. TS-3: Engaging the students in problem-based learning through Tutorials	**Direct:** Mid Exam, & Final Exam **Indirect:** Students' Course CLOs Survey

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			TS-5: Motivating Student: Motivating students to be active during class by asking questions regularly during lectures and giving them assignments to encourage the students to work in home, to search data from the internet and to read related reference books.	
1.2	Describe the basic processing units of the computer.	K_1	TS-1: Relate Course Learning Outcomes (CLOs) to the topics in each chapter TS-2: Lectures: using PPT presentation to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed. TS-4: Lab Demonstrations.	Direct: Locally Developed Exams such as Quiz, Lab Assessments, Mid Exam, Final Lab Exam & Final Exam Indirect: Students' Course CLOs Survey
1.3	Discuss the latest technology in computer science with modern architecture.	K_1, K_3	TS-1: Relate Course Learning Outcomes (CLOs) to the topics in each chapter TS-2: Lectures: using PPT presentation to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed. TS-5: Motivating Student: Motivating students to be active during class by asking questions regularly during lectures and giving them assignments to enforce the students to work in home, search	Direct: Locally Developed Exams such as Quiz, Mid Exam, & Final Exam Indirect: Students' Course CLOs Survey

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			data from internet and to read related reference books TS-6: Recall the topics of last lecture and the critical issues based on different topics.	
2.0	**Skills**			
2.1	Apply conversion formula among different number systems used in digital computers	S4 , S5	TS-1: Relate Course Learning Outcomes (CLOs) to the topics in each chapter TS-2: Lectures: using PPT presentation to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed. TS-3: Engaging the students in problem-based learning through Tutorials.	Direct: Locally Developed Exams such as Quiz, Mid Exam & Final Exam Indirect: Students' Course CLOs Survey
2.2	Compare different types of instruction set architectures and addressing modes	S1, S2	TS-1: Relate Course Learning Outcomes (CLOs) to the topics in each chapter TS-2: Lectures: using PPT presentation to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed. TS-3: Engaging the students in problem-based learning through Tutorials TS-4: Lab	Direct: Locally Developed Exams such as Quiz, Lab Assessments, Mid Exam & Final Exam, Final Lab Exam Indirect: Students' Course CLOs Survey

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			Demonstrations TS-6: Recall the topics of the last lecture and the critical issues based on different topics.	
...				
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Computer Organization and Architecture	6
2.	Number Systems and Data Representation	6
3.	Digital Logic and Circuits Design Basic ALU architecture and components (Combinational circuits, Half adder, full adder), Decoders, Encoders, Flip Flops	12
4.	Assembly Language Basics, Data movement instructions; arithmetic instructions and flags	12
5.	Performance analysis, Amdahl's Law, CPI, MIPS	12
6.	Unsigned and signed Integer representation, integer arithmetic	12
7.	Floating point representation and arithmetic	6
8.	CPU and processing unit and I/O design	12
9.	Memory unit and cache memory	6
10.	Introduction to Pipelining and parallel computation	6
Total		**90**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	3rd week	10%
2.	Assignments or mini project (presentation)	5th week	10%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Midterm	6th week	20%
4.	Lab Performance & Assessment	Every week	10%
5.	Final Lab Exam	11th week	10%
6.	Final Theory Exam	12th or 13th week	40%

*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	1. Kip R. Irvine, Assembly Language for Intel-Based Computers, Prentice Hall; 5th edition 2. John L. Hennessy and David A. Patterson, Computer Architecture- A quantitative approach, Morgan Kaufmann; 6th edition, 2017 3. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw Hill, 5th Edition
Supportive References	1. William Stalling, Computer Organization and Architecture, Pearson, 11th edition, 2019 2. M. Morris Mano, Computer System Architecture, Revised 3rd edition, 2017, Pearsons
Electronic Materials	-
Other Learning Materials	Logisim and Microsoft Assembler (MASM) Software

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	- Smart Boards may be provided to carry out the demonstrations and lectures. - The classroom that has a minimum of 25-30 seats and laboratories that has at least 20 PCs
Technology equipment (projector, smart board, software)	- The laboratory may be equipped with a network so that the students have their privacy (by providing logins) in accessing their files with limited permissions of accessibility. - All the computers in all the laboratories may be installed with the MASM and Logisim software

Items	Resources
Other equipment (depending on the nature of the specialty)	installed in all the systems in the lab. - Printers should be installed in each lab to enable the students to take the printout of their lab work.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Collecting students' suggestions to facilitate more during the class.	Students	Verbal discussion
Student's questionnaire once during the semester about course learning outcomes.	Students	Indirect Survey
Achievement percentage of course learning outcomes, direct evaluation using CLO assessment sheet	Course Instructor	Direct evaluation using CLO achievement calculation
Teaching strategies	Quality unit	Indirect
Assessment methods	Quality unit	Indirect
Instructor performance	Quality unit	Indirect
Course content	Quality unit	Indirect

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Computer Science Departmental Council
REFERENCE NO.	14440203-0185-00002
DATE	1st Sep, 2022