

Title (Units): COMP 1320 Computer Organization (3,3,0)

Course Aims: To introduce the organization of digital computers, the different components and their basic principles and operations.

Prerequisite: Nil

Learning Outcomes (LOs):

Upon successful completion of this course, students should be able to:

No.	Learning Outcomes (LOs)
	Knowledge
1	Describe various data representations and explain how arithmetic and logical operations are performed by computers
2	Describe organization of digital computers and explain the basic principles and operations of different components
3	Evaluate the performance of CPU, memory and I/O operations
	Professional Skill
4	Design a basic computer system using the major components
5	Write low-level programs to perform different basic instructions

Calendar Description: This course introduces the organization of digital computers, the different components and their basic principles and operations.

Assessment:

No.	Assessment Methods	Weighting	Remarks
1	Continuous Assessment	30%	Continuous assessments are designed to measure how well students have learned the fundamentals and major concepts of computer organization and architecture.
2	Examination	70%	Final examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be analysis and skills based to assess students' knowledge on computer components and their basic principles and operations.

Rubrics for Final Examination

	Excellent (A)	Good (B)	Satisfactory (C)	Marginal Pass (D)	Fail (F)
Data representation and manipulation	• Demonstrates thorough knowledge and understanding of data representation • Has a high degree of correctness in basic arithmetic operations	• Demonstrates sufficient knowledge and understanding of data representation • Has a considerable degree of correctness in basic arithmetic operations	• Demonstrates moderate knowledge and understanding of data representation • Has a moderate degree of correctness in basic arithmetic operations	• Demonstrates some knowledge and understanding of data representation • Has some degree of correctness in basic arithmetic operations	• Demonstrates limited knowledge and understanding of data representation • Has a limited degree of correctness in basic arithmetic operations
Digital components	• Demonstrates thorough knowledge and understanding of the basic principles and operations of different	• Demonstrates sufficient knowledge and understanding of the basic principles and operations of different	• Demonstrates moderate knowledge and understanding of the basic principles and operations of different	• Demonstrates some knowledge and understanding of the basic principles and operations of different digital	• Demonstrates limited knowledge and understanding of the basic principles and operations of

	digital components	digital components	digital components	components	different digital components
Organization of digital computers	Demonstrates thorough knowledge and understanding of key concepts of the organization of digital computers	Demonstrates sufficient knowledge and understanding of key concepts of the organization of digital computers	Demonstrates moderate knowledge and understanding of key concepts of the organization of digital computers	Demonstrates some knowledge and understanding of key concepts of the organization of digital computers	Demonstrates limited knowledge and understanding of key concepts of the organization of digital computers
CPU, memory, and I/O	- Demonstrates thorough knowledge and understanding of key concepts of CPU, memory, and I/O - Has a high degree of effectiveness and correctness in evaluating the performance of CPU, memory and I/O operations	- Demonstrates sufficient knowledge and understanding of key concepts of CPU, memory, and I/O - Has a considerable degree of effectiveness and correctness in evaluating the performance of CPU, memory and I/O operations	- Demonstrates moderate knowledge and understanding of key concepts of CPU, memory, and I/O - Has a moderate degree of effectiveness and correctness in evaluating the performance of CPU, memory and I/O operations	- Demonstrates some knowledge and understanding of key concepts of CPU, memory, and I/O - Has some degree of effectiveness and correctness in evaluating the performance of CPU, memory and I/O operations	- Demonstrates limited knowledge and understanding of key concepts of CPU, memory, and I/O - Has a limited degree of effectiveness and correctness in evaluating the performance of CPU, memory and I/O operations

Learning Outcomes and Weighting:

Content	LO No.
Introduction to Computer Organization and Architecture	1-3
Major Components of Computer System	2,3
Data Representation and Operation	1
Basic Computer Organization	3,4
Overview of Programming	5

Textbook: W. Stallings, Computer Organization and Architecture: Designing for Performance, 7th Edition, Prentice Hall, 2006.

References:

W. Stallings, Computer Organization and Architecture: Designing for Performance, 6th Edition, Prentice Hall, 2003.
W. Stallings, Computer Organization and Architecture: Designing for Performance, 5th Edition, Prentice Hall, 2000.
L.L.Wear, Computer: An Introduction to Hardware and Software Design, McGraw Hill International Edition, 1991.
M.M. Mano, Computer System Architecture, 3rd Edition, Prentice Hall, 1993.
C. Hamacher, Z. Vranesic and S. Zaky, Computer Organization, 5th Edition, Mc Graw Hill, 2002

Course Content in Outline:

Topic

- I. Data Representation and Manipulation
 - A. Numeric data representation
 - B. Non-numeric data representation
 - C. Basic arithmetic operations
- II. Digital Component
 - A. Arithmetic and logic unit
 - B. Decoders
 - C. Multiplexers
 - D. Registers
 - E. Memory unit
 - F. Digital logic circuits
- III. Data Transfer and Microoperations
 - A. Bus system
 - B. CPU-memory transfer
 - C. I/O transfer
 - D. Microoperations
- IV. Basic Computer Organization
 - A. Stored program organization
 - B. Timing and control
 - C. Instruction cycle
 - D. Chip organization
 - E. I/O and interrupt
- V. Overview of Programming
 - A. Machine languages
 - B. Assembly languages
 - C. Assemblers
 - D. Compilers
 - E. Interpreters
- VI. Central Processing Unit
 - A. General register organization
 - B. Stack organization
 - C. Instruction format
 - D. Addressing modes
 - E. Program control
 - F. Characteristics and functions of instruction set
- VII. Memory Organization
 - A. Memory hierarchy
 - B. Main memory
 - C. Auxiliary memory
 - D. Associative memory
 - E. Cache memory
- VIII. Input/Output Organization
 - A. Peripheral devices
 - B. I/O modules
 - C. Priority interrupt
 - D. Direct memory access
 - E. I/O channels and processors