10B22CI421: Computer Organization

Course Credit: 4
Semester: IV

Introduction

All students of computing should acquire understanding and appreciation of a computer system's functional components, their characteristics, their performance, and their interactions. Students need to understand computer architecture in order to structure a program so that it runs more efficiently on a real machine. The course provides an overview of computer organization and architecture and teaches students the operation of a typical computing machine. It covers the basic principles, while acknowledging the complexity of existing commercial systems.
The format of the course will be lecture-discussions, assignments. Students are strongly encouraged to participate actively in class discussions.

Course Objectives (Post-conditions)
Knowledge objectives:

1) To become familiar in following Topics:
    a. How a Computer System works & its basic principles
    b. How to analyze the system performance?
    c. Concepts behind pipelining techniques.
    d. The current state of art in memory system design
    e. How I/O devices are being accessed and its principles.
2) To provide an idea of Instruction Level Parallelism

Application objectives:

- To apply the knowledge of performance metrics to find the performance of systems.
- To create an assembly language program to program a microprocessor system.
- To design a hardware component for an embedded system.
- To deal with different types of computers.
- To identify high performance architecture design.
- To develop independent learning skills and be able to learn more about different computer architectures and hardware.
- To learn & use the new technologies in computers.

Expected Student Background (Preconditions)
Students must have good understanding of the following courses from their previous classes: Introduction to Computers and C Programming Language, Microprocessor and Controllers

Topics Outline:

S NO	Topics	Hrs
1	INTRODUCTION: Levels in architecture, Virtual machine, Evolution of multi-level machines.	01
2	PERFORMANCE MEASURES FOR COMPUTER SYSTEM	03

3	CPU ORGANIZATION: Data-path and control, Instruction execution, Microinstruction, Hardwired and micro-programmed control, ISA: Instruction Set Architecture, Stack/accumulator/register-register/register-memory type of architecture, Memory addressing, Types of instruction, Data movement, Arithmetic/logic, Control flow, Addressing modes, Instruction format, MIPS and 8085 architecture.	14
4	ASSEMBLY LANGUAGE PROGRAMMING: Assembler, Case study of 8086 and Assembly language programming.	08
5	MEMORY ORGANIZATION: Hierarchal memory structure, Cache memory and organization, concept of virtual memory.	07
6	I/O ORGANIZATION: Programmed/Interrupt driven I/O, Direct memory access, Interfacing and programming of 8255 with a microprocessor.	07
7	INTRODUCTION TO PIPELINING	02
	Total	42

References

1. M. Morris Mano, Computer System Architecture
2. William Stallings, Computer Organization and Architecture–Designing for Performance, Ninth Edition, Pearson Education
3. John L. Hennessy and David A Patterson, Computer Architecture A quantitative Approach, Morgan Kaufmann / Elsevier, Fourth Edition.
4. Andrew S. Tanenbaum, Structured Computer Organization, PHI, Fifth Edition.
5. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware / software interface, Second Edition, Morgan Kaufmann.
6. John P.Hayes, Computer Architecture and Organization, Third Edition, McGraw-Hill.
7. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, Fifth Edition, McGraw-Hill.

Evaluation Scheme:

S.No	Examination	Marks
1	T-1	15
2	T-2	25
3	T-3	35
4	*Internal Marks	25

*Internal Marks Breakdown:

Assignments 9 marks (3x3)

Quizzes 12 marks (3x4)

Regularity 4 Marks