10B11CI613: Computer Organization and Architecture

Course Credit: 4
Semester: VI

Introduction

All students of computing should acquire some 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 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:

At the conclusion of the course, following learning objectives are expected to be achieved:

1. You will broaden your knowledge of contemporary computer architectures.
2. You will become aware of the contemporary computer organization.
3. You will increase your proficiency in performance evaluation of processors.
4. You will know how to design computer memory chips efficiently.
5. You will know the design principles of contemporary computers.
6. You will acquire the background for understanding next-generation CPUs.
7. You will learn about Parallel Organizations –Parallel Processing and Multi Core Computers
8. You will learn how to design the pipeline for uniprocessor and multiprocessor systems.
9. You will learn concepts associated with distributed, grid and cluster computing
10. You will learn data centre architecture and case study of supercomputers.

Application objectives:
The homework portions of the course are intended to help you apply your understanding,

1. to design memory system of contemporary computers.
2. to understand and be able to explain bus transactions, memory organization and address decoding, basic I/O interfaces and port addressing.
3. to understand how to write micro programmed control sequence for processors.
4. to understand the design principles for distributed computing.
5. to lay a foundation for pursuing some additional career options in computer manufacturing organizations.

Expected Student Background (Preconditions)

Students are expected to have a solid grasp of the fundamentals of computer system, including a basic understanding of the operation of the computer, especially CPU. In addition, students are expected to know application development environment and programming concepts. Assembly programming ability will be helpful, as we will be looking to understand architecture of contemporary computers.

Topics Outline:

S NO	Topics	Hrs
1	Introduction- Organization & Architecture, Structure & Function	1
2	Computer Evolution & Performance	3
3	A Top Level View of Computer Function and Interconnection	3
4	Cache Memory	5
5	Internal Memory Technology	3
6	External Memory	3
7	Input/Output	3
8	Computer Arithmetic	4
9	Processor Structure and Function	4
10	Instruction Level Parallelism and Superscalar Processors	4
11	Control Unit Operation & Micro programmed Control	5
12	Parallel Processing & Multi Core Computers	4
	Total	42

References

1. Computer Organization & Architecture - Designing for Performance by **William Stallings,** Eighth Edition, Pearson, 2010
2. Computer Architecture: A Quantitative Approach by John L. Hennessy and David A. Patterson, Fourth Edition, Morgan Kaufmann Publishers
3. Computer System Architecture by M. Morris Mano, Third Edition, Pearson Education Inc
4. The Datacenter as a Computer – An Introduction to the Design of Warehouse Scale Machines by Luiz Andre Barroso and Urs Holzle; Morgan and Claypool Publishers

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