INSTRUCTION DIVISION
First Semester 2025 - 2026
COURSE HANDOUT (PART II)

Date: 28-07-2025

In addition to Part I (General Handout for all courses appended to the timetable) this handout gives further details regarding the course.

Course No   : **CS F342**
Course Title   : **Computer Architecture**
Instructor-in-charge : **Dr Rajib Ranjan Maiti**
Co-Instructors   : Dr. Aritra Mukherjee and Dr. Nikumani Choudhury

1. Scope and Objective of the Course:
The scope of this course is to cover various aspects of Computer Architecture, which is a specification detailing how a set of software and hardware technology standards interact to form a computer system or platform. Performance issues with respect to computer system design and the compatible technologies would be discussed.

The main objective of this course is to give the students exposure to

- Processor performance criteria, performance benchmarks
- CPU design - instruction set architecture, instruction execution
- Single and Multicycle implementation, ILP, Pipeline design, Hazards
- Methods of overcoming hazards, Branch prediction
- Memory subsystems including cache optimization

2. Text Book:
T1. Patterson, D.A. & J.L. Hennessy, Computer Organization and Design: MIPS Edition, Elsevier, 5th edition., 2013.

3. Reference Books:
(i) Hamacher et. al, Computer Organisation, McGraw Hill, 5th ed., 2002.

(ii) J.L. Hennessy & D.A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kauffmann, 5th Ed, 2012.

(iii) W. Stallings, Computer Organisation & Architecture, PHI, 6th ed., 2004.

(iv) Patterson, D.A. & J.L. Hennessy, Computer Organization and Design: MIPS Edition, Elsevier, 6th edition., 2021.

4. Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Chapter No.

1 - 2	To understand about the overview of classes of computers	Computer Abstractions and Technology	Ch. 1
3 - 4	To learn about instructions; ISA as well as know about sample ISAs like MIPS	Instructions- language of the computer	Ch.2
5-7		MIPS Architecture & Instruction Set	Ch. 2
8			
9 - 11	To practice arithmetic operations on integers; floating point numbers etc	Arithmetic for computers: floating point arithmetic	Ch 3
12 -13	To understand the basics of processor; learn about data path, control path	Processors: logic design conventions	Ch 4
14 - 15		Role of Performance, pipelining – design issues	Ch 4
16 - 17		Pipelined data path and control	Ch 4
18		Various types of hazards	Ch 4
19		Structural hazards	Ch 4
20 - 21		Data Hazards	Ch 4
22 - 23		Control Hazards	Ch 4
24		Branch prediction techniques	Ch 4
25		Static Branch Prediction	Ch 4
26		Dynamic Branch Prediction	Ch 4
27	To know about the organization of memory hierarchy and learn various optimization techniques at each level	Exploiting memory hierarchy - introduction	Ch 5
28		Cache Memory Organization	Ch 5
29-32		Measuring and improving cache performance, cache optimization	Ch 5
33 - 34		Main Memory and Interleaving	Ch 5
35		Virtual Memory and Virtual Machines	Ch 5
36-38		Performance and memory hierarchies: Cache coherence	Ch 5
39	To understand about storage systems and performance	Storage and other I/O topics	T1 Ch5; R(ii)
40		Dependability, reliability, availability	T1 Ch5; R(ii)
41 - 42		I/O performance measures, Redundant Array of Independent Disks	T1 Ch5; R(ii)

5. Evaluation Scheme:

EC No.	Evaluation Component	Duration (Min)	Weightage (%)	Date & Time	Nature of Component
1	Mid Sem Test	90	30 %	8/10/2025	Closed Book
2	Quiz	20	10%	In-Class (tutorial)	Open Book
3	Lab tests	60	20%	In-Lab	Open Book
4	Comprehensive	180	40 %	06/12/2025	Closed Book

Note: At least *40% of the evaluation to be completed by midsem grading.*

6. Chamber Consultation Hour: To be announced in the class

7. Notices: Notices regarding the course will be put up on the CSIS notice board and in CMS.

8. **Makeup Policy:** No makeup exam allowed without prior permission.

9**. Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and any type of academic dishonesty is not acceptable.

INSTRUCTOR-IN-CHARGE
CS F342