NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. (CSE), Integrated B.Tech.(CSE)-MBA
Course Code:	3CS401ME24
Course Title:	Advanced Computer Architecture
Course Type:	Department Elective–I
Year of Introduction:	2024-25

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Course Learning Outcomes (CLO):

At the end of the course, students will be able to

1. demonstrate an understanding of the fundamental design concepts in computer architecture (BL2)
2. apply the knowledge of computer organization to quantitatively evaluate the performance of a computer architecture (BL3)
3. explain the state-of-the-art computer architectures (BL5)
4. design a prototype of an existing computer architecture module (BL6)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	**Processor Design Concepts:** Review of Basic Computer Organization, Performance Evaluation Techniques, Instruction Pipelining and Performance, RISC Pipeline	05
Unit-II	**Instruction Pipelining:** ILP, Pipeline and Control Hazards, Branch Prediction, Pipeline Hazard Analysis, MIPS Pipeline for multi-cycle operations, Pipeline Scheduling, Static and Dynamic Scheduling	10
Unit-III	**Superscalar Processing:** Advanced Pipelining, Superscalar Processors, Vector and GPU Architectures, Core Optimization	08
Unit-IV	**Cache Memory:** Introduction, Writing/Replacement Strategies, Design Techniques, Cache Optimization	08
Unit-V	**Primary and Secondary Storage Systems:** Introduction to DRAM and SRAM, DRAM Controllers and Address Mapping, Design Concepts of DRAM, Secondary Storage Systems	06
Unit-VI	**Tiled Chip Multicore Processors:** Introduction, Routing Techniques in Network on Chip, Router Microarchitecture, TCMP and NoC Design Principles	08

Self-Study: The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents

Suggested Readings/ References:	1. John L. Hennessy and David A. Patterson, "Computer Architecture: A Quantitative Approach", Morgan Kaufmann Publishers 2. Kai Hwang and F. A. Briggs, "Computer architecture and parallel processor", McGraw Hill. 3. Hesham El-Rewini, Mostafa Abd-El-Barr, "Advanced Computer Architecture and Parallel Processing", Wiley. 4. William Stallings, "Computer Organization and Architecture", Prentice Hall. 5. Andrew S. Tanenbaum, "Structured Computer Organization", Prentice Hall. 6. Patterson, J. L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann Publication.
Suggested List of Experiments:	-NA-
Suggested Case List:	-NA-