21CSE27	ADVANCED COMPUTER ARCHITECTURE	L	T	P	C
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Course Objectives

- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
- To learn the different multiprocessor issues.
- To expose the different types of multicore architectures.
- To understand the design of the memory hierarchy.

UNIT I	FUNDAMENTALS OF COMPUTER DESIGN AND ILP	9 Hours

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges –Exposing ILP - Advanced Branch Prediction - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP - Instruction Delivery and Speculation - Limitations of ILP - Multithreading

UNIT II	MEMORY HIERARCHY DESIGN	9 Hours

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

UNIT III	MULTIPROCESSOR ISSUES	9 Hours

Introduction- Centralized, Symmetric and Distributed Shared Memory Architectures –Cache Coherence Issues – Performance Issues – Synchronization – Models of Memory Consistency – Case Study-Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks

UNIT IV	MULTICORE ARCHITECTURES	9 Hours

Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-scale computers Architectures- Physical Infrastructure and Costs- Cloud Computing –Case Study- Google Warehouse-Scale Computer.

UNIT V	VECTOR, SIMD AND GPU ARCHITECTURES	9 Hours

Introduction-Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism-Case Studies.

UNIT VI	LATEST TRENDS	

Latest Trends

	TOTAL PERIODS: 45

Course Outcomes:

- Identify the limitations of ILP.
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit

parallelism.
- Discuss the various techniques used for optimising the cache performance
- Design hierarchal memory system
- Point out how data level parallelism is exploited in architectures

Text books:

1. John L. Hennessey and David A. Patterson, ―Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier, 5th edition, 2012.
2. Darryl Gove, ―Multicore Application Programming: For Windows, Linux, and Oracle Solaris, Pearson, 2011.

Reference Books:

1. David B. Kirk, Wen-mei W. Hwu, ―Programming Massively Parallel Processors, Morgan Kauffman, 2010.
2. David E. Culler, Jaswinder Pal Singh, ―Parallel Computing Architecture : A hardware/software approach , Morgan Kaufmann /Elsevier Publishers, 1999.
3. Kai Hwang and Zhi.Wei Xu, ―Scalable Parallel Computing, Tata McGraw Hill, NewDelhi, 2003.

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Course Objective:

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LIST OF EXPERIMENTS	**30 Periods**

Course Outcomes:

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