

CP5152 ADVANCED COMPUTER ARCHITECTURE

DETAILED SYLLABUS

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

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

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

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

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

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

REFERENCES:

1. Darryl Gove, —Multicore Application Programming: For Windows, Linux, and Oracle Solarisll, Pearson, 2011
2. David B. Kirk, Wen-mei W. Hwu, —Programming Massively Parallel Processorsll, Morgan Kaufman, 2010
3. David E. Culler, Jaswinder Pal Singh, —Parallel computing architecture: A hardware/software approachll, Morgan Kaufmann /Elsevier Publishers, 1999
4. John L. Hennessey and David A. Patterson, —Computer Architecture – A Quantitative Approachll, Morgan Kaufmann / Elsevier, 5th edition, 2012.
5. Kai Hwang and Zhi.Wei Xu, —Scalable Parallel Computingll, Tata McGraw Hill, NewDelhi, 2003