II Year II Semester

Code:20CS4613

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ADVANCED COMPUTER ARCHITECTURE (Honors)

Course Objectives:

The course objectives of Advanced Computer Architecture are to discuss and make student familiar with the

- 1. Understand the Concept of Pipeline and vector processing
- 2. Discuss pipelining and superscalar techniques
- 3. Understand the performance of different memories of Computers.
- 4. Introduce the advanced processor architectures.
- 5. Study about scalability and data flow computer architectures.

Course Outcomes:

By the end of the course, the student will:

- 1. Demonstrate concepts the Concept of Pipeline and vector processing.
- 2. Discuss Pipelining and Superscalar Techniques.
- 3. Interpret the performance of different memory techniques like Bus Cache and Shared memory.
- 4. Gain knowledge of Parallel and Scalable Architectures.
- 5. Explain Multithreaded and Dataflow Architectures for scalability.

UNIT I

Pipeline and Vector Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing, array processors.

UNIT II

Pipelining and Superscalar Techniques: Linear Pipeline Processors, Asynchronous and Synchronous models, Clocking and Timing Control, Speedup, Efficiency and Throughput, Pipeline Schedule Optimization.

Instruction Pipeline Design: Instruction, Execution Phases, Mechanisms for Instruction Pipelining, Dynamic Instruction Scheduling, Branch Handling Techniques.

UNIT III

Bus Cache and Shared memory: Introduction, Backplane bus systems, Cache Memory organizations, Shared- Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, super scalar pipeline design.

UNIT IV

Parallel and Scalable Architectures: Introduction, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputer, Message-passing Mechanisms, Vector Processing Principals, Multi-vector Multiprocessors, Compound Vector processing.

UNIT V

Scalable: Introduction, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputer, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

Text Books:

- 1. Computer System Architecture, Morris M. Mano, 3rd edition, Pearson/Prentice Hall India.
- 2. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

Reference Books:

- 1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
- 2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor & Francis.
- 3. Computer Organization and Architecture, William Stallings ,8th edition, PHI
- 4. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
- 5. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
- 6. Computer Architecture, B. Parhami, Oxford Univ. Press.