(CS607) ADVANCED COMPUTER ARCHITECTURE

Objective of the Course :

The course focuses on processor design, pipelining, superscalar, out-of-order execution, caches (memory hierarchies), virtual memory, storage systems, and simulation techniques. Advanced topics include a survey of parallel architectures and future directions in computer architecture

UNIT - I

Introduction to Computer Architecture : Types of computers, REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS : Register Transfer language. RegisterTransfer Bus and memory transfers, rithmetic Mircro operatiaons, logic micro operations, shift microoperations, Arithmetic logic shift unit. Instruction codes. STACK organization. Instruction formats.Addressing modes.

UNIT - II

Control Unit and Memory Management : Control memory, Address sequencing, microprogram example, design of control unit : Hard wired control & Microprogrammed control unit.

The Memory System : Basic concepts semiconductor RAM memories. Read-only memories Cache memories performance considerations, Virtual memories.

UNIT - III

Instruction Level Parallel Processors : Introduction to Parallel Processing : Basic Concepts, Types and Levels of Parallism, Classification of Parallel Architecture, Basis Parallel Techniques.

Instroduction to IPL-processors: evolution and overview of ILP-processors, dependencies between instructions. Instruction scheduling, preserving sequentional consistency.

Pipelined processors: Basic concepts, Design space of pipelines, Overview of pipelined instruction processing, pipelined execution of integer and Boolean instructions.

UNIT - IV

Processing of Control Transfer Instructions : introduction , types of branches , how architectures check the results of operations , the branch problems ,performance measures of branch processing , basic approaches to branch handling , delayed branching , branch processing

Introduction to data-parallel architectures : introduction, connectivity, alternative architectural classes.

SIMD architectures : introduction , design space

UNIT - V

Thread and process-level parallel architectures : Introduction to MIMD architectures , multi-threaded architectures , introduction , computational models.

Distributed memory MIMD Architectures : Introduction , direct interconnection networks.

Shared Memory MIMD Architectures : Introduction , dynamic interconnection networks , cache coherence

TEXT BOOKS :

- 1. M.Moris Mano, "Computer Systems Architecture" 3rd ed., Pearson/PHI, 2010.
- 2. Dezso sima, Terence Fountain, Peter Kacsuk, "Advanced computer architectures", 1st ed., Pearson, 1997.

REFERENCES BOOKS :

- John L. Hennessy & David A.Patterson Morgan Kufmann, "Computer Architecture A quantitative approach" 4th ed., Pearson, 2006.
- 2. Andrew S. Tanenbaum, "Structured Computer Organization" 4th ed., PHI/Pearson, 2008.