III Year I Semester	L	T	P	C
Code: 20AI5655	3	0	0	3

HIGH PERFORMANCE COMPUTING (Honors)

Course Objectives:

After completion of this course, students able to

1. Understand the high-performance computing techniques
2. Understand the pipelining techniques in performance of the computing.
3. Understand the memory management techniques.
4. Understand the parallelism techniques
5. Understand the multiprocessor architectures

Course Outcomes:

Upon completion of the course, graduates will be able to

1. Inferring the high-performance computing techniques
2. Interpreting the pipelining techniques in performance of the computing
3. Annotating the memory management techniques
4. Inferring the parallelism techniques
5. Distinguish the multiprocessor architectures

UNIT-I

Introduction: Review of basic computer architecture, quantitative techniques in computer design, measuring and reporting performance. CISC and RISC processors.

UNIT-II

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques. Compiler techniques for improving performance.

UNIT-III

Hierarchical memory technology: Introduction, Coherence and locality of reference properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

UNIT-IV

Instruction-level parallelism: Basic concepts, techniques for increasing ILP, superscalar, super-pipelined and VLIW processor architectures. Array and vector processors.

UNIT-V

Multiprocessor architecture: Taxonomy of parallel architectures. Centralized shared-memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture.

Text Book:

1. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.

Reference Books:

1. John Paul Shen and Mikko H. Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, TataMcGraw-Hill
2. M. J. Flynn, Computer Architecture: Pipelined and Parallel Processor Design, Narosa Publishing House.
3. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.