

TCS2039 HIGH PERFORMANCE COMPUTER ARCHITECTURE

Module 1:

Parallel Computer Models : The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks.

Module 2:

Program and Network Properties : Conditions for Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architectures.

Module 3:

Principles of Scalable Performance: Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches.

Module 4:

Processors and Memory Hierarchy: Advanced Processor Technology, Super Scaler and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

Bus, Cache, and Shared Memory: Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models, Weak Consistency Models

Module 5:

Pipelining and Superscalar Techniques: Linear Pipeline Processors, Non Linear Pipeline Processor, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar Pipeline Design

Multiprocessors and Multicomputers: Multiprocessor System Interconnects, Cache Coherence Synchronization Mechanism, Three Generations of Multicomputers, Message-Passing Mechanisms.

Module 6:

Multivector and SIMD Computers: Vector Processing Principles, Multivector Multiprocessor, Compound Vector Processing, SIMD Computer Organizations, The Connection Machine CM-5

Scalable, Multithreaded and Data Flow Architecture: Latency-Hiding Techniques, Principle of Multithreading, Fine-Grain Multicomputers, Scalable and Multithreaded Architectures, Data Flow and Hybrid Architectures.

Module 7:

Parallel Models, Languages, and Compilers: Parallel Programming Models, Parallel languages and Compilers, Dependence Analysis of Data Arrays, Code Optimization and Scheduling, Loop Parallelization and Pipelining, Parallel Programming Environments, Shared-Variable Program Structures, Message-Passing Program Development, Mapping Programs onto Multicomputers, Instruction Level Parallelism.

Text Book:

Hwang K., Jotwani N., Advanced Computer Architecture, 2nd Edition, Tata McGrawhill, India, 2010

Reference Book:

Stone, H. S., High Performance Computer Architecture, 3rd Edition, Addison Wesley Publishing Company, USA.