

ADVANCE COMPUTER ARCHITECTURE (TCS - 702)

Unit 1

Parallel computer models: The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers.

Program and network properties: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms

Unit 2

System Interconnect Architectures: Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

Advanced processors: Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

Unit 3

Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design

Memory Hierarchy Design: Cache basics & cache performance, reducing miss rate and miss penalty, multilevel cache hierarchies, main memory organizations, design of memory hierarchies. Memory consistency models: SC, PC,WO/WC, RC;

Unit 4

Multiprocessor architectures: Symmetric shared memory architectures, distributed shared memory architectures, cache coherence protocols (MSI, MESI, MOESI), scalable cache coherence, overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, synchronization. Introduction of OpenMP and MPI, threads, mutex etc.

Unit 5

Introduction to multi-core architectures, multiprocessor Chip architecture case studies: Intel core 2 duo, Core i3, Core i5

Text Books:

1. Kai Hwang, “Advanced computer architecture”; TMH. 2000
2. D. A. Patterson and J. L. Hennessey, “Computer organization and design”, Morgan Kaufmann, 2nd Ed. 2002
3. www.intel.com

Reference Books:

1. J.P. Hayes, “computer Architecture and organization”; MGH. 1998.
2. V. Rajaranam & C.S.R. Murthy, “Parallel computer-Theory and practices”; PHI. 2002.
3. J. Quin, “Parallel Computing”, TMH
4. R.K. Ghose, Rajan Moona & Phalguni Gupta, “Foundation of Parallel Processing”, Narosa Publications, 2003
5. Kai Hwang and Zu, “Scalable Parallel Computers Architecture”, MGH. 2001
6. Stalling W, “Computer Organization & Architecture”, PHI. 2000
7. D.A. Patterson, J.L. Hennessey, “Computer Architecture :A quantitative approach”; Morgan Kauffmann, 2002.