

M.Tech(IT) : First Semester
Paper Code : MT12
Paper Name : Advanced Computer Architecture

Syllabus

1. Processor Organization: General structure of CPU-registers, stacks, ALU and control units, Instruction types, formats, sets and addressing modes. Basic mathematical operations- fixed-point addition, subtraction, multiplication and division. Implementation of fixed-point operations and ALU design. F. P. operations & their implementation H. W. fast addition, multiplication and division. Principles of array and pipelined processors.

2. Design of Controller: Principles of instruction decoding and implementation. Hard-wired and micro instruction based control units. Horizontal & vertical classes of micro instructions. Nano-program control. Identifying micro instructions, minimizing micro instruction size, parallelism in micro instructions, encoding control instructions, timing cycles and clock generations. Organization of Micro-program based control unit. Concepts of RISC & comparison with CISC processors.

3. Memory Organization: Main memory, memory hierarchy, memory references, address mapping, relocation mechanism, concepts of memory compaction, principles of virtual memory, segmentation and paging. Cache memories, Cache memory working principles, Cache coherence issues, cache performance analysis, High bandwidth memories. Interleaved memories and principles of address interleaving. Associative memories- word organized associative memory, masking. Hardware protection features in multi-programmed systems.

4. System Organisation: Communication: Introduction, Bus control, Computer Networks Input-Output systems: Programmed I/O, DMA, Interrupt control, I/O processors. Operating Systems: Introduction, concurrency control, system management. Parallel Processing: Introduction types of parallel processors, performance considerations, pipelined, vector and multiprocessor systems.

5. Parallel Computer Models:- Classification of machines, SISD,SIMD, MISD,MIMD, condition of parallelism, data and resource dependencies, grain size latency, program flow mechanism, control flow versus data flow, data flow architecture, demand driven mechanisms.

6. Vector Processor and Synchronous Parallel Processing:- Vector instruction types, vector-access memory schemes, vector and symbolic processors, SIMD architecture and programming principles, SIMD parallel algorithms

Reference Books:-

1. Michael J. Flynn, "Computer Architecture : Pipelined and Parallel Processor Design", Jones and Barlett, Boston
2. Kai Hwang, "Advanced computer Architecture", TMH
3. M. Mano, "Computer System Architecture", Pearson Education.