Computer Architecture – MCA Syllabus

Unit	Course Topics	Hours
1	**Introduction to Computer Architecture:** Basic organization of a computer, functional units, instruction execution cycle, types of architectures (SISD, SIMD, MISD, MIMD), performance metrics (MIPS, MFLOPS), Amdahl's Law	4L
2	**Data Representation & Arithmetic:** Number systems, integer and floating-point representation (IEEE-754), fixed-point arithmetic, addition & subtraction, multiplication algorithms, Booth's algorithm, division methods	6L
3	**Processor & Control Unit:** CPU architecture, instruction formats, addressing modes, instruction cycle, micro-operations, hardwired vs microprogrammed control unit, control memory	6L
4	**Memory Organization:** Memory hierarchy, cache memory (mapping techniques, replacement policies), main memory organization, virtual memory, paging and segmentation, TLB	6L
5	**I/O Organization:** I/O mapped I/O, memory-mapped I/O, interrupts, DMA (Direct Memory Access), I/O processors, buses and bus arbitration	5L
6	**Pipelining & Parallel Processing:** Instruction pipelining, pipeline hazards (data, control, structural), pipeline performance, RISC vs CISC, superscalar architecture, multiprocessors, multithreading	4L
7	**Advanced Architectures:** GPU architecture basics, multi-core processors, cluster computing, cloud hardware architecture, modern CPU trends (ARM, RISC-V), energy-efficient processors	4L