Computer Organization & Architecture

Module 1: Functional blocks of a computer
CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction set of 8085 processor.
Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-andadd, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Module 2: Introduction to x86 architecture.
CPU control unit design: Hardwired and micro-programmed design approaches,
Case study – design of a simple hypothetical CPU.
Memory system design: semiconductor memory technologies, memory organization.
Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes –role of interrupts in process state transitions, I/O device interfaces – SCII, USB.

Module 3: Pipelining
Basic concepts of pipelining, throughput and speedup, pipeline hazards.
Parallel Processors: Introduction to parallelprocessors, Concurrent access to memory and cache coherency.

Module 4: Memory Organization
Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.