Course Code: BTES401-18

Course Title: Computer Organization & Architecture

Pre-requisites: Digital Electronics

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.

List of Experiments

Task 1: Computer Anatomy- Memory, Ports, Motherboard and add-on cards.

Task 2: Dismantling and assembling PC.

Task 3: Introduction to 8085 kit.

Task 4: 2. Addition of two 8 bit numbers, sum 8 bit.

Task 5: Subtraction of two 8 bit numbers. **Task 6:** Find 1's complement of 8-bit number.
Task 7: Find 2's complement of 8-bit number. **Task 8:** Shift an 8-bit no. by one bit.

Task 9: Find Largest of two 8 bit numbers.

Task 10: Find Largest among an array of ten numbers (8 bit).

Task 11: Sum of series of 8 bit numbers.

Task 12: Introduction to 8086 kit.

Task 13: Addition and subtraction of two 16 bit numbers, sum 16 bit.

Task 14: Implement of Booth's algorithm for arithmetic operations.

Task 15: Find 1's and 2's complement of 16-bit number.

Task 16: Implement simple programs using I/O based interface.