

## **MTIT C 103: Advanced Computer Architecture**

### **Unit I**

Introduction to computer architecture. Software-hardware interface. Performance metrics. Performance measurement, Benchmark programs. Micro-operations, Computer Instruction, Timing and control, Instruction Cycle, Instruction Types and formats, Micro-programmed and hardware control unit, Addressing Modes, Program Control, **Outline the principles of instruction set design and demonstrate the use of Armv8-A Instruction Set Architecture.**

### **Unit II**

Auxiliary memory, Main memory, Memory Address Map, Associative memory, Cache memory, Virtual Memory. Computer Arithmetic: Floating point representation. Addition, Subtraction. Multiplication and Division, **Cortex-A9 Processor as case study, Identify how the MMU and TLBs work in the Cortex-A9 processor.**

### **Unit III**

Pipelining, Instruction and arithmetic pipelining, Structural Hazards, Control Hazards, Data Hazards: Forwarding versus Stalling. Vector processing. I/O interfaces, Asynchronous Data Transfer, Priority Interrupt, I/O Processor, **Pipeline in the Arm10 processor.**

### **Unit IV**

Multiprocessor Organization, types, Symmetric Multi-Processors, Cache Coherence, Hardware solutions and MESI protocol. Multi-Threading and chip multiprocessors. Multicore Organization. Interconnection Network: Multistage Cube and Omega Network.

### **Unit V**

Introduction to OpenMP, OpenMP directives, Parallel constructs, Work-sharing constructs, Data environment constructs, Synchronization constructs, Extensive API library for finer control.

### **References:**

1. Computer Organisation & Architecture: Designing for performance by W. Stallings, 9th edition, Prentice Hall International edition.
2. Computer System Architecture by M. Mano, 2001, Prentice-Hall.
3. Computer Organization and Design, 2nd Ed., by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.
4. Computer Organization, 5th Edi, by Carl Hamacher, Zvonko Vranesic, 2002, Safwat Zaky.