Course Name: COMPUTER ORGANIZATION AND ARCHITECTURE

Course Code: ES1045

Credits: 2	**Teaching Scheme: Theory: 2 Hours / Week**

Section I

Basic concepts of Digital Electronics: Computer Organization and Architecture, Structure and Function, Evolution (a brief history) of computers, Von Neumann Architecture, Evolution of Intel processor architecture- 4 bit to 64 bit, Interconnection Structures instruction execution cycle, interpretation of instructions, Instruction Pipeline

Number System and Computer Arithmetic: Integer Representation, Integer Arithmetic:2's Complement arithmetic, multiplication, Booth's Algorithm, Division Restoring Algorithm, Floating point representation: IEEE Standards for Floating point representations

RIS C Processors: RISC-Features, CISC Features, Comparison of RISC &CISC Superscalar Processors. Super pipelined Processor.

Fundamental Concepts and processor organization: Single Bus CPU organization, register ransfers, Performing anarithmetic/ logic operations, fetching a word from memory, storing a word in memory, Execution of a complete instruction. Micro-operations, Hard wired Control, Example-Multiplier CU. Micro-programmed Control: Microinstructions,

Section II

Input and Output System : External devices, **I/O modules**- Module function and I/O module structure, **Programmed I/O**- overview, I/O commands, I/O instructions, Interrupt driven I/O- design issues. **Direct Memory Access**- drawbacks of programmed and interrupt driven I/O, DMA functions**, I/O channels and processors-** evolution and characteristics

Hierarchical memory system- Characteristics, Size, Access time, Read Cycle time and address space. Principle of Locality of Reference. Main Memory Organization: ROM, RAM, EPROM, E^2PROM, DRAM

Cache memory Organization: Address mapping. Basic concepts: role of cache memory, Virtual Memory

Parallel Processing Paradigm – Parallelism in Uni processor system, Evolution of parallel processors, Architectural Classification, Flynn's Classification, Need and basics of Multi core architecture , Multi core Model **Case Study of Raspberry Pi Single board Computer – Raspberry Pi 0,/Raspberry pi 4**

Text Books:

1. William Stallings, "Computer Organization and Architecture: Designing for Performance", 7th Edition, Pearson Prentice Hall Publication, ISBN 81-7758-9 93-8.
2. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", 5th Edition, Tata McGraw Hill

Publication, ISBN 007-120411-3.

3. Kai Hwang, Advanced Computer Architecture;, Tata McGraw-Hill ISBN 0-07-113342-9

Reference Books:

1. Hwang and Briggs, "Computer Architecture and Parallel Processing", Tata McGraw Hill Publication ISBN 13: 9780070315563.

2. A. Tanenbaum, "Structured Computer Organization", Prentice Hall Publication, ISBN 81 –203 – 1553 – 7, 4th Edition.

MOOCs Links and additional reading material:

1. **www.nptelvideos.in** **2.** **https://learn.saylor.org** **3.** **https://www.coursera.org**

4.https://swayam.gov.in **5.** **https://teach-sim.com**

6. **https://www.raspberrypi.com/documentation/computers/processors.html**

Course Outcomes :

The student will be able to –

1. demonstrate computer architecture concepts along with Computer arithmetic and various related algorithms
2. understand design of modern processors, Instruction pipeline.
3. illustrate the micro-operations sequencing.
4. understand concepts related to memory & IO organization
5. understand need and design of modern processor architecture.