**B.A.(Prog.) Computer**
**Discipline Specific Course-(DSC-5) (Minor)**

## DSC-5 : COMPUTER SYSTEM ARCHITECTURE

**Computer Science Courses for Undergraduate Programme of study with Computer Science discipline as one of the two Core Disciplines**
**(For e.g. courses for B.A. Programmes with Computer Science as Non-major Discipline)**

### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course (if any) |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ Practice | | |
| DSC03: Computer System Architecture | 4 | 3 | 0 | 1 | Passed 12th class with Mathematics | NIL |

### Learning Objectives

This course introduces students to the fundamental concepts of digital computer organization, design, and architecture. It aims to develop a basic understanding of the building blocks of a computer system and highlights how these blocks are organized together to architect a digital computer system.

### Learning outcomes

On successful completion of the course, students will be able to:

- Design combinatorial circuits using basic building blocks. Simplify these circuits using Boolean algebra and Karnaugh maps. Differentiate between combinational circuits and sequential circuits.
- Represent data in binary form, convert numeric data between different number systems, and perform arithmetic operations in binary.
- Determine various stages of the instruction cycle and describe interrupts and their handling.
- Explain how the CPU communicates with memory and I/O devices.
- Simulate the design of a basic computer using a software tool.

### SYLLABUS OF DSC-3

**Unit 1**

**Digital Logic Circuits:** Digital Logic Gates, Flip flops and their characteristic table, Logic circuit simplification using Boolean algebra and Karnaugh map, Don't care conditions, Combinational circuits, Introduction to Sequential Circuits

**Unit 2**

**Digital Components:** Decoders, Encoders, Multiplexers, Binary Adder, Binary Adder Subtractor, Binary Incrementor, Registers, and Memory Units

**Unit 3**

**Data Representation:** Binary representation of both numeric and alphanumeric data, representation of numeric data in different number systems, (Binary, Octal, Decimal and Hexadecimal), conversion from one number system to another, complements, representation of signed and unsigned numbers, addition and subtraction of signed and unsigned numbers and overflow detection.

**Unit 4**

**Basic Computer Organization and Design:** Stored program organization, Computer registers, Instruction set and their completeness, Instruction cycle, Memory reference instructions, Register reference instructions, Input- Output reference instructions, Interrupt cycle, Addressing modes.

**Unit 5**

**Input-Output Organization**: I/O interface, I/O vs. Memory Bus, Isolated I/O, Memory Mapped I/O, Direct Memory Access.

**Essential/recommended readings**

1. M. Morris Mano, *Computer System Architecture*, 3rd edition, Pearson Education, 2017.
2. Linda Null, Julia Lobur, *Essentials of Computer Organization and Architecture*, 5th Edition, 2019.

**Additional References**

3. D. Comer, *Essentials of Computer Architecture,* 2nd edition, CRC Press, 2017.

**Suggested Practical List (If any): (30 Hours)**

Practical exercises such as

(Use Simulator – CPU Sim 3.6.9 or any higher version for the implementation)

1. Create a machine based on the following architecture:

Registers

| IR | DR | AC | AR | PC | I | E |
|---|---|---|---|---|---|---|
| 16 bits | 16 bits | 16 bits | 12 bits | 12 bits | 1 bit | 1 bit |

| | |
|---|---|
| Memory 4096 words<br>16 bits per word | Instruction format<br><br>15 12 11<br>0 |