ICT 2171: DIGITAL SYSTEMS & COMPUTER ORGANIZATION [3 1 0 4]

Course Objective:

- To explain the elements of digital system abstractions such as Boolean algebra, flip-flops, finite-state machines (FSMs) and memory devices.
- To demonstrate MSI combinational and sequential logic circuits design.
- To illustrate significance of control unit, execution unit and I/O in computer organization.

Abstract:

Introduction, Simplification of Boolean functions – K-map method, NAND and NOR implementation, Combinational logic, Design of Adders/Subtractors, code converters, Application of typical TTL integrated circuit components like Binary Parallel adder[74283], multiplier using 74283, Magnitude Comparator [7485], Decoders [74138,7442], Encoders [74148], Multiplexers [74157], combinational shifter design, De Multiplexers, Sequential logic –counters and shift registers, Computer organization- Introduction, ALU unit, Control unit, Hardwired and Micro – programming approach, Memory unit, Input and Output unit.

Syllabus:

Introduction to Digital System

Digital computers and digital systems, canonical and standard forms. The K map method, Product of sums and Sum of products simplification, NAND and NOR implementation. Don't care conditions, Determination and selection of prime implicants. **[05 Hours]**

Combinational logic

Design procedure, Design and comparison of Adders (Carry Propagation Adder, Carry Look ahead Adder), Subtractors, BCD adder design and code converters. **[07 Hours]**

Combinational logic with MSI and LSI

Application of typical TTL integrated circuit components like Binary Parallel adder[74283], multiplier using 74283, Magnitude Comparator [7485], Decoders [74138,7442], Encoders [74148], Multiplexers [74157], combinational shifter design, De Multiplexers. **[10 hours]**

Synchronous sequential logic

Different types of flip-flops and their triggering, flip-flop excitation tables, Shift Registers, General purpose register, Design of counters [Asynchronous and Synchronous], Design of synchronous sequential circuits **[10 hours]**

Introduction to Computer organization

Evolution of computers, Von- Neumann architecture **[01 hour]**

Execution Unit

Arithmetic and Logic Unit Design, Multiplication algorithms, Division algorithms **[05 hours]**

Control Unit
Introduction, basic concepts, Design methods: Hardwired and Micro – programming approach.
[05 Hours]

Memory Unit
Types of memory and characteristics, Memory Hierarchy, memory mapping, cache memory.
[02 Hour]

Input & Output
Programmed I/O, Interrupt I/O, Direct memory access, I/O bus standards. **[03 Hours]**

Course Outcomes:

After studying this course, students are able to:

- Identify the applications of various elements of digital system abstractions.
- Design MSI combinational logic circuits using typical TTL integrated circuit components.
- Devise applications employing sequential logic circuits.
- Distinguish operations of control unit, execution unit and I/O in computer organization.