

**Name of the Department/Centre: Physics**

**Course Type (Please tick appropriate box):**

Major	<input type="checkbox"/>	Discipline Specific Core	<input type="checkbox"/>
Minor	<input type="checkbox"/>	Multidisciplinary	<input type="checkbox"/>
Value Added	<input type="checkbox"/>	Any other	<input type="checkbox"/>

Ability Enhancement	<input type="checkbox"/>
<b>Skill Enhancement</b>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>

**Semester - II**

**Course Title – Digital Systems**

**Course Type – Skill Enhancement Course**

**Course Code - 24-PHY-S-155**

**Maximum Marks: 100**

**Course Level – 100**

**Total Credits – 3**

**Classes /week – 3**

**Prerequisite – Physics in class XII**

**Course Advisor's Name :**

**Course Advisor's Email :**

**Expected Learning Outcome –**

After completing this course, the students will be able to -

1. Understand number systems, codes, and Boolean algebra.
2. Design and analyze digital logic circuits.
3. Apply arithmetic and data processing concepts to digital circuits.
4. Design and analyze sequential logic circuits.
5. Convert between analog and digital signals.

**Reference Books:**

1. Digital Electronics : Gothman
2. Digital Principals & Applications : Malvino & Leach
4. Digital Computer Electronics : A.P.Malvino
5. Analog and Digital Electronics : Peter.H.Beards.
6. Integrated Electronics : Millman & Halkias

## **Course Syllabus**

### **Unit I: Number system and codes**

Introduction to decimal, binary, octal, hexadecimal number system, Inter conversion of binary, decimal, BCD, Octal and hexadecimal, BCD codes, Excess-3, grey codes. Simple binary arithmetic, binary addition, binary subtraction, 1's and 2's complement of a binary number.

### **Unit II: Boolean algebra**

Boolean laws, OR, AND and NOT operations (realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates. XOR and XNOR Gates and application as Parity Checkers. De Morgan's theorems, simplification of logic circuit using Boolean algebra, sum-of-products (SOP) and product-of-sums (POS), idea of minterms and maxterms, conversion of a truth table into equivalent logic circuit by SOP and POS method, Karnaugh Map.

### **Unit III: Arithmetic and Data Processing Circuits**

Half adder, Full adder, Half and Full subtractors, Adder-subtractor, Digital comparators, Multiplexers, Demultiplexers, Decoders, Encoders, Parity checker and Generator

### **Unit IV: Sequential Logic Circuits**

Clock and timer : clock parameters, propagation delay, IC 555 block diagram, working principle, astable multivibrator, monostable multivibrator.

Flip-flops : RS flip-flops, D flip-flop and JK flip-flop, the use of clock, racing, edge triggering, pulse triggering, master-slave flip-flop, preset and clear operations.

Shift Register : serial-in-serial-out, serial-in-parallel-out, parallel-in-serial-out and parallel-in-parallel-out shifting operations, applications of shift register

Counter : asynchronous counter, synchronous counter, decade counter, applications

D/A and A/D Conversions : Weighted resistor D/A converter, R-2R ladder D/A converter, accuracy and resolution, A/D Conversion