



S.V. University 4-Year Honours Degree Programme
BSc (Physics) Honours Degree Syllabus (W.E.F. AY-2026-27)

**Model Syllabus for 4-Year UG Honours in B.Sc. (Physics) as Major in
consonance with Curriculum framework w.e.f. AY 2026-27**

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	5	Atomic, Molecular & Nuclear physics	3	3
			Atomic, Molecular & Nuclear physics-Practical	2	1
		6	Basic Electronics	3	3
			Basic Electronics-Practical	2	1
		7	Applied Optics	3	3
			Applied Optics-Practical	2	1

SEMESTER-III

COURSE 6: BASIC ELECTRONICS

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVES

This course aims to introduce undergraduate physics students to the fundamental principles of electronics. It covers passive components, semiconductor physics, diode and transistor operation, DC power supplies, and the basics of digital logic. The goal is to build a solid foundation in circuit analysis and electronic devices for students with minimal prior background.

LEARNING OUTCOMES:

By the end of the course, students will be able to:

1. Identify and explain the function and types of resistors, capacitors, and inductors.
2. Understand the basic concepts of semiconductors and diode characteristics.
3. Analyze simple transistor circuits and their applications.
4. Describe the functioning of rectifiers, filters, and voltage regulators.
5. Perform basic binary arithmetic and construct simple digital logic circuits.

UNIT I: PASSIVE COMPONENTS AND CIRCUIT FUNDAMENTALS (9 hrs)

Resistors: Types (carbon, wire-wound, metal film), color coding, tolerance, power ratings
- Capacitors: Types (ceramic, electrolytic, film), applications, charge/discharge behavior -
Inductors: Basic structure and applications - Series and parallel combinations: Equivalent resistance/capacitance/inductance - Basic laws: Ohm's Law, Kirchhoff's Voltage and Current Laws (KVL, KCL) with simple applications

UNIT II: SEMICONDUCTOR PHYSICS AND DIODES (9 hrs)

Intrinsic vs extrinsic semiconductors - Doping, energy band diagrams, charge carriers - PN junction diode: Construction, working, forward/reverse biasing, I-V characteristics - Special diodes: Zener diode, LED, photodiode, solar cell – construction, characteristics and uses

UNIT III: TRANSISTORS AND THEIR OPERATION (9 hrs)

BJT: Structure, current components, working of NPN/PNP - Configurations: CB, CE, CC – input/output characteristics - Applications: Transistor as switch and amplifier (qualitative understanding)

UNIT IV: POWER SUPPLIES AND REGULATION (9 hrs)

Need for DC power supply: Block diagram - Rectifiers: Half-wave, full-wave, bridge with waveforms - Filter circuits: RC, LC, and π filters – working principle - Voltage regulation: Zener diode regulation, IC regulators (brief intro)

UNIT V: INTRODUCTION TO DIGITAL ELECTRONICS

(9 hrs)

Analog vs Digital signals - Number systems: Binary, decimal, hexadecimal – conversions, binary arithmetic - Logic gates: AND, OR, NOT – symbols, truth tables, simple logic circuits, Universal gates (NAND, NOR) – brief introduction

Textbooks / References:

1. V.K. Mehta & Rohit Mehta – *Principles of Electronics*, S. Chand
2. R.S. Sedha – *A Textbook of Applied Electronics*, S. Chand
3. D. Chattopadhyay & P.C. Rakshit – *Electronics: Fundamental Concepts*, New Central
4. Malvino & Leach – *Digital Principles and Applications*, McGraw-Hill
5. A.K. Maini – *Digital Electronics*, Wiley India

Student Activities

1. **Component Hunt**
 - Task: Identify and collect physical samples of resistors, capacitors, diodes, and transistors from old circuit boards.
 - Outcome: Visual and tactile understanding of component shapes, labels, and ratings.
2. **Poster Presentation**
 - Topic examples: “Types of Diodes and Their Applications” or “Power Supply Block Diagram.”
 - Outcome: Encourages concise technical communication and peer learning.
3. **Group Demonstration**
 - Task: Simulate or build a basic rectifier or transistor switch circuit using breadboard or simulation software.
 - Outcome: Team collaboration and hands-on understanding.
4. **Number System Puzzle or Quiz**
 - Task: Convert between binary, decimal, and hexadecimal; perform binary addition/subtraction.
 - Outcome: Reinforces digital electronics basics through gamified learning.
5. **Mini Project (Optional)**
 - Task: Build a simple LED flasher or night lamp circuit using transistors and passive components.
 - Outcome: Design thinking and real-world application.
6. **Circuit Debugging Challenge**
 - Task: Find and correct errors in a faulty circuit diagram provided by the teacher.
 - Outcome: Improves analytical and practical troubleshooting skills.
7. **Logic Gate Simulation**
 - Task: Use a free simulator (like Falstad, Tinkercad, or Logic.ly) to create logic circuits.
 - Outcome: Concept reinforcement through virtual labs.

SEMESTER-III

COURSE 6: BASIC ELECTRONICS

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVE:

To develop practical skills in handling basic electronic components and circuits by constructing, testing, and analyzing simple electronic systems such as rectifiers, filters, diode/transistor configurations, and digital logic gates using fundamental measurement tools.

Learning Outcomes

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

1. Measure and verify the behavior of passive components in circuits.
2. Construct and test diode and transistor-based circuits.
3. Analyze rectifier output and filter performance using basic instruments.
4. Build and verify logic gate circuits using ICs or trainer kits.
5. Practice circuit debugging, use of multimeters, and interpretation of waveforms using a CRO.

Minimum of 6 experiments to be done and recorded

Experiments (Practical List)

1. **Verification of Ohm's Law** using resistive networks (series and parallel combinations).
2. Series and Parallel Combination of Capacitors and Inductors
3. **Capacitor charging and discharging curves** using RC circuits and a stopwatch/multimeter.
4. **V-I characteristics of a PN junction diode** (forward and reverse bias)
5. Temperature Dependence of Resistance (Using Thermistor).
6. **Zener diode characteristics** and voltage regulation behavior.
7. **Study of LED and photodiode characteristics** under different light conditions.
8. **BJT transistor as a switch**: ON/OFF control of an LED.
9. **Construction of half-wave and full-wave rectifiers** and measurement of output voltage.
10. **Design and analysis of simple π -filtered power supply** circuits.
11. **Verification of logic gates (AND, OR, NOT, NAND, NOR)** using digital ICs or simulation.

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**4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-III**

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V