



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	IV	8	Electricity, Magnetism and Electromagnetic Theory	3	3
			Electricity, Magnetism and Electromagnetic Theory-Practical	2	1
		9	Analog Electronics	3	3
			Analog Electronics-Practical	2	1
		10	Advances in Physics	3	3
			Advances in Physics-Practical	2	1

SEMESTER-IV

COURSE 9: ANALOG ELECTRONICS

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVE:

To build on the understanding of transistor and op-amp-based analog circuits, enabling students to analyze and design amplifiers, oscillators, and basic analog signal processing systems for real-world applications.

LEARNING OUTCOMES:

By the end of the theory course, the student will be able to:

1. Analyze the design and performance of BJT amplifier circuits and multistage configurations.
2. Distinguish between different classes of power amplifiers and understand feedback principles.
3. Understand the internal operation and characteristics of operational amplifiers.
4. Design practical op-amp-based analog circuits for mathematical operations and signal conditioning.
5. Explain the principles of sinusoidal oscillator circuits and their applications.

UNIT I: BJT AMPLIFIERS

(9 hrs)

Review of transistor operation in CE configuration - Load line analysis, biasing concepts (fixed bias, voltage divider bias) - CE amplifier: Circuit, gain, input/output impedance - Frequency response, bandwidth - Multistage amplifiers and emitter follower (voltage follower)

UNIT II: POWER AND FEEDBACK AMPLIFIERS

(9 hrs)

Classification of amplifiers: Class A, B, AB, C - Class A and Class B power amplifiers – working and efficiency - Push-pull amplifier – circuit and waveforms - Negative feedback: Types (voltage/current series/shunt), effect on gain, bandwidth, stability

UNIT III: OPERATIONAL AMPLIFIERS – BASICS

(9 hrs)

Characteristics of ideal and practical op-amp - Parameters: CMRR, slew rate, input offset voltage, bias current - Pin configuration and block diagram of IC 741 - Open loop and closed loop configuration

UNIT IV: APPLICATIONS OF OP-AMPS

(9 hrs)

Inverting and non-inverting amplifiers – gain derivation and characteristics - Adder, subtractor circuits - Integrator and differentiator – design and applications - Comparators and zero-crossing detectors

UNIT V: OSCILLATOR CIRCUITS

(9 hrs)

Conditions for oscillations: Barkhausen criterion - RC oscillators: Phase shift oscillator, Wein bridge oscillator – circuit, working - LC oscillators: Hartley, Colpitts – basic theory and circuits - Crystal oscillator: Construction and applications

Textbooks / References:

1. Robert L. Boylestad – *Electronic Devices and Circuit Theory*, Pearson
2. Ramakant A. Gayakwad – *Op-Amps and Linear Integrated Circuits*, PHI
3. D. Roy Choudhury – *Linear Integrated Circuits*, New Age International
4. A.P. Malvino – *Electronic Principles*, Tata McGraw-Hill
5. Millman & Halkias – *Integrated Electronics*, McGraw-Hill

Student Activities List

1. **Waveform analysis:** Record and interpret CRO traces from amplifier and oscillator outputs.
2. **Op-amp datasheet exploration:** Interpret specifications of IC 741 or similar.
3. **Mini project:** Build a tone generator or audio amplifier circuit.
4. **Simulation task:** Simulate CE amplifier or op-amp circuit using free tools like Falstad or Multisim Live.
5. **Classroom quiz:** Identify amplifier classes and feedback types based on circuit conditions.
6. **Group circuit-building challenge:** Design a multistage amplifier with given constraints.
7. **Poster presentation:** On “Power Amplifier Classes: Differences and Applications.”
8. **Function generator use:** Demonstrate square, triangle, and sine wave outputs and measure frequency.
9. **Lab oral viva:** Justify component selection in op-amp applications.
10. **Oscillator comparison chart:** Create a chart comparing Hartley, Colpitts, and Wein bridge oscillators.

SEMESTER-IV

COURSE 9: ANALOG ELECTRONICS

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVE:

To provide hands-on experience in constructing and analyzing analog circuits involving BJTs, operational amplifiers, and oscillator configurations using commonly available components and instruments.

LEARNING OUTCOMES:

By the end of the lab course, the student will be able to:

1. Design and analyze various transistor amplifier circuits.
2. Measure amplifier parameters such as voltage gain, bandwidth, and input/output impedance.
3. Implement analog signal processing circuits using op-amps.
4. Test sinusoidal oscillator circuits and identify working conditions.
5. Utilize function generators, power supplies, and CROs for analog circuit testing..

Minimum of 6 experiments to be done and recorded

1. **CE amplifier design and performance:** Measure voltage gain and bandwidth.
2. **Transistor biasing circuits:** Fixed bias and voltage divider bias—measurement of Q-point.
3. **Class-B push-pull amplifier:** Construction and efficiency estimation.
4. **Negative feedback amplifier:** Study gain variation with and without feedback.
5. **Study of IC 741 op-amp parameters:** Offset voltage, bias current, and CMRR.
6. **Op-amp inverting and non-inverting amplifiers:** Gain and phase comparison.
7. **Op-amp adder and subtractor circuits:** Build and verify output equations.
8. **Op-amp integrator and differentiator:** Observe and sketch output waveforms.
9. **Wein bridge oscillator using op-amp or transistor:** Frequency and waveform measurement.
10. **Phase-shift oscillator** using RC networks and op-amp.

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

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