# B.Sc. ELECTRONICS
# III SEMESTER

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| Programme Name | B.Sc. in Electronics | |
| Semester | Third Semester | |
| Course Title | OP-AMPS AND LINEAR INTERGARTED CIRCUITS | |
| Course Code | ELE CT-3 | No. of Credits: 04 |
| Teaching Hours | 64 | Duration of Exam: 3 hours |
| Formative Assessment Marks | 20 | Summative Assessment Marks: 80 |

**Course Objectives:**

The students are able to understand and gain the knowledge on

- Basics of Op-Amps, configurations and applications of Op-Amps
- Principles of Oscillators, design and working of wave form generators.
- IC-555 timer working and its applications.
- The design and working of wave shaping circuits.

**Course Outcome**:

After studying the syllabus, the students are able to understand principles, design and construct the various circuits using Op. Amps and their applications.

## ELE CT-3: OP-AMPS AND LINEAR INTERGARTED CIRCUITS

**UNIT –I: Operational Amplifiers:** **16Hrs**

**Differential Amplifier:** Emitter coupled differential amplifier-circuit and working. Block diagram, parameters of op-amp: input bias current, input offset voltage, output offset voltage, CMRR, slew rate, SVRR and thermal drift. Characteristics ideal and practical op-amps, open loop gain in inverting and non-inverting and differential modes - Limitations.

**Op-Amp with Negative Feedback:** Inverting amplifier-derivation for $A_v$, concept of virtual ground and virtual short. Non-inverting amplifier- derivation for $A_v$, voltage follower circuits and features. Difference Amplifier: Derivation of its output.

**UNIT II: Application of Operational Amplifiers:** **16 Hrs**

Op-amp as adder and subtractor, derivation for the output voltage. Averaging amplifier, scale changer, op-amp integrator and differentiator and derivation for the output voltage, output wave forms for square wave input.

**Instrumentation Amplifier**: Construction and working using op-amps & principal of oscillations, phase shift and Wein- bridge oscillators.

**UNIT III: IC 555 timer and Waveform Generators:** **16 Hrs**

IC 555 timer : functional block diagram and its working.

**Multivibrators:** Astable, Monostable and Bistable Multivibrators using 555 timer, working, equation for frequency of oscillations (no derivation), Schmitt trigger using IC 555 , wave forms, mention of UTP and LTP.

**Waveform Generators:** Square wave generator and triangular wave generator using Op. Amps, circuit diagram, working and wave forms, Ramp generator circuit diagram and working.

**UNIT IV: Wave Shaping** **16 Hrs**

**Wave shaping circuits:** Clippers-Positive, negative, positive biased, negative biased and combinational clippers. Clampers- positive and negative clampers-circuit diagram working and waveforms of all circuits.

**Active filters:** Low-pass, High-pass, Band-pass and Band-reject filters using Op-Amps.

**Text Books for study:**


1. A text book of Electronics, R S Sedha, S Chand and co, Multicolour, 3rd edition 2012.
2. Operational-amplifier and linear integrated circuits: Ramakanth Gaikwad, PHI 5th Edition.
3. Electronics devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition 2013 PHI.
4. Linear integrated circuits by Roy Choudhury, New age international, 4th Edition 2010.


Reference Books:


1. Basic Electronicsp-B.L. Theraja-S. Chand and Co., 3rd Edition 2012.
2. Electronics text lab manual, Paul B. Zbar.
3. Electronics devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
4. Electronic devices, applications and integrated circuits, Mathur, Kulshreshta and Chadha, Umesh Publications.

**ELE CP-3: OP-AMPS AND LINEAR INTERGARTED CIRCUITS LAB**
**(Minimum 12 experiments to be performed)**

1. Inverting and Non-inverting amplifiers using Op-Amp (Determination of gain)
2. Frequency response of inverting Op-Amp (Determination of Bandwidth)
3. Frequency response of Non-inverting Op-Amp (Determination of Bandwidth)
4. Op-Amp as Adder(two inputs only)
5. Op-Amp as Subtractor(two inputs only)
6. Square wave generator using Op-amp(AMV)
7. Triangular wave generator using Op-Amp
8. Ramp generator using IC 555.
9. Instrumentation amplifier using Op-amp(Three op-amp circuit)
10. Phase shift oscillator using Op-amp(Determination of frequency of oscillation)
11. Wein-bridge oscillator using Op-amp (Determination of frequency of oscillation)
12. Clipping circuits-positive and negative clippers.
13. Clamping circuits-positive and negative Clampers
14. Astable multivibrator using IC 555
15. Monostable multivibrator using IC 555
16. Schmitt trigger using IC 555-determination of LTP and UTP
17. Op-amp as integrator
18. Op-amp as differentiator
19. Determination of Op-amp parameters ($I_b$, $V_{io}$, $I_{io}$, SR, FBW, CMRR).