

UNDERGRADUATE PROGRAMME IN INSTRUMENTATION

ELI -9

Linear Integrated Circuits

48 Periods

UNIT 1

Operational Amplifiers Fundamentals: Differential amplifiers (Dual input balanced output), constant current bias, current mirror, cascaded differential amplifier stages, block diagram of an operational amplifier. Open loop Equivalent circuit of op-amp, ideal voltage transfer curve.

Characteristics of Op Amp: input offset voltage, input offset current, input bias current, differential input resistance, input capacitance, offset voltage adjustment range, input voltage range, common mode rejection ratio, slew rate, supply voltage rejection ratio, comparative study of different amplifier Integrated circuits (LM 741, LM 324)

13 Periods

UNIT 2

Feedback Amplifiers: Op-Amp in open and closed loop configuration, Introduction to feedback amplifiers, Voltage series feedback amplifier, Voltage follower and its applications, Voltage shunt feedback, summing and difference amplifier, Integrator, Differentiator, voltage to current converter, current to voltage converter. Instrumentation amplifier

10 Periods

UNIT 3

Active filters: First order low pass and high pass butter worth filter, Second order filters, Band pass filter, Band reject filter, All pass filter.

Signal generators: Phase shift oscillator, Wein bridge oscillator, Square wave generator, triangle wave generator, saw tooth wave generator, and Voltage controlled oscillator (IC 566).

11 Periods

UNIT 4

Comparators: Basic comparator, Level detector, Voltage limiters, Schmitt Trigger. Precision half wave and full wave rectifiers with IC 741

Timers: IC 555 Block diagram, Astable and monostablemultivibrator circuit, Applications of Monostable and Astablemultivibrators.

Voltage regulators: Linear and Switching DC Voltage regulators: Basic 78XX.

Converters: Analog to Digital and Dgital to Analog Converter.

14 Periods

Essential Books:

UNIT 1

Chapter 1 - R. A. Gayakwad, Op-Amps and Linear IC's, 3/e, Pearson Education

Chapter 1, 2 - R. A. Gayakwad, Op-Amps and Linear IC's, 4/e, Pearson Education

Chapter 1,2 - R. F. Coughlin and F. F. Driscoll, Operational amplifiers and Linear Integrated circuits, Pearson Education (2001)

UNIT 2

Chapter 3, 6 - R. A. Gayakwad, Op-Amps and Linear IC's, 4/e, Pearson Education

UNIT 3

Chapter 7 - R. A. Gayakwad, Op-Amps and Linear IC's, 4/e, Pearson Education

UNIT 4

Chapter 8, 9 - R. A. Gayakwad, Op-Amps and Linear IC's, 4/e, Pearson Education

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Suggested Books:

1. D. Roy Choudhry and Shail Jain, Linear Integrated Circuits, New Age International Publishers Ltd.
2. James M Fiore, Op-Amps and Linear Integrated Circuits – Concepts and applications Cengage Learning, 1st Edition, Indian Edition.
3. Bakshi, Godse, Bakshi, Linear Integrated Circuits, Technical Publications

Practicals (based on ELI-9)

1. To study op-amp characteristics: CMRR and Slew rate.
2. To design an amplifier of given gain for an inverting/non-inverting configuration using an op-amp.
3. To design an integrator using op-amp for a given specification and study its frequency response.
4. To design a differentiator using op-amp for a given specification and study its frequency response.
5. To design a First Order Low-pass/High filter using op-amp.
6. To design a RC Phase Shift Oscillator using op-amp.
7. To study IC 555 as an astablemultivibrator.
8. Instrumentation amplifier using LM 324.