

LINEAR INTEGRATED CIRCUITS (Core Subject)

Course Code:	17B11EC511	Semester:	Semester 5 th , B. Tech (ECE)
Credits:	4	Contact Hours:	L-3, T-1, P-0

Course Objective

1. Acquire knowledge about basic building blocks of an operational amplifier and its terminal characteristics.
2. Acquire knowledge about linear and nonlinear circuits and their applications.
3. Foster ability to identify basic requirements for designing any application using linear integrated circuits.
4. Foster ability to understand the use of linear integrated circuits in commercial and industrial applications.

Course Outcomes

1. Ability to understand the terminal characteristics of op-amps and design /analyze fundamental circuits based on op-amps.
2. Understanding of various parameters and interpretation of data sheets for Op-Amp.
3. Ability to analyze and design various applications like amplifiers, active filters, wave generators, wave shaping circuits, A/D and D/A convertors using Op-Amp.
4. Design and analysis of various applications using 555 timer.

Course Contents

Unit	Topics	References (chapter number, page no. etc)	Lectures
1.	Introduction to Op-Amp and its characteristics. Linear Integrated Circuits Differential Amplifiers Basic of Differential Amplifier, Transistorized differential Amplifier, Configurations of Differential Amplifier, Analysis of Dual Input Balanced Output Differential Amplifier, Constant Current Bias, Current Mirror Circuit, Cascading of Differential Amplifiers.	Chapter 1, 2 & 3: OP-AMPS & Linear Integrated Circuits. Fourth Edition R A Gayakwad	7
2.	Op-Amp characteristics and frequency response Op –Amp packaging type, pin configuration, Op-Amp basics, Op-Amp specifications, DC offset parameters, Frequency parameters, Unit	Chapter 4 & 5: OP-AMPS & Linear Integrated Circuits. Fourth Edition R A Gayakwad	5

	specifications, offset voltages and currents, virtual Ground, slew rate, CMRR, PSRR, Gain bandwidth product etc.		
3.	General linear applications. DC & AC Amplifiers, Peaking Amplifier, Summing, Scaling and Averaging amplifier, Instrumentation Amplifier, Voltage-to-Current Converter, Current to-Voltage Converter, The Integrator, The Differentiator, Log and Antilog Amplifier, Peak Detector, Precision Rectifiers, Comparator, Zero Crossing Detector, Schmitt Trigger, Sample and Hold Circuit, Clippers and Clampers, A/D and D/A Converters.	Chapter 6 OP-AMPS & Linear Integrated Circuits. Fourth Edition R A Gayakwad	8
4.	Active Filters Butterworth Filters, Band-Pass Filters, Band Reject Filters, All Pass Filters, Universal Active Filter.	Chapter 7 OP-AMPS & Linear Integrated Circuits. Fourth Edition R A Gayakwad	6
5.	Wave Shaping Circuits Multi-vibrators (Astable, Mono-stable, Bi-Stable), High pass and low pass filters using R-C Circuits and R-L, R-L-C Circuits & their response to step input, Pulse input, Square input and Ramp Input, Attenuators, Clamping Circuit theorem, Clipping and Clamping circuits, Schmitt Trigger, Comparator.	Chapter 8 OP-AMPS & Linear Integrated Circuits. Fourth Edition R A Gayakwad	8
6.	Specialized IC Applications Voltage-Controlled Oscillator (VCO), Square Wave Generator, Triangular Wave Generator, Saw-tooth Wave Generator, The 555 Timer, Monostable and Astable Multivibrator using IC 555, Phase-Locked Loop (PLL), Voltage Regulators.	Chapter 9 OP-AMPS & Linear Integrated Circuits. Fourth Edition R A Gayakwad	8
Total number of Lectures			42

Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
 - 10 Marks : Class performance, Tutorials & Assignments
 - 10 Marks : Quizzes

- 5 marks : Attendance

Text Books

1. R.A. Gayakwad, Op Amp and Linear Integrated Circuits, Fourth edition, Pearson Education .
2. Robert F. Coughlin & Frederick F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, 6th edition, Pearson, 2000.

Reference Books

1. Adel S. Sedra, Kenneth C. Smith : Microelectronics Circuits, 5th Ed., Oxford University Press, 2004