

Course Code	Course Title	L	T	P	C
1151EC105	LINEAR INTEGRATED CIRCUITS	3	0	0	3

a) Course Category

Program Core

b) Preamble

Linear Integrated Circuits introduces the basic building blocks of the Integrated circuits along with fundamental concepts of electronic circuits like operational amplifiers, rectifiers & timers and acquire the knowledge in analysis and design IC based circuits.

c) Prerequisite

Nil

d) Related Courses

VLSI Design, Analog Communication Systems, Medical Electronics

e) Course Outcomes

On successful completion of this course the student will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain internal components and characteristics of Op-Amp	K2
CO2	Illustrate the linear, non-linear applications of Op-Amp and active filters.	K3
CO3	Describe Op-Amp based comparators, waveform generators, VCO and PLL operation and its application	K2
CO4	Explain and compare the performance of various types of ADC and DAC using Op-Amp	K2
CO5	Discuss various applications of special function Op-Amp ICs such as 555 IC, Voltage Regulator IC and Amplifier IC	K2

f) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO1	M	L	L	-	-	-	-	-	-	-	-	-	-	-
CO2	H	H	M	-	L	L	L	-	-	-	-	-	L	-
CO3	M	M	M	-	L	L	L	-	L	-	-	M	L	-
CO4	M	M	M	-	L	M	L	-	L	-	L	M	L	-
CO5	M	M	M	L	L	M	L	L	M	M	M	M	L	-

g) Course Content

UNIT I INTRODUCTION TO OPERATIONAL AMPLIFIERS 9

BJT differential amplifier - Concept of CMRR - methods to improve CMRR - constant current source - active load - current mirror - Darlington pair differential input impedance - The Ideal Op Amp- Block diagram representation of Op Amp -Voltage Transfer Curve of Op Amp - DC and AC Characteristics of an Op Amp - Frequency Response - Slew Rate.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Active Filters: Low pass, High Pass and band pass filters - Switched capacitor filter Linear Applications: Inverting and Non inverting Amplifiers – Differentiator – Integrator - Voltage to current converter - Instrumentation amplifier Non Linear Applications: Clippers and Clampers - Precision rectifier - Log and Antilog amplifiers.

UNIT III WAVE GENERATORS & PLL 9

Comparators and Wave form Generators: Comparator - Regenerative comparator – AstableMultivibrators – MonstableMultivibrators - Triangular wave generator - Sine wave generators PLL: Voltage Controlled Oscillator- Closed loop analysis of PLL – PLL Applications - Frequency synthesizers

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog switches- High speed sample and hold circuits and sample and hold ICs- Types of D/A converter- Current driven DAC- Switches for DAC- A/D converter Flash- Single slope- Dual slope- Successive approximation - Delta Sigma Modulation- Voltage to Time converters.

UNIT V SPECIAL FUNCTION ICS 9

555 Timer: Astable and MonostableMultivibrators, Schmitt trigger Voltage regulators using op-amp - linear and switched mode types - Frequency to Voltage converters- Tuned amplifiers- Video amplifiers- ECG using op-amp.

Total 45 Hrs

h) Learning Resources

Text Books

1. D. Roy Choudhry and Shail B. Jain, "Linear Integrated Circuits"- (4/e), New Age International Pvt. Ltd, 2011.
2. R. Gayakwad, Op-amps and Linear Integrated Circuits (4/e), PHID. A. Bell, Solid state Pulse Circuits (4/e), PHI, 2009

Reference Books

- 1.S. Franco, Design with Operational Amplifiers and Analog Integrated Circuits (3/e) TMH, 2003.
- 2.R. F. Coughlin & F. F. Driscoll: Operational Amplifiers and Linear Integrated circuits, PHI, 1996.
- 3.D. A. Bell: Solid State pulse circuits, (4/e), PHI. Milman Gravel: Micro-Electronics, McGraw Hill 1991

Online Resources

1. www.electronicstutorials.ws
2. www.circuitstoday.com
3. www.nptel.com