

COURSE CODE: <b>1151EE115</b>	COURSE TITLE: <b>LINEAR INTEGRATED CIRCUITS</b>	L	T	P	C
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**COURSE CATEGORY:**

Program Core

**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.

**PREREQUISITE COURSES:**

Basic Electronics Engineering.

**RELATED COURSES:**

VLSI Design, Analog Communication Systems

**COURSE EDUCATIONAL OBJECTIVES :**

The objectives of the course are to make the students,

- Familiar in the operational amplifier principle- analysis- design and application.
- Gain knowledge on the linear and nonlinear applications of operational amplifiers.
- Understand the theory and applications of Active filters and PLL.
- Familiar in the ADC- DAC and its classifications.
- Understand the few applications of specific ICs.

**COURSE OUTCOMES :**

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Design the Active filters using Op- Amp for the given specifications. Describe the concept of CMRR and AC - DC characteristics of operational amplifier	K3
CO2	Explain the linear and nonlinear applications of Op- Amp including comparators and waveform generators.	K2
CO3	Understanding the VCO, PLL and its application.	K2
CO4	Illustrate the ADC, DAC and its various types, schematic construction and operation of 555timer.	K3
CO5	Explain various applications of special function IC's such as voltage Regulators, 555 timer applications.	K2

**CORRELATION OF COs AND POs**

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

**COURSE CONTENT:**

<b>UNIT I</b>	<b>INTRODUCTION TO OPERATIONAL AMPLIFIERS</b>	<b>12</b>
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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. Active Filters: Low pass, High Pass and band pass filters - Switched capacitor filter

<b>UNIT II</b>	<b>APPLICATIONS OF OPERATIONAL AMPLIFIERS</b>	<b>9</b>
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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  
 Comparators and Wave form Generators: Comparator - Regenerative comparator – Astable Multivibrators – Monstable Multivibrators - Triangular wave generator - Sine wave generators.

<b>UNIT III</b>	<b>PLL</b>	<b>6</b>
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Voltage Controlled Oscillator- Closed loop analysis of PLL – PLL Applications - Frequency synthesizers.

<b>UNIT IV</b>	<b>ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS</b>	<b>9</b>
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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.

<b>UNIT V</b>	<b>SPECIAL FUNCTION ICs</b>	<b>9</b>
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555 Timer: Astable and Monostable Multivibrators, 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 PERIODS**

<b>TEXT BOOKS:</b>	
<ol style="list-style-type: none"><li>1. D. Roy Choudhry and Shail B. Jain, "Linear Integrated Circuits"- (d/e), New Age International Pvt. Ltd, 2011.</li><li>2. R. Gayakwad, Op-amps and Linear Integrated Circuits (d/e), PHID. A. Bell, Solid state Pulse Circuits (d/e), PHI, 2009</li></ol>	
<b>REFERENCE BOOKS:</b>	
<ol style="list-style-type: none"><li>1. S. Franco, Design with Operational Amplifiers and Analog Integrated Circuits (c/e) TMH, 2003.</li><li>2. R. F. Coughlin &amp; F. F. Driscoll: Operational Amplifiers and Linear Integrated circuits, PHI, 1996.</li><li>3. D. A. Bell: Solid State pulse circuits, (d/e), PHI. Milman Gravel: Micro-Electronics, McGraw Hill, 1999.</li></ol>	