OPERATIONAL AMPLIFIERS AND LINEAR ICs (Foundation Course)
B.E., IV Semester, Electrical and Electronics Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	17EE46	CIE Marks	40
Number of Lecture Hours/Week	03	SEE Marks	60
Total Number of Lecture Hours	40	Exam Hours	03

Credits - 03

Course Objectives:

- To understand the basics of Linear ICs such as Op-amp, Regulator, Timer & PLL.
- To learn the designing of various circuits using linear ICs.
- To use these linear ICs for specific applications.
- To understand the concept and various types of converters.
- To use these ICs, in Hardware projects.

Module-1	**Teaching Hours**
Operational amplifiers: Introduction, Block diagram representation of a typical Op-amp, schematic symbol, characteristics of an Op-amp, ideal op-amp, equivalent circuit, ideal voltage transfer curve, open loop configuration, differential amplifier, inverting & non –inverting amplifier, Op-amp with negative feedback(excluding derivations). **General Linear Applications:** A.C. amplifier, summing, scaling & averaging amplifier, inverting and non-inverting configuration, Instrumentation amplifier.	**08**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	
Module-2	
Active Filters: First & Second order high pass & low pass Butterworth filters. Band pass filters, all pass filters. **DC Voltage Regulators:** voltage regulator basics, voltage follower regulator, adjustable output regulator, LM317 & LM337 Integrated circuits regulators.	**08**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	
Module-3	
Signal generators: Triangular / rectangular wave generator, phase shift oscillator, saw tooth oscillator. **Comparators & Converters:** Basic comparator, zero crossing detector, inverting & non-inverting Schmitt trigger circuit, voltage to current converter with grounded load, current to voltage converter and basics of voltage to frequency and frequency to voltage converters.	**08**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	
Module-4	
Signal processing circuits: Precision half wave & full wave rectifiers **A/D & D/A Converters:** Basics, R–2R D/A Converter, Integrated circuit 8-bit D/A, successive approximation ADC, linear ramp ADC ■	**08**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	
Module-5	
Phase Locked Loop (PLL): Basic PLL, components, performance factors. **Timer:** Internal architecture of 555 timer, Mono stable multivibrators and applications.	**08**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	

ELECTRICAL AND ELECTRONIC MEASUREMENTS (Foundation Course)
B.E., IV Semester, Electrical and Electronics Engineering [As per Choice Based Credit System (CBCS) scheme]

17EE46 OPERATIONAL AMPLIFIERS AND LINEAR ICs (Foundation Course) (continued)

Course Outcomes:

At the end of the course the student will be able to:

- Describe the characteristics of ideal and practical operational amplifier.
- Design filters and signal generators using linear ICs.
- Demonstrate the application of Linear ICs as comparators and rectifiers.
- Use ICs in the electronic projects.

Graduate Attributes (As per NBA)

Engineering Knowledge, Design / development of solutions, Conduct investigations of complex Problems.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 16 marks.
- There will be 2full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from eachmodule.

Text Books:

1	Op-Amps and Linear Integrated Circuits	Ramakant A Gayakwad	Pearson	4th Edition 2015
2	Operational Amplifiers and Linear ICs	David A. Bell	Oxford	3rd Edition 2011

Reference Books:

3	Linear Integrated Circuits; Analysis, Design and Applications	B. Somanthan Nair	Wiley India	2013
4	Linear Integrated Circuits	S. Salivahanan, et al	McGraw Hill	2nd Edition,2014
5	Operational Amplifiers and Linear Integrated Circuits	K. Lal Kishore	Pearson	1st Edition, 2012