ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

DEPARTMENT OF ELECTRONICS

ACADEMIC YEAR 2024-'25 (4th Semester) (January to July)

Prepared by: Dr. Arindam Sen, Associate Professor, Dept of Electronics

Course Title: Operational Amplifiers and Applications

Course Learning Objectives:

- To develop understanding of Analog Devices starting with ideal Op Amp model and assessing the practical device limitations covering the direct and cascading approach and learning importance of the Data Sheets.
- Design not only linear applications but also design of non-linear application without feedback (voltage comparators), with positive feedback (Schmitt Trigger), and the negative feedback but using non-linear elements such as diodes and switches(sample and hold circuits).
- Study of Signal Generators including also Timers, Multivibrators using IC 555, and V-F conversion with IC 566, and also a Study of various fixed and variable IC Regulators 78XX and 79XX and IC LM317.
- Understanding of non-linear circuits such as log/anti-log amplifiers and also study of Phase Locked Loop (PLL), a topic that covers many important concepts of this paper.

Course Learning Outcomes: At the end of this course, students will be able to

- CO1: Understand basic building blocks of an op-amp and its parameters for various applications design.
- CO2: Elucidate and design the linear and non-linear applications of an op-amp.
- CO3: Understand the working of Multivibrators using IC 555 timer and V-F inter-conversion using special application ICs 565 and 566.
- CO4: Study various fixed and variable IC regulators.

MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
March 2023	2	a. Introduction to operational amplifier and its importance b. Block diagram of an op-amp (IC741) **c.** Concept of differential amplifiers (Dual input balanced and unbalanced output)
	3	a. Constant current bias circuit, b. Current mirror circuit **c.** Cascaded differential amplifier stages with concept of level translator
	4	a. Brief description of Op-Amp parameters b. Input offset voltage, input offset current, input bias current, c. Differential input resistance, input capacitance, offset voltage adjustment range
	5	a. Input voltage range, b. Common mode rejection ratio (CMRR) & supply voltage rejection ratio (SVRR) c. Slew rate d. Class Test

MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
April 2023	1	a. Open and closed loop configuration of op-amp b. Frequency response of an op-amp in open loop and closed loop configurations
	2	a. Inverting, Non-inverting, Summing and Difference amplifier using op-amp b. Ideal and Practical Integrator, Differentiator circuits using op-amp c. Voltage to current converter, Current to voltage converter d. Designing of an amplifier of given gain for an inverting and non-inverting configuration using an op-amp (Practical)
	3	a. Designing of an integrator using op-amp for a given specification and study its frequency response (Practicl) b. Basic comparator using op-amp c. Inverting and Non-Inverting Schmitt Trigger
	4	a. Phase shift oscillator using op-amp b. Wein bridge oscillator using op-amp c. Square wave generator, triangle wave generator, saw tooth wave generator using op-amp d. Designing of a RC Phase Shift Oscillator using op-amp(Practical)
	5	a. Voltage controlled oscillator (IC566) b. Designing of analog adder and subtractor circuit using op-amp(Practical) c. Class Test
MONTH/YEAR	**WEEK**	**TOPICS TO BE TAUGHT**
May 2023	1	a. Introduction to Multivibrators b. IC 555: Block diagram and working c. Astable multivibrator using IC 555 - Circuit diagram and working principle d. Applications of Astable multivibrator e. Study of IC 555 as an astable multivibrator (Practical)
	2	a. Monostable multivibrator using IC 555 Circuit diagram and working principle b. Applications of Monostable multivibrator c. Study of IC 555 as monostable multivibrator (Practical)
	3	a. Phase locked loops (PLL): Block diagram and working of its components b. IC 565- Pin diagram and working c. Designing of a differentiator using op-amp for a given specification and study its frequency response (Practical)
	4	a. Introduction to voltage regulator b. Advantages and disadvantages of Fixed and variable IC regulators c. IC 78xx and IC 79xx series
	5	a. IC LM317-output voltage equation b. Class Test
MONTH/YEAR	**WEEK**	**TOPICS TO BE TAUGHT**
June 2023	1	a. Non-linear application of op-amp b. Log and anti log amplifiers
	2	a. Introduction to filters

		b. Difference between Active and passive filters
	3	a. First order low pass active filter (Butterworth) using op-amp b. First order high pass filter (Butterworth) using op-amp c. Designing of a First Order Low-pass filter using op-amp (Practical)
	4	a. Second order active filters using op-amp b. Designing of Band pass filter, Band reject filter using op-amp c. Designing of a First Order High-pass filter using op-amp (Practical)
	5	a. All pass filter using op-amp b. Class Test
MONTH/YEAR	**WEEK**	**TOPICS TO BE TAUGHT**
July 2023	1	a. Solution of numerical problems
	2	Study Leave
	3	
	4	
	5	

Suggested Books:

1. R.A. Gayakwad, Op-Amps and Linear IC's, Pearson Education (2003)
2. R.F. Coughlin and F.F. Driscoll, Operational amplifiers and Linear Integrated circuits, Pearson Education (2001)