



**DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)**

(Approved by AICTE & Affiliated to Anna University, Chennai)

Re-Accredited by NAAC with 'A' Grade

Accredited by NBA for AERO, BME, CSE, ECE, EEE, IT & MECH.

PERAMBALUR-621212, TAMILNADU, INDIA.

Website: www.dsengg.ac.in



COURSE PLAN

Name of the Faculty				
Designation/Department	ASSISTANT PROFESSOR / ECE			
Course Code/Name	U23ECT42 / LINEAR INTEGRATED CIRCUITS			
Year/Section/Department	II / B / ECE			
Credits Details	L: 3	T: 0	P: 0	C: 3
Total Contact Hours Required	45			

Syllabus:

UNIT I/ BASICS OF OPERATIONAL AMPLIFIERS	No. Of Periods: 9
Current mirror and current sources, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages - and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.	
UNIT II/ APPLICATIONS OF OPERATIONAL AMPLIFIERS	No. Of Periods: 9
Sign Changer, Scale Changer, Voltage Follower, V-to-I and I-to-V converters, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.	
UNIT III/ TIMER CIRCUITS ,VCO AND PLL	No. Of Periods: 9
IC 555 Timer– Astable and Monostable Multivibrators using IC555, Operation of the basic PLL, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.	
UNIT IV/ ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS	No. Of Periods: 9
Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type)	
UNIT V/ WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs	No. Of Periods: 9

Sine-wave generators and Triangular wave generator, IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop - Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Power amplifier, Isolation Amplifier, Opto couplers.

Objective:

- ❖ To introduce the basic building blocks of linear integrated circuits.
- ❖ To learn the linear and non-linear applications of operational amplifiers.
- ❖ To introduce the theory and applications of Timer IC and PLL.
- ❖ To learn the theory of ADC and DAC.
- ❖ To introduce the concepts of waveform generation and introduce some special function ICs.

Text Book:

T1: D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2018, Fourth Edition (UNIT I-V).

Reference Book:

R1: Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH, 2nd Edition, 4th print, 2016.

Website:

- W1: www.youtube.com/watch?v=c1TA0pONnMs
W2: <https://www.youtube.com/watch?v=d3v4Z9dmXS8>
W3: LM723 Voltage Regulator Circuit (theorycircuit.com)
W4: <https://www.youtube.com/watch?v=uIWsthZBAdA>

Online Mode of Study:

- NPTEL:
- ❖ <https://nptel.ac.in/courses/108/108/108108111/>
 - ❖ <https://nptel.ac.in/courses/108/106/108106068/>

Course Plan:

Topic Number	Topic	Reference Detail	Page Number	Mode of teaching	Number of Periods Required	Cumulative Period
UNIT I - BASICS OF OPERATIONAL AMPLIFIERS (9)						
1	Introduction	R1	(R)36-37	BB	1	1
2	Current mirror and current sources	T1,R1	(T)65-69 (R)37-46	BB	1	2
3	Basic information about op-amps -	T1,R1, W1	(T)37-41 (R)98-99	BB	1	3
4	Ideal Operational Amplifier	T1	(T)41-42	BB	1	4
5	General operational amplifier stages -and internal circuit diagrams of IC 741	T1,R1	(T)53-57, (T)85-89 (R)100-106	BB	1	5
6	DC performance characteristics	T1,R1,W2	(T)104-111 (R)112-120	BB	1	6
7	AC performance characteristics	T1,R1,W2	(T)111-123 (R)120-128	BB	1	7
8	Slew rate	T1,R1	(T)123-125 (R)133-134	BB	1	8
9	Open and closed loop configurations	T1, R1	(T)42-52 (R)139-143	BB	1	9
Outcome of Unit I:						
CO1: Design linear and non linear applications of op – amps.						
UNIT II - APPLICATIONS OF OPERATIONAL AMPLIFIERS (9)						
10	Sign Changer, Scale Changer, Voltage Follower	T1,R1	(T)135-140 (R)183	BB	1	10
11	V-to-I and I-to-V converters	T1,R1	(T)146-147 (R)190-193	BB	1	11
12	Instrumentation amplifier	T1,R1	(T)141-143 (R)193-201	BB	1	12
13	Integrator, Differentiator	T1,R1	(T)164-171 (R)203-214	BB	1	13
14	Logarithmic amplifier, Antilogarithmic amplifier	T1,R1	(T)155-159 (R)215-220	BB	1	14

15	Comparators, Schmitt trigger	T1,R1	(T)207-216 (R)231-234 237-239	BB	1	15
16	Precision rectifier, peak detector, clipper and clamper	T1,R1	(T)148-153 (R)240-242 248-251	BB	1	16
17	Low-pass, high-pass and band-pass Butterworth filters	T1,R1	(T)264-282 (R)268-289	BB	2	18

Outcome of Unit II:**CO2: Design** Various op-amp applications.**UNIT III - TIMER CIRCUITS ,VCO AND PLL (9)**

18	IC 555 Timer	T1	(T)311-312	BB	1	19
19	Astable and Monostable Multivibrators using IC555	T1	(T)312-324	BB	2	21
20	Operation of the basic PLL	T1,R1	(T)327-328 (R)415-417	BB	1	22
21	Voltage controlled oscillator	T1,R1	(T)334-336 (R)424-427	BB	1	23
22	Monolithic PLL IC 565	T1,R1	(T)337-342 (R)431-439	BB	1	24
23	Application of PLL for AM detection, FM detection	T1,R1	(T)342-344 (R)439-442	BB	2	26
24	FSK modulation and demodulation and Frequency synthesizing	T1,R1	(T)322-323 &344-345 (R)443-446	BB	1	27

Outcome of Unit III:**CO3: Design** applications using Timer ICs and PLL.**UNIT IV - ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS (9)**

25	Analog and Digital Data Conversions, D/A converter, specifications	T1,R1	(T)366-367 (R)451-456	BB	1	28
26	Weighted resistor type, R-2R Ladder type	T1,R1	(T)349-354 (R)456-464	BB	1	29

27	Voltage Mode and Current-Mode R & 2R Ladder types	R1	(R)464-466	BB	1	30
28	Switches for D/A converters,	R1	(R)466-469	BB	1	31
29	High speed sample-and-hold circuits	T1,R1	(T)153-154 (R)479-480	BB	1	32
30	A/D Converters – specifications - Flash type	T1,R1	(T)358-360 (R)480-488	BB	1	33
31	Successive Approximation type , Single Slope type,	T1,R1	(T)361-363 (R)491-497	BB	2	35
32	Dual Slope type	T1,R1	(T)363-365 (R)498-499	BB	1	36

Outcome of Unit IV:**CO4: Design** ADC and DAC using op – amps.**UNIT V - WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS (9)**

37	Sine-wave generators	T1	(T)222-225	BB	1	37
38	Triangular wave generator	T1,R1	(T)220-222 (R)332-336	BB	1	38
39	IC Voltage regulators – Three terminal fixed and adjustable voltage regulators	T1,R1	(T)241-248 (R)364-368	BB	1	40
40	IC 723 general purpose regulator - Monolithic switching regulator	T1,R1, W3	(T)248-258 (R)372-380 385-389	BB	1	41
41	Low Drop-Out (LDO) registers	W1, W2	-	LCD	1	43
42	Switched capacitor filter IC MF10	T1,R1	(T)298-300 (R)301-305	BB	1	42
43	Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier	T1,R1	(T)336 (R)515-519 530-538	BB	1	44
44	Isolation Amplifier, Opto-couplers	T1,R1, W4	(R)538-556	BB	1	45

Outcome of Unit V:**CO5: Generate** waveforms using OP – AMP Circuits**CO6: Analyze** special function ICs

Course Outcome:

At the end of course: Students should be able to do:

C01: Design linear and non linear applications of op – amps.

C02: Design Various op-amp applications.

C03: Design applications using Timer ICs and PLL.

C04: Design ADC and DAC using op – amps.

C05: Generate waveforms using OP – AMP Circuits

C06: Analyze special function ICs

Course Outcome Vs Program Outcome Mapping:

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
C01	3	3	2	2	2	1	-	-	-	-	-	2	3	2
C02	3	2	3	2	3	-	-	-	-	-	-	2	3	2
C03	2	3	2	2	3	-	-	-	-	-	-	2	3	2
C04	3	3	2	2	3	-	-	-	-	-	-	2	3	3
C05	2	3	2	2	2	-	-	-	-	-	-	2	3	2
C06	3	3	2	2	2	1	-	-	-	-	-	2	3	2
AVG	2.67	2.83	2.17	2	2.5	1	-	-	-	-	-	2	3	2.17

Content beyond Syllabus:

- ❖ Phase Shift Circuits
- ❖ Video Amplifier

Internal Evaluation Components:

Webportal	Assignment	Components	Topic Number with Topic / Unit Details	Relevance to CO
Webportal 1	--	Assessment - I (60)	Unit I and II	CO 1 & CO2
	1	Assignment - Handwritten (20)	6,7: AC and DC characteristics 8: Open and Closed Loop Configurations with Examples	CO1
	2	Assignment - Poster Presentation / * PPT (20)	10-18: Applications of IC741 (Any 5)	CO2
Webportal 2	--	Assessment - II (60)	Unit III and IV	CO3 & CO4
	3	* Seminar (20)	19: Astable and Monostable Multivibrators using IC555 21: VCO 22: Monolithic PLL IC565	CO3
	4	Case Study Report (20)	26: R-2R Ladder type 31: Successive Approximation type 32: Dual Slope type	CO4
Webportal 3	--	Model Exam (75)	Unit I to V	CO1 to CO6
	5	MCQ (15)	Unit I to V	CO1 to CO6
	-	Course Attendance (10)	--	--

*** Note:**

- ❖ Seminar contents should be of minimum 8 pages.
- ❖ PPT contents should be of minimum 24 slides.
- ❖ Each students Seminar and PPT should not be in Unique.

Submission Details:

Phase 1(Before AT 1)		Phase 2 (Before AT 2)		Phase 3 (Model)
Assignment 1	Assignment 2	Assignment 3	Assignment 4	Assignment 5

Google Class Code Details:

Class Name:

PLAN OF ASSESSMENT TEST -DISTRIBUTION OF MARKS:

TEST	CO- MARK WISE DISTRIBUTION						BLOOM'S LEVEL MARK WISE DISTRIBUTION					
	CO1	CO2	CO3	CO4	CO5	CO6	BTL1	BTL2	BTL3	BTL4	BTL5	BTL6
AT-1												
AT-2												
MODEL												

Prepared By

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