

**SARDAR RAJA COLLEGE OF ENGINEERING,
ALANGULAM**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

MICRO LESSON PLAN



SUBJECT : LINEAR INTEGRATED CIRCUITS

CODE : EC2254

CLASS : II Year / IV SEM

STAFF: Ms. S. SUDHA, Asst.Prof,

DEPT. OF ECE.

UNIT-I IC FABRICATION AND CIRCUIT CONFIGURATION FOR LINEAR IC**9**

Advantages of ICs over discrete components – Manufacturing process of monolithic ICs – Construction of monolithic bipolar transistor – Monolithic diodes – Integrated Resistors – Monolithic Capacitors – Inductors. Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, 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**9**

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, 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 ANALOG MULTIPLIER AND PLL**9**

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell - Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, 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**9**

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode 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 - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT - V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3rd Edition, Tata McGraw-Hill, 2007.
2. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.

REFERENCES:

1. B.S.Sonde, System design using Integrated Circuits , New Age Pub, 2nd Edition, 2001
2. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
3. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall / Pearson Education, 4th Edition, 2001.
4. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.
5. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004.
6. K Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006.
7. S.Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.

SUBJECT DESCRIPTION AND OBJECTIVES

DESCRIPTION

Integrated circuits are used in virtually all electronic equipment today and have revolutionized the world of electronics. Computers, mobile phones, and other digital home appliances are now inextricable parts of the structure of modern societies, made possible by the low cost of producing integrated circuits.

1. The first integrated circuits contained only a few transistors. Called "small-scale integration" (SSI), digital circuits containing transistors numbering in the tens provided a few logic gates
2. The next step in the development of integrated circuits, taken in the late 1960s, introduced devices which contained hundreds of transistors on each chip, called "medium-scale integration" (MSI).
3. Further development, driven by the same economic factors, led to "large-scale integration" (LSI) in the mid 1970s, with tens of thousands of transistors per chip.

An operational amplifier (op-amp) is a DC-coupled high-gain electronic voltage amplifier with a differential input and, usually, a single-ended output. An op-amp produces an output voltage that is typically hundreds of thousands of times larger than the voltage difference between its input terminals

All op-amps have basically the same internal structure, which consists of three stages:

1. Differential amplifier — provides low noise amplification, high input impedance, usually a differential output.
2. Voltage amplifier — provides high voltage gain, a single-pole frequency roll-off, usually single-ended output.
3. Output amplifier — provides high current driving capability, low output impedance, current limiting and short circuit protection circuitry.

OBJECTIVE:

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC
- To introduce a few special function integrated circuits.

MICRO LESSON PLAN

Hours	LECTURE TOPICS	READING
UNIT I - IC FABRICATION AND CIRCUIT CONFIGURATION FOR LINEAR IC		
1	Advantages of Ics over discrete components	T2
2	Manufacturing process of monolithic Ics Construction of monolithic bipolar transistor(AV Class)	T2
3	Monolithic diodes – Integrated Resistors –Monolithic Capacitors – Inductors.	T2
4	Current mirror and current sources Current sources as active loads	T2
5	Voltage sources, Voltage References	R7
6	BJT Differential amplifier with active loads	T2
7	General operational amplifier stages -and internal circuit diagrams of IC 741	T2
8	DC and AC performance characteristics	T2
9	Slew rate, Open and closed loop configurations.	T2
UNIT-II APPLICATION OF OPERATIONAL AMPLIFIERS		
10	Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower	T2
11	V-to-I and I-to-V converters, adder, subtractor	T2
12	Instrumentation amplifier, Integrator	T2
13	Differentiator,Logarithmic amplifier	T2
14	Antilogarithmic amplifier	T2
15	Comparators	T2
16	Schmitt trigger, Precision Rectifier	T2
17	Peak detector, clipper and clamper (AV Class)	T2
18	Low pass, high pass and band pass Butterworth filters	T2

Hours	LECTURE TOPICS	READING
UNIT-III ANALOG MULTIPLIER AND PLL		
19	Analog Multiplier using Emitter Coupled Transistor Pair	R2
20	Gilbert Multiplier cell	R2
21	Variable transconductance technique,	R2
22	Analog multiplier ICs and their applications,	R7
23	Operation of the basic PLL, Closed loop analysis,	T2
24	Voltage controlled oscillator,	T2
25	Monolithic PLL IC 565,	T2
26	Application of PLL for AM detection, FM detection,	T2
27	FSK modulation and demodulation and Frequency synthesizing. (AV Class)	T2
UNIT-IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS		
28	Analog and Digital Data Conversions, D/A converter specifications	T2
29	weighted resistor type	T2
30	R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types	T2
31	Switches for D/A converters, high speed sample-and-hold circuits	T2
32	A/D Converters –specifications - Flash type	T2
33	Successive Approximation type (AV Class)	T2
34	Single Slope type	T2
35	Dual Slope type - A/D Converter using Voltage-to-Time Conversion	T2
36	Over-sampling A/D Converters.	T2

UNIT-V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs		
37	Sine-wave generators	T2
38	Multivibrators and Triangular wave generator, Saw-tooth wave generator	T2
39	ICL8038 function generator, Timer IC 555(AV Class)	T2
40	IC Voltage regulators – Three terminal fixed and adjustable voltage regulators	T2
41	IC 723 general purpose regulator	T2
42	Monolithic switching regulator	T2
43	Switched capacitor filter IC MF10,	T2
44	Frequency to Voltage and Voltage to Frequency converters,	R7
45	Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC(AV Class)	R7

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