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## **EC8453 LINEAR INTEGRATED CIRCUITS**

### **DETAILED SYLLABUS**

#### **UNIT I BASICS OF OPERATIONAL AMPLIFIERS**

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, 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 – JFET Operational Amplifiers – LF155 and TL082.

#### **UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS**

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**

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 and clock synchronisation.

#### **UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS**

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 - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.

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## **UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs**

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, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Optocouplers and fibre optic IC.

### **OBJECTIVES:**

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 analog multipliers and PLL

To learn the theory of ADC and DAC

To introduce the concepts of waveform generation and introduce some special function ICs

### **TEXT BOOKS:**

1. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4<sup>th</sup> Edition, Tata Mc Graw-Hill, 2016 (Unit I – V)

### **REFERENCES:**

1. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
3. B.S.Sonde, “System design using Integrated Circuits” , 2nd Edition, New Age Pub, 2001.

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4. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 5<sup>th</sup> Edition, 2009.
5. William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 4<sup>th</sup> Edition, 2001.
6. S. Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH, 2<sup>nd</sup> Edition, 4<sup>th</sup> Reprint, 2016..