JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous) PULIVENDULA

II B.Tech II Semester (E.C.E) **L – T – P – C** **3 – 0 – 0 – 3**

LINEAR INTEGRATED CIRCUITS & APPLICATIONS

COURSE OBJECTIVES:

1. To study differential amplifiers and their characteristics, characteristics of Op-amp and its applications.
2. To understand the operation of op-amp with negative feedback and its frequency response.
3. To design and analyze amplifiers, filters and converters
4. To develop oscillators and Multivibrators using Linear IC's.
5. To learn about various techniques to design A/D and D/A convertors.

UNIT I

Differential Amplifiers: Basic BJT and FET Differential Amplifiers and its qualitative description, Differential amplifier configurations Balanced and unbalanced output differential amplifiers, current mirror, level translator.

Operational Amplifiers: Classification of IC's, Package Types, Op-amp Block diagram, Ideal Op-Amp, Equivalent circuit, Voltage Transfer curve, open loop op-amp configurations, 741 Op-Amp and its features, Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the differential amplifiers and their characteristics.
- Analyze the linear and non-linear applications of operational amplifiers.

UNIT II

OP-AMP with Negative Feedback and Frequency Response: Introduction, feedback configurations, voltage series feedback, voltage shunt feedback and differential amplifiers, properties of Practical op-amp.

Frequency Response: Introduction, compensating networks, frequency response of internally compensated op-amps and non-compensated op-amps, High frequency op-amp equivalent circuit, open loop gain vs frequency, close loop frequency response, circuit stability, slew rate.

Learning Outcomes:

At the end of the unit, the student will be able to

- Learn the feedback configurations of OP-AMP.
- Explain the frequency response of op-amp circuits.

UNIT III

OP-AMP Applications-1

DC and AC amplifiers, peaking amplifiers, summing, scaling and averaging amplifiers, instrumentation amplifier, voltage to current converter, current to voltage converter, integrator,

differentiator, active filters, First, Second and Third order Butterworth filter and its frequency response, Tow-Thomas bi-quad filter.

Learning Outcomes:

At the end of the unit, the student will be able to

- Design and analyze different amplifiers using op-amp.
- Understand the working of converters and filters using op-amp.

UNIT-IV

OP-AMP Applications-2

Oscillators: Phase shift and Wien bridge oscillators, square, triangular and sawtooth wave generators, comparators, Zero crossing detector, Schmitt trigger, Characteristics and limitations.

Specialized applications: 555 timer IC (Monostable& Astable operation) & its applications, PLL operating principles, Monolithic PLL, applications, analog amplifier and phase detection, Wide bandwidth precision analog multiplier MPY634 and its applications.

Learning Outcomes:

At the end of the unit, the student will be able to

- Design oscillators using op-amps.
- Learn the design of Multivibrators and PLL's using timer IC.

UNIT V

Analog to Digital and Digital to Analog Converters: Analog and Digital Data Conversions, D/A Converters – 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..

Learning Outcomes:

At the end of the unit, the student will be able to

- Learn the techniques for designing Digital to Analog Converters.
- Implement Analog to Digital Converters in different methods.

TEXT BOOKS:

1. D.RoyChowdhury, "Linear integrated circuits", 2nd Edition, New Age International (P) Ltd, 2003.
2. Ramakanth A.Gayakwad,"Op-amps and Linear ICs", 4th Edition, PHI, 1987.
3. TL082 Data sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf

REFERENCES:

1. R.F.Coughlin and Fredrick Driscoll, "Op-amps and Linear ICs", 6th Edition, PHI.
2. David A.Bell, "Op-amps and Linear ICs", 2nd Edition, Oxford University press, 2010.

COURSE OUTCOMES:

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

1. Learn about differential amplifiers and their characteristics, characteristics of Op-amp and its applications.
2. Understand the operation of op-amp with negative feedback and its frequency response.
3. Design and analyze amplifiers, filters and converters
4. Develop oscillators and Multivibrators using Linear IC's.
5. Study various techniques to design A/D and D/A convertors.