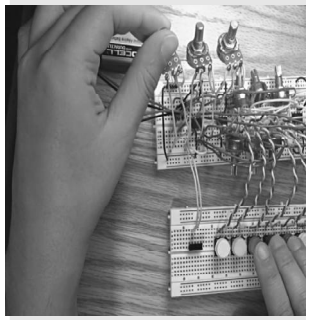
19EE205 ANALOG ELECTRONICS



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Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSE : Basic Electrical and Electronics Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with fundamental concepts of semi-conductor devices and circuits. Along with semi-conductor devices it also deals with the op-amps. The objective of the course is to enable students to hook up and understand working of simple electronic circuits such as clippers, clampers, amplifiers, filters and regulators.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Understand the characteristics of diode, transistors, 555 timer and op-amp.
2	Analyse various rectifier and amplifier circuits.
3	Design sinusoidal and non-sinusoidal oscillators.
4	Apply the knowledge of KVL and KCL to obtain voltage / current waveforms at different points in analog electronic circuits such as diode clippers and clampers.
5	Conduct experiment using analog electronic components to function as amplifier, comparator, rectifier, ADC and DAC.

SKILLS:

- ***ü*** *Analyse the operation of transistor based multistage and feedback amplifiers.*
- ***ü*** *Design of amplifier for specified gain.*
- ***ü*** *Design and analysis of op-amp based function generator.*
- ***ü*** *Realize multivibrator circuits using 555 timer.*

UNIT - I **L - 9**

DIODE CIRCUITS: P-N junction diode, I-V characteristics of a diode, Current equation of diode and temperature variations, Analysis of half-wave and full-wave rectifiers with capacitor filter, Zener diode, Design of voltage regulator using Zener diode, Basic operation of diode clamping circuits and diode clipping circuits.

UNIT - II **L - 9**

TRANSISTORS: BJT: Formation of PNP and NPN transistor, Transistor current components, Transistor as an amplifier-CB, CE and CC configurations with performance comparison.

FET: Working principles and characteristics of JFET and MOSFET.

UNIT - III **L - 9**

TRANSISTOR BIASING (BJT & FET): DC load line, AC load line and selection of operating point, Need for biasing, Various biasing techniques Fixed bias, Collector to base bias and self bias with stability factors; Various compensation circuits, Thermal runaway and thermal stability.

UNIT - IV **L - 9**

OPERATIONAL AMPLIFIERS: Ideal op-amp, Non-idealities in an op-amp, Inverting and non-inverting amplifier, differential amplifier.

LINEAR APPLICATIONS OF OP-AMP: V-I converters, Sample & Hold circuits, Instrumentation amplifier, Integrator, Active filter, P, PI and PID controllers using op-amp.

UNIT - V **L - 9**

NON LINEAR APPLICATIONS: Voltage comparators, Hysteretic comparator, Square-wave and triangular-wave generators; Precision half wave rectifier, Peak detector, Oscillators (Wein bridge and phase shift), 555 timer and its applications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Study of clipping operation.
2. Study of clamping operation.
3. Input and Output Characteristics of BJT.
4. Input and Output Characteristics of MOSFET.
5. Design of oscillator circuits.
6. Design of basic arithmetic circuits such as adder and subtractor.
7. Design of Integrator and differentiator.
8. Design of voltage comparators using op-amp.
9. Design of active LPF/HPFusing op-amp.
10. Design of Astable multi vibrator using op-amp.
11. Schmitt trigger by using BJT/op-amp/555 Timer.

TEXT BOOKS:

1. Ramakant A. Gayakwad, “Op-Amps and Linear - Intergrated Circuits”, 4th edition, PHI, 2000.
2. D. Roy Choudhary and Shail.B.Jain, “Linear Integrated Circuits”, 5th edition, New Age International Publishers, 2018.

REFERENCE BOOKS:

1. R.L. Boylestad and Lovis Nashelsky, “Electronic Devices and Circuits Theory”, 10th edition, Pearson Eduction, 2010.
2. A.S. Sedra and K.C. Smith, “Microelectronic Circuits”, 7th edition, New York, Oxford University Press, 2017.