



Source: <https://www.eletimes.com/the-perennial-role-of-analog-electronics>

## 22EE204 ANALOG ELECTRONICS

Hours Per Week :

L	T	P	C
3	0	2	4

**PREREQUISITE KNOWLEDGE:** 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 understand the working of simple electronic circuits such as clippers, clampers, amplifiers, filters and regulators.

### MODULE-1

#### UNIT-1

**12L+0T+8P=20 Hours**

#### INTRODUCTION TO SEMICONDUCTOR DEVICES:

**Diodes:** Current equation of diode and temperature variations, Analysis of half-wave and full-wave rectifiers with capacitor filter, Clippers and clampers.

**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-2

**12L+0T+8P=20 Hours**

#### TRANSISTOR BIASING (BJT & FET):

DC load line, AC load line and selection of operating point, Need for biasing, Biasing techniques, Thermal runaway and thermal stability.

#### PRACTICES:

- Study of clipping operation.
- Study of clamping operation.
- Input and Output Characteristics of BJT.
- Input and Output Characteristics of MOSFET.

### MODULE-2

#### UNIT-1

**6L+0T+4P=10 Hours**

#### OPERATIONAL AMPLIFIERS:

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

**555 TIMER:** Working and pin diagram of 555 timer.

#### UNIT-2

**18L+0T+12P=30 Hours**

#### APPLICATIONS OF OP-AMP:

**Linear Applications of OP-AMP:** V-I converters, Sample & Hold circuits, Instrumentation amplifier, Integrator, Active filter, P, PI and PID controllers using op-amp.

**Non Linear Applications:** Voltage comparators, Hysteretic comparator, Square-wave and triangular-wave generators; Precision half wave rectifier, Peak detector, Zero crossing Detector, Oscillators (Wein bridge and phase shift), Application of 555 timer.

**PRACTICES:**

- Design of basic arithmetic circuits such as adder and subtractor.
- Design of Integrator and differentiator.
- Design of oscillator circuits.
- Design of voltage comparators using op-amp.
- Design of active LPF/HPF using op-amp.
- Design of Astable multi vibrator using op-amp.
- Schmitt trigger by using BJT/op-amp/555 Timer.

**COURSE OUTCOMES:**

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the characteristics of diode, transistors, 555 timer and op-amp.	Apply	2	1, 2, 3, 4, 9, 11
2	Analyse various rectifier and amplifier circuits.	Analyse	1, 2	1, 2, 3, 4, 9, 11
3	Design sinusoidal and non-sinusoidal oscillators.	Evaluate	2	1, 2, 3, 4, 9, 11
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.	Apply	1, 2	1, 2, 3, 4, 9, 11
5	Conduct experiment using analog electronic components to function as amplifier, comparator, rectifier, ADC and DAC.	Evaluate	1, 2	1, 2, 3, 4, 9, 11

**TEXT BOOKS:**

1. Ramakant A. Gayakwad, "Op-Amps and Linear - Integrated 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 Education, 2010.
2. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", 7th edition, New York, Oxford University Press, 2017.

**SKILLS:**

- ✓ Analyze the signal conditioning circuits
- ✓ Realization of multi vibrator using 555 timer.
- ✓ Analyze the oscillator circuits.