

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ECC206	Analog Circuits	3	1	0	11

**Course Objective**

The objective of the course is to develop an ability to analyze and design electronic circuits using discrete components like BJT, MOSFET and to understand the working of important circuits like amplifiers, oscillators, operational amplifiers and their applications.

**Learning Outcomes**

Upon successful completion of this course, students will:

- acquire a basic knowledge device models and apply them for circuit analysis
- develop the ability to analyze and design analog electronic circuits using discrete components
- be able to design amplifiers and oscillators, current sources etc. based on the performance criteria

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	BJT and MOSFET: Biasing, small signal models (Hybrid- $\pi$ model), input output resistance, frequency response	6+3T	Acquire the techniques for modelling BJT and MOSFET
2	Single stage Transistor amplifiers: Common base, common emitter, common collector, common source, common gate, common drain configuration, Multiple stage amplifiers: CE-CC, CC-CC, Darlington configuration, Cascode configuration	7+2T	Develop the understanding about the circuits and performance of different amplifier configurations
3	Current Sources, Two transistor current source, Basic three transistor current source, Wilson current source, Widlar current source, Active loads, Multi-transistor current mirror, Cascode Current Source, Different MOSFET based current sources	7+2T	Acquire ability to analyze and design Various types of current sources
4	Feedback: Effect of negative feedback, Feedback configurations (series-shunt, series-series, shunt-shunt, shunt-series), loop gain, stability	4+1T	Understanding of the general characteristics of negative-feedback amplifiers and analyze the parameters of various feedback configurations
5	Output stages, Class-A, AB, C and their efficiency. Class-B push pull configuration	6+2T	Understand the features of different classes of amplifiers and analyze their characteristics
6	Operational Amplifier: Internal circuit (input stage, gain stage, level shifter, output stage), Differential amplifier, MOS and BJT differential pair, Large-Signal operation, Small-Signal operation, Non-ideal characteristics of differential amplifier, input offset voltage, input bias and offset currents and OPAMP Applications	12+4T	Knowledge of the internal configuration of an operational amplifier along with its unique features and applications
Total		56	

**Textbook:**

1. Microelectronic Circuits: Theory And Applications, A. S. Sedra, K. C. Smith and A. N. Chandorkar, Oxford University Press (2017)

**Reference Books:**

1. Microelectronics, J. Millman and A. Grabel, McGraw Hill Education (2017)
2. Analysis and Design of Analog Integrated Circuits, P. R. Gray, P. J. Hurst, S. H. Lewis, R. G. Meyer, Wiley (2009)
3. Microelectronics Circuit Analysis and Design, D. Neamen, McGraw-Hill Education (2009)
4. Microelectronics, B. Razavi, Wiley (2018)
5. The Art of Electronics, P. Horowitz and W. Hill, Cambridge University Press; 3 edition (2015)