



CLUSTER UNIVERSITY SRINAGAR

SYLLABUS (FYUP UNDER NEP 2020)

Offered By Department Of ELECTRONICS

Semester 1st (Major Course)

Course Title: Network Analysis & Analog Electronics

Course Code: UGELT22J101

Credits: 4 (Theory: 3, Practical: 1)

Contact Hrs: 75 (Theory: 45, Practical: 30)

Max. Marks 100

Theory External: 60; Min Marks: 24

Theory Internal (Continuous Assessment): 15 Marks, Min Marks: 06

Practical Experimental Basis= 15, Min. Marks: 06

Practical Experimental (Continuous assessment) = 10, Min. Marks: 04

Objectives:

- To develop an understanding of the fundamental laws and elements of electrical circuits.
- To learn the energy properties of electric elements and the techniques to measure voltage and current.
- To design and implement different Applications on Software.
- To assemble a collection of interconnected circuit elements that perform a specific objective function.
- To allow an electric current to pass in one direction, while blocking it in the opposite direction.
- To establish a DC level from a sinusoidal input signal that has zero average level.
- *To maintain a specific voltage across its terminals within given limits of line or load change.*
- *To learn the regulation of current or voltage flow in addition amplifying and generating these electrical signals and acting as a switch/gate for them.*
- To increase the signal strength in a Television or radio receiver.
- To produce an output signal larger than that of the input signal.
- To control the output of electronic devices, such as amplifiers.
- To generate signals in computers, wireless receivers and transmitters, and audio-frequency equipment, particularly music synthesizers.
- To control the signal from the microcontroller to external receivers.

Learning Outcomes:

By the end of this course, the students will be able:

- To find all the currents and voltages in a network of connected components.
- To use basic electrical DC concepts and theorems to analyze circuits.
- To build and simulate electrical DC circuits and perform measurements with electronic test equipment.
- To reduce the risk a facility could face and help avoid catastrophic losses.
- To evaluate the application of protective devices and equipment.
- To recognize types of diodes, explain basic terms related with diodes and tell the operating principle of diodes.
- To understand *that the voltage across Zener diode remains constant despite a larger variation in current.*
- To learn the function of BJT as a switch or to amplify, filter, and rectify power.
- To understand the basics of electronics communication and types of communication.
- To understand that cascading Increases lower cutoff and decreases higher cutoff frequency hence bandwidth decreases.
- To use feedback for better output production.
- To control the output of electronic devices, such as amplifiers.
- To understand that Sinusoidal Oscillators can generate sinusoidal signals of very high frequencies.
- To understand the concepts, basic operation, steady state operation of efficient switched- mode power conversion techniques, including basic circuit operation and magnetic design.

Unit-I

15 Hrs

Circuit Analysis: Concept of Voltage and Current Sources. Passive Components, Kirchhoff's Current Law, Kirchhoff's Voltage Law. Current & Voltage Division Theorem, Mesh Analysis. Node Analysis. Star and Delta networks, StarDelta, Conversion. Principal of Duality. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem.

Unit-II**15 Hrs**

Junction Diode and its applications: PN junction diode (Ideal and practical)- Construction, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, dc load line analysis, Quiescent (Q) point, Zener diode, Reverse saturation current, Zener and avalanche breakdown. Rectifiers- Half wave rectifier, Full wave rectifiers (Centre tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. Filters; Shunt capacitor filter, its role in power supply, output waveform, and working. Regulation- Line and load regulation, Zener diode as voltage regulator.

Unit-III**15 Hrs**

Bipolar Junction Transistor and Amplifiers: Transistor Concepts, Construction & Working (PNP & NPN). Characteristics of transistor in CE, CB & CC Configurations. Regions of operation (active, cut off and saturation), Current gains α and β . Relations between α and β . dc load line and Q point. Transistor biasing circuits- Fixed Bias and Voltage Divider Bias, Thermal Stability and Stability Factor.

Unipolar Devices: JFET: Construction, Working and I-V characteristics (output and transfer), Pinchoff voltage.

MOSFET: Types, Construction, Working and I-V characteristics.

PRACTICALS (Lab Course: Network Analysis and Analog Electronics)**30 Hrs**

At least 06 experiments from the following list:

1. To familiarize with basic electronic components (R, C, L, diodes, transistors), digital Multimeter, Function Generator and Oscilloscope.
2. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.
3. Verification of (a) Thevenin's theorem and (b) Norton's theorem.
4. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem.
5. Verification of the Maximum Power Transfer Theorem.
6. Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
7. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR).
8. Study the effect of (a) C- filter and (b) Zener regulator on the output of FWR.
10. Study of the output and transfer I-V characteristics of common source JFET.
11. Study of the I-V Characteristics of MOSFET.

Recommended Books:

- Introduction to Electric Circuits, Richard Dorf and James Svoboda, Wiley
- Electronics Fundamentals; Circuits, Devices and Applications, Thomas Floyd and David Buchla, Pearson
- Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press
- Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
- Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press