Semester I

ELECTRONICS-DSC 1A: NETWORK ANALYSIS AND ANALOG ELECTRONICS

(Credits: Theory-04, Practicals-02)
Theory: 60 Lectures

UNIT I

Circuit Analysis: Concept of Voltage and Current Sources. Passive Components, Kirchhoff's Current Law, Kirchhoff's Voltage Law. Current & Voltage Division Theorm, 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. Two Port Networks: h, y and z parameters and their conversion.

(15 Lectures)

UNIT II

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. Qualitative idea of Schottky diode. 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.

(15 Lectures)

UNIT III

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 and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor S. Transistor as a two port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains. Class A, B and C Amplifiers.

(15 Lectures)

UNIT IV

Cascaded Amplifiers: Two stage RC Coupled Amplifier and its Frequency Response.
Feedback in Amplifiers: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only).
Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Determination of Frequency, Conditions of oscillation.
Unipolar Devices: JFET. Construction, working and I-V characteristics (output and transfer), Pinchoff voltage.UJT, basic construction, working, equivalent circuit and I-V characteristics.

(15 Lectures)

Recommended Books:

- 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
- Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
- J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)

ELECTRONICS LABORATORY DSC 1A

LAB: N E T W O R K ANALYSIS AND ANALOG LECTRONICS

60 Lectures

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.
9. Study of the I-V Characteristics of UJT and design relaxation oscillator.
10. Study of the output and transfer I-V characteristics of common source JFET.
11. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
12. Design of a Single Stage CE amplifier of given gain.
13. Study of the RC Phase Shift Oscillator.
14. Study the Colpitt`s oscillator.