1st SEMESTER
DISCIPLINE SPECIFIC COURSE (CORE-1)

ELT116C: ELECTRONICS: NETWORK ANALYSIS AND ANALOG ELECTRONICS

CREDITS: THEORY-04, PRACTICAL-02
MAX. MARKS: THEORY: 60; PRACTICAL: 30
MIN. MARKS: THEORY: 24; PRACTICAL: 12

THEORY: 60 LECTURES

Unit-I: Circuit Analysis

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Star and Delta networks, Star-Delta 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. **(12 Lectures)**

Unit-II: Semiconductor Devices-I

Junction Diode and its applications: PN junction diode (Ideal and practical) - I-V characteristics, dc load line analysis, Quiescent (Q) point. Zener diode, Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. Zener diode as voltage regulator, Introduction to Tunnel diode, metal contact diode **(15 Lectures)**

Unit-III: Semiconductor Devices - II
Bipolar Junction Transistor: Review of the characteristics of transistor in CE and CB 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. Unipolar Devices: JFET and MOSFET. Construction, working and I-V characteristics (output and transfer), Pinch- off voltage. **(15 Lectures)**

Unit-IV: Amplifiers and Oscillators

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. Cascaded Amplifiers, two stage RC Coupled Amplifier and its Frequency Response. Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only). Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Determination of Frequency and Condition of oscillation. **(18 Lectures)**

REFERENCE BOOKS:

1. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
2. Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
3. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
4. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
5. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
6. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
7. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
8. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline.

PRACTICAL: 2 CREDITS (60 HOURS) – 30 MARKS

AT LEAST 10 EXPERIMENTS FROM THE FOLLOWING

1. To familiarize with basic electronic components (R, C, L, diodes, transistors),
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.

REFERENCE BOOKS:

1. Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India.
2. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
3. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation.