**Amended Course as passed by the Subject Committee Meeting held on Feb. 29, 2004.**

**ELX 213.3 Electronic devices (3-1-2)**

| | Theory | Practical | Total |
|---|---|---|---|
| Sessional | 30 | 20 | 50 |
| Final | 50 | - | 50 |
| Total | 80 | 20 | 100 |

**Course objectives:**

1. To understand the basics and working principles of electronic devices.
2. To provide a method for analysis of Semiconductor devices.

**Course Contents:**

**1. Non-Linear Model (4 hrs)**

Basic properties of non-linear elements, Bon-linear circuit analysis. Analysis using KVL and KCL methods. Graphical analysis method, Piecewise linear modeling. Use and application of SPICE in analysis.

**2. Semiconductor diode (9 hrs)**

Review of conduction in semiconductors. Theory of p-n junction. Band structure of p-n junction. The p-n junction as diode, the effects of temperature in V-1 characteristics. Space – charge of transition region capacitance and its effects. Difffusion capacitance. Diode switching times. Zener diode, tunnel diode, construction, Characteristics and Applications of Schottky diode. Varactor diode and Metal Oxide Varister.

**3. Bi-polar Junction Transistor (BJT)**

Construction of a BJT, The EBERS-Moll equations. Current components. Analytical expression of transistor characteristics, BJT switching time. Maximum voltage rating. Avalanche effect, Reach – through. The transistor as an amplifier. CB. CE and CC configurations.

**4. BJT biasing and Thermal Stabilization (2 hrs)**

Types of biasing, Bias stability Bias compensation, thermal runway and stability.

**5. The Small Signal Low Frequency Analysis Model of BJT (8 hrs)**

Low frequency hybrid model, Transistor configurations and their hybrid model measurement of h-parameters, analysis of a transistor amplifier circuit using h-parameters Low frequency $r_e$ model, amplifier configuration and their expression for voltage gain, current gain, input impedance and output impedance using re model, analysis of transistor amplifier circuit using $r_e$ model.

**6. The High Frequency model of BJT (2 hrs)**

High frequency model (t-model), transistor configurations and their high frequency model, high frequency current gain.

**7. The Junction Field Effect Transistor (JFET) (6 hrs)**

Construction and types of JFET, the pinch-off voltage and its importance. Biasing and load line. V-I characteristics, Configuration of JFET, Small signal model and analysis generalized FET Amplifier, Uni-junction transistor

**8. The Metal Oxide Semiconductor (2 hrs)**

Construction and types, load line and biasing, V-I characteristics. Small model and analysis.

**9. Clippers, Champers and Rectifiers (6 hrs)**

Diode clipper and Champers, Rectifier, half wave and full wave. Ripple factor harmonic components, filters, inductor and capacitor filters-section an PI section filters.

**Laboratory:**

1. Familiarization with equipment.
2. Measurement of characteristics of pn Diode and Zener diode.
3. Study of half wave and full wave rectifier circuits.
4. Measurement of input and output characteristics of CB, CE and CC configurations.
5. Measurement of input and output characteristics of JFET.
6. Measurement of input and output characteristics of nMOS.
7. Measurement of input and output characteristics ofCMOS.

**Reference Books:**

1. S. Sedra and KC. Smith. Microelectronics Circuits. Holt, Rinebart and Winston Ine., New York.
2. MN. Horenstein, Microelectronic Circuits and Devices, second edition, Prentice Hall 0on India.
3. J. Millman and Halkias, Electronics Devices and Circuits, McGraw Hill.

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