Electronic Devices and Circuits
BEG230EC

Year: II   **Semester: III**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	25	80	-	125

Course Objective: To introduce students about the working principles and applications of semi-conductor devices such as diodes, transistors, and FETs.

Course Contents:

1. **Semiconductor diode**   [8 hrs]
   - 1.1 Review of p-n junction diode
   - 1.2 Analysis of diode circuits
   - 1.3 Applications of p-n junction diode
     - 1.3.1 Clipping and Clamping circuits
     - 1.3.2 Rectification (half wave, full wave and bridge rectifier)
   - 1.4 Types of diode (Schottky, varactor, tunnel, zener)
   - 1.5 Zener diode as a voltage regulator

2. **Bipolar Junction Transistor**   [18hrs]
   - 2.1 Construction of a BJT
   - 2.2 Ebers-Molls Equation
   - 2.3 Basic Transistor Equation
   - 2.4 CB, CC, CE Configurations
   - 2.5 Load line analysis
   - 2.6 Transistor as an amplifier
   - 2.7 Types of biasing
   - 2.8 Biasing stabilization and thermal runaway
   - 2.9 Small signal analysis (h-parameter and r_e' model)
   - 2.10 High Frequency t-model

3. **Applications of BJT**   [11hrs]
   - 3.1 Power amplifiers (Class A, B, C, AB and efficiency calculation)
   - 3.2 BJT as a switch
   - 3.3 Cascaded amplifier (Single stage and multistage)
   - 3.4 Untuned amplifier
     - 3.4.1 Frequency and phase response of RC coupled amplifier
   - 3.5 Differential Amplifiers

4. **Field Effect Transistors**   [8hrs]
   - 4.1 **Junction field effect transistor (JFET)**
     - 4.1.1 Construction and characteristics
     - 4.1.2 Biasing of JFET
     - 4.1.3 Small signal analysis of JFET
     - 4.1.4 UJT as an oscillator
   - 4.2 **MOSFET**
     - 4.2.1 Construction, characteristics and types
     - 4.2.2 Biasing of MOSFET
     - 4.2.3 NMOS (Depletion and enhancement type)
     - 4.2.4 Introduction to CMOS

Practicals (In Trainer kits, Multisim and P-Spice):

1. Measurement of characteristics of diode, zener diode
2. Rectifier circuits
3. Measurement of input and output characteristics of CE configurations
4. Single stage BJT amplifier
5. Measurement of input and output characteristics of JFET
6. Measurement of input and output characteristics of MOSFET

Reference Books:

1. A. S. Sedra & K. C. Smith, *"Microelectronic Circuits"*, 6th Edition, Oxford University Press
2. Theodorre S. Bogart, *"Electronic Devices and Circuits"*
3. Millman & Halkias, *"Electronic Devices and Circuits"*, McGraw Hill
4. Robert Boylestad, *"Electronic Devices and Circuits"*
5. M. N. Horenstein, *"Microelectronic Circuits and Devices"*, Second Edition, Prentice Hall