

**Course Name:** Electrical and Electronics Engineering Group

**Course Code:** EE/EP/ET/EJ/EN/EX/IE/IS/IC/DE/MU/ICD/ED/EI

**Semester:** Third

**Subject Title:** Basic Electronics

**Subject Code:** 9034

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	Paper Hrs.	TH	TEST	PR	TW	TOTAL
04	--	02	3	80	20	50#	25@	175

**Rationale:**

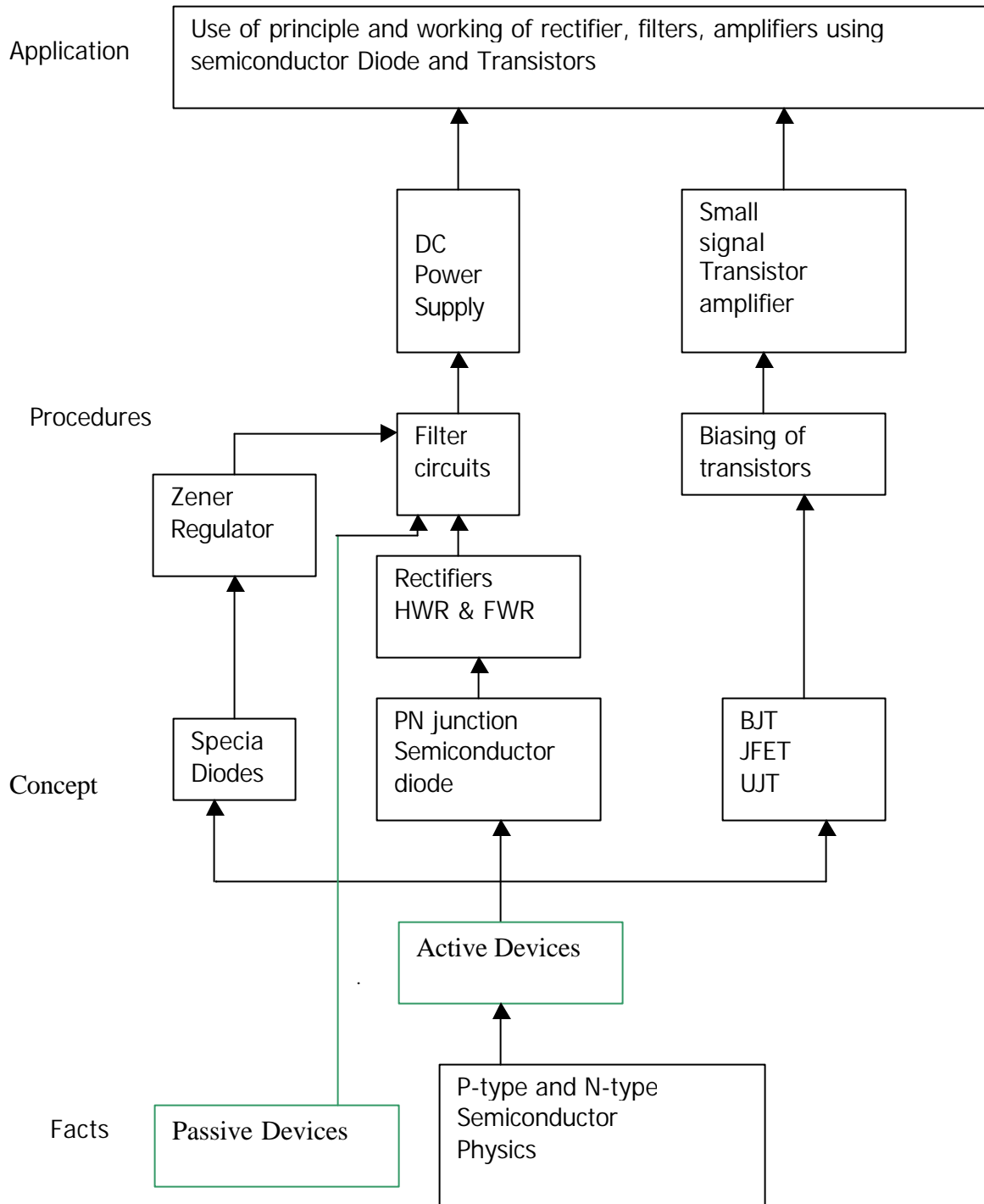
Electronics Plays major in our day to day life. In each and every field, electronics systems are used. Basic electronics is one of the subjects which is the base of all advance electronics. It starts with PN junction which makes the student to follow the functioning of all semiconductor based electronics. This is a core group subject and it develops cognitive and psychomotor skills.

**Objectives:**

Student will be able to:

- 1) Describe the formation of PN junction.
- 2) Draw the characteristics of basic components like diode, transistor etc.
- 3) Draw and describe the basic circuits of rectifier, filter, regulator and amplifiers.
- 4) Know voltage amplifiers.
- 5) Test diode and transistors.
- 6) Read the data sheets of diode and transistors.

## Learning Structure:



## Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	<p><b>1.1 Semiconductor diode</b></p> <p>1.1.1 Rectifying diode Review of P-type and N-type semiconductor Junction of P-type &amp; N-type i.e. PN junction Barrier voltage , depletion region ,Junction Capacitance</p> <p>1.1.2 Forward biased &amp; reversed biased junction Diode symbol , circuit diagram for characteristics (forward &amp; reversed ) Characteristics of PN junction diode</p> <p>1.1.3 Specifications:- Forward voltage drop , Reversed saturation current, maximum forward current , power dissipation Package view of diodes of different power ratings (to be shown during practical hours)</p> <p><b>1.2 Zener Diode:</b> construction ( reference to doping level )</p> <p>1.2.1 Symbol , circuit diagram for characteristics ( forward &amp; reversed )</p> <p>1.2.1 Avalanche &amp; zener breakdown</p> <p>1.2.3 Specifications:- Zener voltage , power dissipation , break over current, dynamic resistance &amp; maximum reverse current</p> <p><b>1.3 Special Diodes:</b> Point contact diode , Schottky diode</p> <p><b>1.4 Optical Diodes:</b> LED, IRLED, photo diode, laser diode. Symbol, operating principle &amp; applications of each.</p>	12	16
02	<p><b>2.1 Rectifiers &amp; Filters</b> Need of rectifier , definition</p> <p>2.1.1 Types of rectifier – Half wave rectifier, Full wave rectifier (Bridge &amp; centre tapped )</p> <p>2.1.2 Circuit operation: Input/output waveforms for voltage &amp; current, Average (dc) value of current &amp; voltage ( no derivation), Ripple , ripple factor , ripple frequency , PIV of diode used , transformer utilization factor , efficiency of rectifier.</p> <p>2.1.3 Comparison of three types of rectifier</p> <p>2.1.4 Need of filters Types of filters A] shunt capacitor B] Series inductor C] LC filter D] p filter</p> <p>2.1.5 Circuit operation, dc output voltage , ripple factor (formula) , ripple frequency , Dependence of ripple factor on load . Input/output waveforms , limitations &amp; advantages</p>	10	12

3	<p><b>Transistors</b></p> <p><b>3.1] Bipolar Junction Transistor(BJT)</b>  Introduction , Basic concept</p> <p>3.1.1 Types of transistors , structure &amp; symbols  Transistor operation  Conventional current flow , relation between different currents in transistor</p> <p>3.1.2 Transistor amplifying action  Transistor configurations:- CB , CE &amp; CC  Circuit diagram to find the characteristics  Input/output characteristics</p> <p>3.1.3 Transistor parameters- input resistance, output resistance, <math>\alpha</math>, <math>\beta</math> &amp; relation between them.  Comparison between three configurations</p> <p>3.1.4 Transistor specifications:  <math>V_{CE\text{ Sat}}</math> , <math>I_{C\text{ Max}}</math> , <math>V_{CEO}</math> , <math>I_{CEO}</math> , <math>\alpha</math> , <math>\beta</math> <math>V_{CE\text{ Breakdown}}</math> , Power dissipation ( to be explained during practical using data sheets)</p> <p>3.1.5 Testing of transistor using multimeter( To be shown during practical)</p> <p>3.1.6 Construction, working principle, characteristics of Photo transistor  Introduction to opto-coupler</p> <p><b>3.2] Unipolar Transistor (JFET)</b>  Construction, working principle &amp; characteristics.</p> <p><b>3.3] Unijunction Transistor(UJT)</b>  Construction, working principle&amp; characteristics.</p>	12	16
04	<p><b>Biasing of BJT</b></p> <p>4.1 Introduction , need of biasing , concept of dc load line, selection of operating point (Q point) , need of stabilization of Q point, ( thermal run away concept)</p> <p>4.2 Types of biasing circuits  A] Fixed biased circuit  B] Base biased with emitter feed back  C] Base biased with collector feed back  D] Voltage divider  E] Emitter biased</p> <p>4.3 Circuit operation of each circuit.</p> <p>4.4 Introduction to two port n/w  Hybrid model for CE</p>	10	12

05	<p><b>Regulated Power Supply</b></p> <p>5.1 What is a regulator?</p> <p>5.1.1 Need of regulators , voltage regulation factor</p> <p>5.1.2 Concept of load regulation &amp; line regulation</p> <p>5.1.3 Basic zener diode voltage regulator</p> <p><b>5.2 Linear Regulators</b></p> <p>5.2.1 Basic block diagram of dc power supply</p> <p>5.2.2 Transistorised series &amp; shunt regulator – circuit diagram &amp; operation</p> <p>5.2.3 Regulator IC's – 78xx,79xx, 723 as fixed , variable &amp; dual regulator.</p>	08	08
06	<p><b>Small Signal Amplifiers</b></p> <p>6.1 Concept of amplification</p> <p>6.1.1 Small signal amplifier using BJT</p> <p>6.1.2 Graphical analysis</p> <p>6.1.3 Determination of current , voltage &amp; power gain , Input &amp; output resistance , phase shift between input &amp; output.</p> <p>6.1.4 AC Load Line</p> <p>6.1.5 Function of input &amp; output coupling capacitors &amp; criteria for the value selection.</p> <p>6.1.6 Function of emitter bypass capacitor &amp; its value selection.</p> <p>6.2 AC equivalent circuit of transistor CE amplifier.</p> <p>6.3 Single stage CE amplifier with voltage divider bias. Its explanation.</p> <p>6.4 Frequency response of single stage CE Amplifier, Bel, Decibel unit. Bandwidth &amp; its significance. Effect of coupling &amp; emitter bypass capacitor on bandwidth.</p> <p>6.5 Introduction to CB &amp; CC amplifier &amp; List of applications.</p> <p>6.6 Cascade Amplifiers ( Multistage Amplifier)</p> <p>6.6.1 Need of Multistage Amplifiers, Gain of amplifier.</p> <p>6.6.2 Types of amplifier coupling – RC, transformer &amp; Direct coupling.</p> <p>6.6.3 Two stage amplifier circuit diagram, working, frequency Response, merits &amp; demerits &amp; applications of each.</p>	12	16
Total		64	80

**Practical:**

Skills to be developed:

Intellectual Skills:

1. Identification and selection of components
2. Interpretation of circuits
3. Understand working of Regulated dc power supply

Motor skills:

1. Ability to draw the circuits
2. Ability to measure various parameters
3. Ability to test the components using multimeter
4. Follow standard test procedures

**List of Practical:**

- 1] To plot Forward & Reverse biased characteristics of diode.
- 2] To plot Forward & Reverse biased characteristics of Zener diode.
- 3] To Study the Rectifiers a] Half wave b] Full wave & draw i/p & o/p wave forms.
- 4] To Study the filter circuits. a] Capacitor Filter b] Inductor filter & draw wave forms
- 5] To Plot Input & output characteristics of transistor in CE mode.
- 6] To Plot Input & output characteristics of transistor in CB mode.
- 7] To Plot Characteristics of FET.
- 9] To Plot Characteristics of UJT.
- 10] To study the Zener Diode as Regulator & calculate load regulation.
- 11] To study Transistor series and shunt regulator.
- 12] To study Single stage common emitter amplifier & plot its frequency response.
- 13] To study Two stage RC coupled amplifier & plot its Frequency response.

**Learning Resources:**

**Books:**

Sr.No	Author	Title	Publisher
01	N.N.Bhargava, D.C. Kulashreshtha, S.C. Gupta - TTTI Chandigarh	Basic Electronics & Linear Circuits	Tata McGraw Hill
02	Alberrt Malvino David J.Bates	Electronic Principles	Tata McGraw Hill
03	Allen. Mottershead	Electronic Devices & Components'	Prentice Hall of India
04	NIIT	Basic Electronics & Devices	Prentice Hall of India
05	Grob Bernard	Basic Electronics	Tata McGraw Hill
06	David J. Bell	Electronics Devices & Circuits	Prentice Hall of India