

**GOVERNMENT POLYTECHNIC, PUNE****(An Autonomous Institute of Govt. of Maharashtra)**

<b>Programme</b>	:	<b>Diploma in ET/CE/EE//ME/MT/CM/IT/DDGM</b>
<b>Programme Code</b>	:	<b>01/02/03/04/05/06/07/08/21/22/23/24/26/16/17</b>
<b>Name of Course</b>	:	<b>Basic Electronics</b>
<b>Course Code</b>	:	<b>ET 281</b>

**Teaching Scheme:**

	<b>Hours /Week</b>	<b>Total Hours</b>
<b>Theory</b>	<b>04</b>	<b>64</b>
<b>Practical</b>	<b>02</b>	<b>32</b>

**Evaluation Scheme:**

	<b>Progressive Assessment</b>	<b>Semester End Examination</b>			
		<b>Theory</b>	<b>Practical</b>	<b>Oral</b>	<b>Term work</b>
<b>Duration</b>	<b>Three class tests, each of 60 minutes</b>	<b>3 hrs.</b>	<b>3 hrs.</b>	<b>--</b>	<b>--</b>
<b>Marks</b>	<b>20</b>	<b>80</b>	<b>50</b>	<b>--</b>	<b>25</b>

**Course Rationale:**

Identify types of components and understand construction, working principle, specifications and applications.

**Course Objectives:**

After studying this course, the student will be able to

•	Identify types of components and understand construction, working principle , Specifications and applications.
•	Describe the formation of PN junction.
•	Draw the characteristics of basic components like diode, transistor etc.
•	Draw and describe the basic circuits of rectifier, filter, regulator and amplifiers.
•	Read the data sheets of diode and transistors
•	Explain construction, working, characteristics and applications of semiconductor devices and circuits.

**Course Content:**

Chap. No.	Name of Topic/Sub topic	Hrs	Marks
1	<b>Passive Components</b>		
	<b>1.1 Resistor:</b> <ul style="list-style-type: none"> <li>• Classifications of resistors, material used for resistor.</li> <li>• General specification of resistor- maximum voltage rating, power rating,</li> <li>• Application of resistors.</li> <li>• Colour coding: with three, four &amp; five bands</li> <li>• Potentiometer : linear and logarithmic</li> <li>• constructional diagram, specifications, applications of carbon and wire wound resistor</li> </ul>	<b>16</b>	<b>18</b>
	<b>1.2 Capacitor :</b> <ul style="list-style-type: none"> <li>• Classification of capacitor, dielectric materials used in capacitor</li> <li>• Capacitor specifications: working voltage, capacitive reactance, frequency characteristic</li> <li>• Fixed capacitor : specifications &amp; applications</li> <li>• Electrolytic capacitor: constructional diagram &amp; working</li> <li>• Variable capacitors: requirement of variable capacitor, construction, working, specification of air gang, PVC gang capacitor, trimmer capacitor</li> <li>• Coding of capacitors using numerals, colour band system</li> </ul>		
	<b>1.3 Inductor:</b> <ul style="list-style-type: none"> <li>• Introduction of magnetic materials- Ferromagnetic &amp; ferrimagnetic.</li> <li>• B-H curve, hard &amp; soft magnetic material, concept of Hysteresis, permeability,</li> <li>• Faradays law of electromagnetic induction, self &amp; mutual induced emf.</li> <li>• Induction – Definition &amp; expression (with simple derivation) of self inductance, mutual inductance, coefficient of coupling, Q factor, inductive Reactance.</li> <li>• Constructional diagram &amp; application of Air core, iron core &amp; ferrite core,</li> </ul>		
2	<b>Semiconductor Diodes</b>		
	<ul style="list-style-type: none"> <li>• <b>2.1 P.N. Junction Diodes</b></li> <li>• Working principle &amp; circuit diagram</li> <li>• characteristic of PN junction diode,</li> <li>• Specification, Static &amp; dynamic resistance, forward voltage drop, maximum forward current power dissipation.</li> </ul>	<b>16</b>	<b>20</b>
	<b>2.2 Zener diode</b>		

		<ul style="list-style-type: none"> <li>• Symbol &amp; Working principle</li> <li>• circuit diagram and characteristics of Zener diode</li> <li>• Specification: Zener voltage, power dissipation, dynamic resistance</li> </ul>		
		<b>2.3 Special Diodes</b> <ul style="list-style-type: none"> <li>• Construction, symbol &amp; applications of</li> <li>• PIN diode</li> <li>• Schottky diode</li> <li>• Tunnel diode</li> </ul>		
		<b>2.4 Optical diodes</b> <ul style="list-style-type: none"> <li>• Construction, symbol, operating principle &amp; applications of</li> <li>• LED,</li> <li>• LDR</li> <li>• Photodiode</li> </ul>		
<b>3</b>		<b>Rectifiers and Filters</b>		
		<b>3.1 Rectifiers</b> <ul style="list-style-type: none"> <li>• Need of rectifiers. Types of rectifiers : HWR,FWR (bridge and centre tap) circuit operation I/O waveforms for voltage &amp; current</li> <li>• Parameters of rectifier (without derivation) Average DC value of current &amp; voltage, ripple factor, ripple frequency, PIV of diode, TUF, efficiency of rectifier</li> <li>• Comparison of three types of rectifiers</li> </ul>		
		<b>3.2 Filters</b> <ul style="list-style-type: none"> <li>• Need of filters</li> <li>• Circuit diagrams, operation and input-output waveforms of following types of filters</li> <li>• Shunt capacitor</li> <li>• Series inductor</li> <li>• LC filter</li> <li>• <math>\pi</math> filter</li> </ul>	<b>10</b>	<b>14</b>
<b>4</b>		<b>Wave shaping Circuit</b>		
		<b>4.1 Linear wave shaping circuit</b> <ul style="list-style-type: none"> <li>• Need of wave shaping circuits,</li> <li>• comparison between linear and non-linear wave shaping circuits</li> <li>• Operations of wave shaping circuits</li> <li>• Linear circuits: RC Integrator &amp; differentiator</li> </ul>	<b>10</b>	<b>12</b>

		<b>4.2 Non linear wave shaping circuits</b> <ul style="list-style-type: none"> <li>• Circuit diagram, operation, waveforms of different types of clippers using diodes: series, shunt, (biased and unbiased)</li> <li>• Circuit diagram, operation, waveforms of different types of clampers: positive and negative</li> </ul>		
5	<b>Transistors</b>			
	5.1	<b>Bipolar junction transistor(BJT)</b> <ul style="list-style-type: none"> <li>• Basic concept,</li> <li>• Types of transistors ,</li> <li>• Structure &amp; symbols Transistor operation, Conventional current flow.</li> <li>• Transistor configurations:- CB , CE &amp; CC &amp; their characteristics.</li> <li>• Transistor parameters- input resistance, output resistance, <math>\alpha</math>, <math>\beta</math> &amp; relation between them. Comparison between three configurations</li> </ul>	06	08
6	<b>Regulators</b>			
	6.1	<b>Regulators</b> <ul style="list-style-type: none"> <li>• What is regulator?</li> <li>• Need of regulators</li> <li>• voltage regulation factor</li> <li>• Concept of load regulation &amp; line regulation</li> <li>• Basic zener diode voltage regulator</li> </ul>	06	08
	6.2	<b>Linear Regulators</b> <ul style="list-style-type: none"> <li>• Basic block diagram of dc power supply</li> <li>• Transistorized series &amp; shunt regulator – circuit diagram &amp; operation.</li> <li>• Regulator IC's – 78xx, 79xx, 723 as fixed, variable &amp; dual regulator. Pin diagrams , (only introduction)</li> </ul>		
	<b>Total</b>		<b>64</b>	<b>80</b>

**List of Practicals/Experiments/Assignments:**

<b>Sr. No.</b>	<b>Name of Experiment/Assignment</b>
1	Compute values of resistors by multimeter and colour coding
2	Identify & test fixed and variable capacitors.
3	Identify & test inductors 5 inductor of different types.
4	Verify the performance of LDR and to draw its characteristics
5	Identify & test IC's (analog & digital)
6	Forward & Reverse characteristics of diode (1N4001 , BY127, 1N4007)
7	Forward & Reverse characteristics of Zener diode
8	Zener as voltage regulator.
9	Study of Rectifiers a] Half wave b] Full wave ( Center tapped & Bridge ) (Waveforms, AC (r.m.s.) voltage at input, AC (r.m.s.) voltage at out put , D.C. output voltage, Ripple factor, PIV.)
10	Study of filter circuits. a] Capacitor Filter b] Inductor filter. (Using rectifier circuits. Measurement of Vac, Vdc)
11	Draw outputs for positive, negative and combinational clippers from C.R.O.
12	Draw the outputs waveforms of positive and negative clampers from C.R.O.
13	Plot frequency response of RC integrator and differentiator circuits.
14	Input & output characteristics of transistor in CB mode. (Measurement of $\alpha$ , $\alpha$ D.C. & R0 )
15	Input & output characteristics of transistor in CE mode. (Measurement of $\beta$ , $\beta$ D.C. & R0)

**Note:** Any 10 Practical's from above list.

**Instructional Strategy:**

<b>Sr. No.</b>	<b>Topic</b>	<b>Instructional Strategy</b>
1	Passive Components	Classroom teaching and laboratory work.
2	Semiconductor Diodes	Classroom teaching and laboratory work.
3	Rectifiers and Filters	Classroom teaching and laboratory work.
4	Wave shaping Circuit	Classroom teaching and laboratory work.
5	Transistors	Classroom teaching and laboratory work.
6	Regulators	Classroom teaching and laboratory work.

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**Text Books:**

Sr. No	Author	Title	Publication
1	R.S.Sedha	Applied Electronics.	
2	Albert Malvino.	Basic Electronics.	Tata McGraw Hill
3	B.L.Theraja.	Basic Electronics.	S.Chand.
4	N.N.Bhargava, D.C. Kulashreshtha, S.C. Gupta - TTTI	Basic Electronics & Linear Circuits	Tata McGraw Hill
5	Grob Bernard	Basic Electronics	Tata McGraw Hill
6	David J. Bell	Electronics Devices & Circuits	Prentice Hall of India

**Reference Books:**

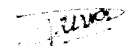



No	Author	Title	Publication
1.	Mottershed	Electronics Devices and Circuits.	Prentice Hall of India
2.	Milmann Halkies	Electronics Devices and Circuits.	Tata McGraw Hill

**Learning Resources:** 1. Reference Books, 2. Data Manual

**Specification Table:**

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Passive Components	06	06	02	14
2	Semiconductor Diodes	04	04	02	10
3	Rectifiers and Filters	06	04	02	12
4	Wave shaping Circuit	06	04	02	12
5	Transistors	06	04	02	12
6	Regulators	04	04	02	08
	<b>Total</b>	<b>38</b>	<b>28</b>	<b>12</b>	<b>80</b>

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