GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Power Electronics

Course / Subject Code : DI02024011

Course / Subject Name : Basic Electronics

w. e. f. Academic Year:	2024-25
Semester:	2nd
Category of the Course:	Engineering Science Course

Prerequisite:	Fundamental knowledge of atoms.
Rationale:	This course will enable students to develop the skills required to use basic electronic components in various electronic circuits. Through the study of this course the students will get the knowledge of working principle, characteristics and application of various types of semiconductor diodes and transistors. This course will develop skills to identify and test electronic components and design basic electronic circuits.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Use different types of diodes in various electronic circuits.	R,U,A
02	Analyze various transistor configurations.	R,U,A
03	Troubleshoot various single phase transistor amplifiers.	R,U,A
04	Use passive filters and DC voltage regulators for various applications.	R,U,A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
2	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Diodes and its applications** Semiconductor Material: Germanium, silicon, atomic structure and characteristics of semiconductor material. P-N junction Diode: Symbol, Forward and Reverse biased characteristics. Rectifiers: half wave and full wave – centre tapped and bridge rectifier for R load. Troubleshooting: Troubleshooting of P-N junction diode using multimeter. Diode clipper: positive and negative clipper Zener diode: forward and reverse characteristics, Zener diode as voltage regulator. LED: voltage and current through LED, Applications. Photo diode: symbol, working principle Opto-coupler: working principle, Applications.	10	30
2.	**Bipolar Junction Transistor** Construction, types- NPN, PNP. Basics of unbiased transistor. Troubleshooting: Transistor Troubleshooting using multimeter. Biased transistor- Common Emitter Configuration, Common Base Configuration, Common Collector Configuration, Comparison between CE, CB and CC configuration. Current gain- β and α, relation between β and α. The DC load line and operating point.	7	25
3.	**Transistor Biasing Circuits and Transistor amplifier.** Importance of biasing, fixed bias, collector to base bias, emitter bias (voltage divider bias). Classification of amplifier according to use, frequency, coupling method and mode of operation. Practical circuit: Basic principal, geographical demonstration, Role of biasing circuit, input capacitor, bypass capacitor, coupling capacitor, Calculate various currents. Phase reversal in amplifier circuit, impedance and input output phase relationship. Calculation of voltage gain of Base biased and Emitter biased	9	30

	amplifier. Transistor Amplifier: Base biased amplifier, Emitter biased (with voltage divider biased) amplifier.		
4.	**Passive Filter and D.C. Voltage Regulator.** Filters: types of filters- series L filter shunt C filter. Limitations of Ordinary power supply and Need of regulated power supply. Series voltage regulator, shunt regulator using transistor. Three terminal IC voltage regulators: 7805, 7812, 7905, 7912.	4	15
	Total	**30**	**100 %**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**60**	**20**	**0**	**0**	**0**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Principles of Electronics	V.K.Metha, Rohit Mehta.	S. Chand, New Delhi, 2014, ISBN: 978-8121924504
2	Electronic Principles	Albert Paul Malvino.	McGraw Hill Education, ISBN 978-0-07-337388-1
3	Electronic devices and circuit theory	Boylestad, Robert Nashelsky, Louis	pearson india ISBN 978-1-292-02563-6

(b) Open source software and website:

1. https://www.vlab.co.in
2. https://nptel.ac.in
3. https://www.youtube.com

Suggested Course Practical List:

S. No.	Practical Outcomes (PrOs)
1	Test the performance of PN junction diode and obtain forward Bias and reverse bias characteristics.
2	Build and test the half wave rectifier.
3	Build and test the full wave rectifiers.
4	Build and test positive/ negative clipper circuit.
5	Build and test zener diode voltage regulator.
6	Test the performance of LED and Opto-coupler.
7	Test common emitter transistor configuration and obtain the value of current gain and input impedance.
8	Test common base transistor configuration and obtain the value of current gain and input impedance.
9	Test common collector transistor configuration and obtain the value of current gain and input impedance.
10	Test voltage divider bias technique.
11	Build and test base biased amplifier and obtain the value of voltage gain for given ac input signal.
12	Build and test emitter biased amplifier and obtain the value of voltage gain for given ac input signal.
13	Test the performance of full wave rectifier with shunt capacitor filter and series inductor filter.
14	Test series voltage regulator using transistor.
15	Test shunt voltage regulator using transistor.
16	Test 7805,7812,7905,7912 regulator ICs.
17	Testing of diode and transistor using multimeter

List of Laboratory/Learning Resources Required:

S. No.	Equipment Name with Broad Specifications
1.	Dual variable DC power supply ,0- 30V, 2A, With Short circuit protection, separate display for voltage and current
2.	Discrete Component Trainer/ Analog component Trainer
3.	Digital Multimeter

S. No.	Equipment Name with Broad Specifications
4.	Digital Storage Oscilloscope
5.	Rectifiers trainer kit
6.	Clipper Trainer
7.	Experimentation with Zener Diode Voltage Regulator trainer kit.
8.	Characteristics of Transistor (CB,CC,CE) Trainer
9.	Transistor amplifier trainer kit
10.	Transistor Shunt Voltage Regulator Experiment Board and Trainer Kit.
11.	Transistor Series Voltage Regulator Experiment Board and Trainer Kit.
12.	7XXX IC Trainer kit

Suggested Project List:

1. Build a full-wave center tap and bridge rectifier circuit with passive filters on PCB.
2. Build positive/negative clipper circuit on PCB/Breadboard.
3. Build positive/negative clamper circuit on PCB/Breadboard.
4. Build DC voltage regulator using Zener diode on PCB/Breadboard.
5. Build single stage voltage divider biased transistor amplifier.

Suggested Activities for Students:

1. Prepare a table and interpret the technical specification of various diodes and transistors using data sheet.
2. Prepare specifications of inductor and capacitor used for passive filter.
3. Undertake a market survey for special purpose diodes.

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