GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Renewable Energy

Course / Subject Code: DI02064011

Course / Subject Name: Electronics Devices & Circuits

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

Prerequisite:	**Basic knowledge of atomic structure and basic semiconductor physics.**
Rationale:	Electrical engineer must have knowledge about electronics devices because now a days in industry many electronics components used, So to meet industrial demands this course discuss about construction, working and applications of various types of semiconductor devices, which are used in electronics circuits. Students must be equipped with the fundamental knowledge about electronic components like diode, transistor for successful handling of industrial problems. The skill developed in this course is handling all types of electronics devices.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Implement the different rectifiers and filters circuits.	U
02	Illustrate about working of transistors, transistors-based amplifiers and it's biasing.	U, A
03	Understand the various types of semiconductor devices.	U

**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.	**Basics of semiconductor and its applications** Contents: (1) Semiconductor properties and bonds in semiconductor (2) Intrinsic and extrinsic semiconductor materials: P type & N type (3) P-N junction diode, Zener diode (4) Applications of Diodeas half wave& full wave rectifier. (5) C, L, LC, π filters.	08	30%
2.	**Transistor and amplifiers** Contents: (1) Introduction of Transistor, PNP and NPN transistors, conduction through transistor, Leakage current, relationship between α and β. (2) Transistor configuration &Characteristics for CE. (3) Biasing methods of Transistor (4) Transistor as a Switch: Working and application.	11	35%
3.	**Semiconductor and Opto electronic devices** Contents: (1) Introduction and working principle of MOSFET, DIAC, TRIAC, UJT, SCR, Photo diode, Photo transistor, LDR, Seven Segment LED display (2) Optical fibre: Construction and working principle only	11	35%
	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 %**			

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:

1. Electronics Fundamental and application, Chattopadhyay, D., New Age International Publishers 2011
2. Electronics Principles, Malvino, Albert, TMH, New Delhi 2012
3. Principle of Electronics, Mehta, V.K., S.Chand, New Delhi 2012
4. Basic Electronics and linear circuits, Bhargava, N.N., TMH, New Delhi 2012
5. Basic Electronics and linear circuits, Kulshreshtha,D.C. Gupta, S.C., TTTI, Chandigarh 2007
6. Fundamentals of Electronics, Thomas F. Schubert, I K International Publishing House, 2017
7. Electronic devices and circuit, Robert Boylestad, PHI, New Delhi 2012
8. Electronics devices and circuits, J.B.Gupta, S.K.kataria& Sons, 2013

(b) Open source software and website:

1. https://circuitmaker.com/
2. https://www.pspice.com/
3. https://www.electronics-tutorials.ws/
4. Electronics work bench
5. https://www.allaboutcircuits.com/
6. Electronicsclub.info
7. https://be-iitkgp.vlabs.ac.in/

Suggested Course Practical List:

Sr. No.	Practical Outcome/Title of experiment	CO1	CO2	CO3
1	Test characteristics of PN junction diode.	√		
2	Test characteristics of Half wave rectifier using CRO	√		
3	Test characteristics of full wave center tapped rectifier using CRO	√		
4	Test characteristics of full wave bridge rectifier using CRO	√		
5	Compare output waveform of different Filters using CRO	√		
6	Test Zener diode as voltage regulator.	√		

7	Test the performance characteristics of CE transistor amplifier.		√	
8	Testing of transistor using multi meter.		√	
9	Demonstrate the waveforms in CRO for transistor as a switch.		√	
10	Demonstrate working of MOSFET amplifier.			√
11	Demonstrate working of SCR.			√
12	Demonstrate working of UJT.			√
13	Display various alphanumeric characters on Seven segment LED Display.			√
14	Test characteristics of LDR.			√
15	Demonstrate the working of optical-fiber.			√

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Regulated power supply: Dual DC , 0-30V/1A & 5V /1A with resolution of 10mV , 2mA
2	Digital Storage Oscilloscope : 300 MHZ Bandwidth , 2GSa/s maximum real time sampling rate refresh rate upto 2000 frames/s , RS232 & USB connectivity
3	C.R.O.: 30 MHz Bandwidth, 2 channels, 20 ns sampling time.
4	Function generator: 10 HZ to 10MHZ , 10 Vpp , rise & fall time =20ns, manual / external triggering
5	Digital Multimeter: 51/2 digits resolutions with all basics measurement facility like DC Voltage: 200 mV ~ 1000 V, DC Current: 200 µA ~ 10 A, AC Voltage: True-RMS, 200 mV ~ 750 V, AC Current: True-RMS, 20 mA ~ 10 A, 2-Wire, 4-Wire Resistance: 200 Ω ~ 100 MΩ, Capacitance Measurement: 2 nF ~ 10000µF, Frequency Measurement: 20 Hz ~ 1 MHz etc., 0.015% DC Voltage Accuracy.
6	DC Ammeter(0-50mA, 0-500µA)

7	DC Voltmeter (0-30V, 0-10V)

Suggested Project List:

1. Build circuit of half wave rectifier without filter on General purpose board.
2. Build circuit of half wave rectifier with filter on General purpose board.
3. Build circuit of Full wave rectifier without filter on General purpose board.
4. Build circuit of Full wave rectifier with filter on General purpose board.
5. Prepare a chart of comparison of various types of rectifiers.
6. Build circuit of common Emitter amplifier using BJT.
7. Prepare chart of CE transistors characteristics.
8. Make a flasher circuit using Diac and Triac.
9. Build circuit of seven segment LED display.
10. Make a circuit of Burglar alarm using LDR.

Suggested Activities for Students:

1. Present seminar on various topics from course content
2. Test different semiconductor devices using multimeter.
3. Prepare a chart on different configuration of transistor.
4. Undertake micro-projects in teams.

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