GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Sem-1 : Plastics Engineering/Mechanical Engineering/ Mechanical Engineering (CAD/CAM) /Mechatronics Engineering

Sem-3 : Fabrication Technology

Course / Subject Code: DI01000171

Course / Subject Name: Basics of Electricals and Electronics Engineering

w. e. f. Academic Year:	2024-25
Semester:	1st and 3rd
Category of the Course:	ESC

Prerequisite:	Zeal to learn the subject
Rationale:	The field of Electrical and Electronics Engineering (EEE) forms the backbone of modern technology and is crucial for the development and functioning of various industries. The "Basics of Electrical and Electronics Engineering" course is designed to provide first-semester diploma engineering students with a fundamental understanding of electrical and electronic principles. Need of knowledge about fundamental electrical concepts for every branch is considered for this course.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Interpret the operation of DC and AC system.	A
02	Explain the operation of DC and AC machines.	U
03	Recognize the given electronic components.	U
04	Test the performance of given electronic circuits.	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)	
0	1	4	3	0	0	50	50	100

Course Content (Tutorial):

Unit No.	Content	No. of Hours	% of Weightage
1.	**Basic concepts of DC and AC** 1.1 Concept of Voltage, Current, Power and Energy with units 1.2 Types of material based on conductivity- Conductor, Semiconductor and Insulator 1.3 Ohm's Law – Statement, limitations and applications, Series and parallel connection of resistor. 1.4 Battery – Ratings and types 1.5 Basic terminologies- Cycle, Time period, Frequency, Amplitude, Instantaneous value, Average value, R.M.S. value 1.6 Single phase and three phase AC supply – Specifications and comparison 1.7 Electrical safety- MCB, ELCB and earthing (Pipe and Plate type) 1.8 Wiring diagram for go down wiring and staircase wiring	04	30%
2.	**Construction, working and applications of DC and AC Machines** 2.1 DC motor 2.2 Induction motor 2.3 Transformer 2.4 Alternator	03	20%
3.	**Basic semiconductor devices** Construction, working and applications of the following devices: 3.1 P-N junction diode 3.2 DIAC 3.3 Types of transistor - PNP and NPN transistor 3.4 Zener diode 3.5 Light emitting diode (LED) 3.6 Light dependent register (LDR)	04	20%
4.	**Basic electronic circuits** 4.1 Half wave and full wave rectifier- Basic circuits and waveform 4.2 Types of filer circuits for rectifier- Capacitor and Inductor 4.3 Voltage regulation using zener diode- Basic circuits and waveform 4.4 Three terminal regulated IC – 78XX and 79XX	04	30%
	Total	**15**	**100**

Note:

1. Tutorial will be conducted by Electrical Engineering Department. (14 week-1 hour/week)
2. Laboratory Sessions will be equally shared by Electrical Engineering Department (U1 and U2) and Electronics and Communications Department (U3 and U4), which will be 2 hours per week for each department.
3. In case, if there is only one department in the institute, the whole course will be taught by the concerned department.

References/Suggested Learning Resources:

(a) Books:

1. “Fundamental of Electrical and Electronics Engineering” by B.L.Theraja. S Chand & Company Limited. ISBN-9788121908719
2. “Principal of Electronics” by V.K.Mehta. S Chand & Company Limited
3. "Electrical Technology Vol-1", Theraja, B. L., S. Chand & Co. Ltd., 23 edition or latest edition, ISBN- 8121924405
4. "Electrical Engineering Fundamentals", Vincent Del Toro, 2nd Edition, Pearson Education Publication, ISBN-978-0139477021
5. “Basic Electrical Engineering", Sahdev Ritu, Khanna Publications, 2018 edition, ISBN: 9789386173492

(b) Open source software and website:

1. www.nptel.iitm.ac.in
2. www.khanacademy.org
3. https://phet.colorado.edu/
4. https://ndl.iitkgp.ac.in
5. www.electrical4u.com
6. www.vlab.co.in
7. https://www.nde-ed.org/Physics/Magnetism/atommagnetism.xhtml
8. https://www.tinkercad.com/dashboard
9. https://www.allaboutcircuits.com/
10. https://www.electronicshub.org/
11. https://openstax.org/
12. https://ocw.mit.edu/courses/8-02t-electricity-and-magnetism-spring-2005/pages/syllabus/

Suggested Course Practical List:(60 HOURS)

Sr. No.	Practical Outcome/Title ofexperiment	CO1	CO2	CO3	CO4
01	Demonstrate various types of resistors and measure resistance	√			
02	Verify Ohm's law in the given electric Circuit.	√			
03	Measure voltage, current and power in the given DC circuit	√			
04	Calculate unit consumption for given Electrical load.	√			
05	Find equivalent resistance for series Connection.	√			
06	Find equivalent resistance for parallel Connection.	√			
07	Demonstrate terminal voltage Measurement of battery using multi meter.	√			
08	Demonstrate waveforms of alternating quantities using CRO and function generator.	√			
09	Use CRO to measure Peak value, RMS value, Time period and frequency ofalternating quantity.	√			
10	Demonstrate operation of protective Devices - MCB and ELCB.	√			
11	Demonstrate pipe and plate earthing.	√			
12	Carryout following wiring: (1) Staircase (2) Godown	√			
13	Identify various parts of DC machines.		√		
14	Identify various parts of AC machines.		√		

15	Measure output voltage of single phase Transformer.		√		
16	Demonstrate electronics components: Diode, Zener diode, DIAC, Transistor,LED and LDR			√	
17	Demonstrate testing of diode using Multi meter.			√	
18	Demonstrate V-I characteristics of P-N Junction diode.			√	
19	Demonstrate V-I characteristics of Zener diode.			√	
20	Demonstrate testing of PNP and NPN Transistor using multi meter.			√	
21	Demonstrate operation of LED.			√	
22	Demonstrate operation of LDR.			√	
23	Demonstrate the operation of half wave rectifier input and output Waveform using CRO.				√
24	Demonstrate the operation of full waverectifier input and output waveform Using CRO.				√
25	Demonstrate the output of full wave Rectifier with capacitor filter using CRO.				√
26	Measure the output voltage of zener Diode based voltage regulator.				√
27	Measure the output voltage of IC 78XX based voltage regulator.				√
28	Measure the output voltage of IC 79XX based voltage regulator.				√
29	Build any working electronics circuits Using breadboard.				√

30	Use virtual lab to demonstrate Operation of electronics circuit.				√

List of Laboratory/Learning Resources Required:

1. Variable DC power supply 0- 30V, 2A, SC protection, display for voltage and current.
2. Discrete Component Trainer/ Analog component Trainer: 2mm patch cords in interconnecting components, Collection of utilities like fixed and variable D.C. supplies, Actual Components like Transistors, SCR, LDR, Photo diode, resistors, capacitors, inductors, diodes, LED's, Transformers Built in DC supply dual ± 0 to 15V/ 500 mA variable power supply, ± 12V / 500 mA fixed supply & +5V/500mA fixed power supply. Built in AC supply 9-0-0 / 500mA.
3. Digital Multi meter : 3 and 1/2 digit display, 9999 counts digital multi meter measures: VAC, VDC (1000V max) , IAC, IDC (10 amp max) , Resistance (0 - 100 M□) , Capacitance and Temperature measurement
4. Demonstration model for staircase and go down wiring.
5. Demonstration model for operation of fuse, MCB and ELCB.
6. Bread board (2 Power, 2 ground rails, 2 circuit areas, contact points > 200, Volt > 15 V, Current > 1 A)
7. Batteries (1.5 V to 12 V, cylindrical, rectangular, chargeable / non-rechargeable, Size A, AA, C, D, E etc.)

Suggested Project List:

1. Construct basic series and parallel circuits using breadboards and components.
2. Perform experiments to measure current, voltage, and resistance using multi meters and oscilloscopes.
3. Identify and test electronic components such as resistors, diodes, and transistors.
4. Create the basic circuit to turn ON LED using a battery and a resistor.
5. Design a simple water alarm circuit that uses a transistor and a buzzer to alert when water is detected.

Suggested Activities for Students:

1. Participate in group discussions on recent advancements in electrical and electronics engineering.
2. Visit local power plants, manufacturing units or electronics labs to see practical applications of the concepts learnt.
3. Analyze case studies on electrical systems or electronic devices to understand their design and functioning.
4. Engage with interactive online modules and tutorials on basic electrical and electronics concepts.
5. Teach a topic or concept to peers in a small group setting.

6. Conduct virtual experiments on various electrical and electronic circuits using online lab simulation tools.
7. Participate in timed online quizzes and assessments covering key concepts.
8. Watch instructional videos on topics such as circuit analysis, semiconductor devices, and electrical machines, followed by guided exercises.

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