GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGG FOR TEXTILE AND PRINTING
(Code: 3342901)

Diploma Programmes in which this course is offered	Semester in which offered
Textile manufacturing Technology, Textile Processing Technology, Printing Technology	4th Semester

1. RATIONALE

In Printing and Textile Industry a diploma graduate has to handle and operate AC and DC electrical systems comprising of transformers, motors, starters, circuits, lights and its parameters and sometimes they have to also deal with routine maintenance of these equipments. They should therefore have necessary theoretical knowledge and practical skills for planning, installing, operating and maintaining AC and DC electrical systems for safe and smooth operations of these and other machineries installed in their plants. This course has been designed to provide these basic knowledge and practical skills.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to achieve required skills so that students are able to acquire the following competency.

- **Operate and ensure maintenance of different electrical equipment and machines in the industry.**

3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire requiredlearning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Describe the basic electrical elements, electric circuit terminology also AC and DC waveform and its various quantities.
ii. Calculate various parameters of AC and DC Circuits.
iii. Explain relationship between phase & line values of various quantities in three phase circuits.
iv. Measure basic electric quantities.
v. Select appropriate range of measuring instruments.
vi. Use various electrical tools and accessories.
vii. Describe working of different starter and tube light with wiring diagrams.
viii. Describe working of different types of transducers.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
2	0	2	4	70	30	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit **ESE** - End Semester Examination; **PA** - Progressive Assessment**.**

5. DETAILED COURSE CONTENT

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I DC Circuits	1a.Define various electrical parameters 1b.Calculate energy bills	1.1 Electrical charge 1.2 The idea of electrical potential 1.3 Concept of EMF, current 1.4 Resistance, specific resistance and ohm's law 1.5 Work, power and energy 1.6 Simple calculations of energy bills
Unit – II AC Circuits	2a.Explain generation of three phase supply 2b.Define various electrical parameters related to AC supply 2c.Explain three phase star and delta connection. 2d.Calculate simple problems of three phase star/delta type load.	2.1 Definition of an AC quantity 2.2 Generation of alternating voltage 2.3 Three phase alternating voltage equation 2.4 Three phase star and delta connection 2.5 Relation of the line voltage and phase voltage in three phase star connection and delta connection 2.6 Three phase power equation and simple problem on it. 2.7 Safety measures in handling AC voltages.
Unit-III DC Machines	3a. Describe principle, construction and applications of D.C. motor 3b. Explain principle, construction and applications of D.C. generator. 3c. Explain the working of three point DC motor starter	3.1 Working principle, construction and applications of D.C. motor and generator. 3.2 Speed control of D.C.motor. 3.3 Necessity of starter 3.4 Working of three point starter and connection diagram
Unit-IV AC Machines	4a.Explain working principle and classification of transformers. 4b. Explain construction of single phase transformer. 4c.Explain working principle, classification and construction of induction motor. 4c.Explain the working of various AC motor starters.	4.1 Working principle, construction & types of transformers. 4.2 Accessories of power transformer. 4.3 Auto transformer. 4.4 Working principle of three phase induction motor 4.5 Types and application of different types of induction motors in textile industry. 4.6 Different types of induction motor

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		starters like D.O.L., Star-delta starter and Auto transformer starter 4.7 Working principle of single phase induction motor 4.8Common faults and their rectifications in three phase AC system
Unit-V Illumination	5a.Explain the laws of Illumination 5b.Define various parameters related to Illumination. 5c.Explain the concept of direct and indirect Illumination. 5d. Solve simple problems related to Illumination	5.1 Production of light 5.2 Laws of illumination 5.3 Define Luminous flux, Luminous intensity, solid angle and plane angle 5.5 Direct and Indirect Illumination system 5.6 Tube light wiring 5.7 Different light sources and reflection
Unit-VI Photo Electric Devices and Digital Controls	6a.Explain the working principle of photo cell and photo diode. 6b.Explain various control circuit related to photo cell.	6.1 Construction and working of photo cell and photo diode. 6.2 Simple operating control circuit using photo/solar cell 6.3 Automatic light operated relay using photo devices. 6.4 Use of digital control in textile processes.
Unit-VII Transducers and Electrical Wiring	7a.Define and classify various types of transducer. 7b.State different types of wires, cable, switches and fuses 7c.Explain importance of earthing 7d Explain different types of electrical instruments	7.1 Definition, and classification of different types of transducer and their application for energy, measurement in textile industry. 7.2 Different types of wires, cables, switches and fuses. 7.3 Specifications of electrical accessories. 7.4 Necessity of earthing and different types of earthing. 7.5 Shock and shock treatment. 7.6 Connection of meters like A-meter, Volt meter, Watt meter, power factor meter, frequency meter, energy meter and Maximum demand meter

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	DC Circuits	04	00	04	00	04
II	AC Circuits	04	00	06	00	06
III	DC Machines	05	04	06	04	14
IV	AC Machines	06	04	08	04	16
V	Illumination	04	04	00	04	08
VI	Photo Electric Devices and Digital Controls	02	00	04	06	10
+ VII	Transducers and Electrical Wiring	03	00	06	06	12
Total		**28**	**12**	**34**	**24**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*
Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.
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Sr. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx Hrs. required
1	I	Verification of OHM's law	02
2	I	Measure equivalent resistance in (a)Series resistances(b)Parallel resistances	02
3	1	Measure power in D.C. Circuits	02
4	II	Measure power and power factor in the single phase A.C. circuit.	02
5	II	Determine relationship between line value and phase value in star/delta connection	02
6	III	Identify different part of DC machine and write function of each parts	02
7	III	Change the direction of rotation of	02

		(a)DC shunt motor (b)Ceiling fan (c)Three phase induction motor	
8	III	Measure speed of DC shunt motor at different armature voltage	02
9	III	Demonstrate three point DC motor starter and working of each parts	02
10	IV	Determine turns ratio of single phase transformer	02
11	IV	(a)Draw simple line diagram of DOL starter (b)List electrical components used in it and function of each component	02
12	IV	Assemble and identify parts of single phase AC motor (ceiling fan).	02
13-	V	Design an illumination scheme for small building for given data.	02
14	V	Measure illumination level of different types of light sources and prepare report for it	
15	V	(a)Draw tube-light wiring (b)List electrical equipments used for it (c)Make connection and test it (if possible)	02
16	V	(a) Draw staircase wiring (b)List electrical equipments used for it (c)Make connection and test it (if possible)	02
17	VI	Operate photo electric relay using twilight switch.	02
18	VI	Make connections for Smoke detector circuit	02
19	VII	Measure linear displacement using LVDT	02
20	VII	Test the strain using strain gauge	02
21	VII	Calibrate Ammeter as per IS	02
22	VII	Calibrate Voltmeter as per IS	02
23	VII	Calibrate Energy meter as per IS	02
Total **Note:** Perform any practical worth total 28 hours so that most units are covered			**46**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as: course/topic based seminars, internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects, etc. For example students can do:

i. Prepare journal based on exercises performer in the laboratory
ii. Prepare chart displaying the various parts of DC machine
iii. Prepare chart displaying the various parts of AC machine

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. Arrange industrial visit to textile mills /textile factory and show in detail the electric/electronic equipment working there and discuss their specifications.
ii. Show video/animation films of the functioning and maintenance of electric and electronic equipment/machines.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr. No.	Title of Book	Author	Publication
1.	B.L.Theraja	Fundamentals of Electrical Engg.	S Chand
2.	B.L.Theraja-II	Electrical Machines	S Chand
3.	V.K.Mehta	Fundamentals of Electrical Engg.	S Chand
4.	S.L.Uppal	A text book of Electrical Engg.	Khanna publication
5.	A K SAWHNEY	Electrical measurement and instrumentation	Dhanpat Rai & Sons
6.	J B GUPTA	Electrical Power Utilization and Traction	S.K.Kataria & Sons

B. List of Major Equipment/ Instrument with Broad Specifications

i. Ammeter, Voltmeter, Wattmeter, Multimeter
ii. DC motors
iii. Single phase transformer
iv. AC motors
v. Tube light, photo cell

C. List of Software/Learning Websites

i. www.electricalandelectronics.org
ii. www.allaboutcircuits.com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. R D Panchal,** Lecturer in Electrical Emgg, R C Technical Institute, Ahmedabad
- **Prof. H C Chawda,** Lecturer in Electrical Emgg, R C Technical Institute, Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. (Mrs.) Susan S. Mathew,** Associate Professor, Department of Electrical and Electronics Engineering.
- **Dr. J. Earnest, Professor,** Associate Professor, Department of Electrical And Electronics Engineering.