Gujarat Technological University

COURSE NAME : ELEMENTS OF ELECTRICAL & MECHANICAL ENGINEERING FOR TEXTILE TECHNOLOGY

1. RATIONALE :

In the era of technology integration, it has become unavoidable to passes the basic knowledge of various engineering disciplines. The advancement in technology is the best on multi technology integration and hence in performance too. The Aim of this subject is to enhance the knowledge and skill level in the inter disciplinary area to strengthen the present engineering practices.

2. [A] ELEMENTS OF MECHANICAL ENGINEERING:

SCHEME OF TEACHING

Topic No.	Name of Topic	No. of Hours		
		Lect.	Pract.	Total
1.	Properties of steam	04	--	04
2.	Air Compressors & Blowers	05	06	11
3.	Air Psychometry	04	06	10
4.	Pumps and valves	05	06	11
5.	Power Transmissions	05	06	11
6.	Vibrations	02	--	02
7.	Material Handling	03	04	07
	Total	28	28	56

3. OBJECTIVES:

1. Describe the property of steam and its applicationS in Textile industries.
2. Describe different air compressors, its composition and applications.
3. Know primary parameters involved in air psychometry.
4. Different types of pumps.
5. Different types of flow control valves.
6. Describe the mode of power transmission.
7. Know the effects of vibration on machines.

4. TOPICS AND SUBTOPICS:

Topic-1 Properties of Steam:

1.1 Sensible, latent and total heat of steam.

1.2 Types of steam.

1.3 Dryness fraction of wet steam.

1.4 Calculations on different types of steam.

1.5 Application of steam in Textile industries and processes.

Topic-2 Air Compressors & Blowers:

2.1 Use of compressed air.

2.2 Types of air compressor.

2.3 Comparison of different air compressors.

2.4 Use of filters & moisture-oil separators.

2.5 Use of Blowers - Types of Blowers.

Topic-3 Air Psychometry:

3.1 Definition of dry bulb, wet bulb and dew point temperature.

3.2 Humidity, specific humidity, relative humidity.

3.3 Methods of humidifications - Unit type humidifier, central station type.

3.4 Importance of humidity in textile industries i.e. in spinning & weaving department.

3.5 Calculation of Relative humidity from Dry Bulb & Wet Bulb temperature.

Topic-4 Pumps and Valves:

4.1 Different types of pumps, their construction and functions.

4.2 Use of pumps.

4.3 Calculations related to pump power, discharge and head.

4.4 Merits and demerits of pumps.

4.5 Different types of valves, construction and working.

4.6 Applications of valves in textile industries.

Topic-5 Power Transmission:

5.1 Importance of power transmission.

5.2 Modes of power transmission (P.T.).

5.3 Applications.

5.4 Belt and rope drive system.

5.5 P.T. by gears & chains.

5.6 P.T. by couplings.

5.7 Calculations for speeds in different modes of P.T.

Topic-6 Vibrations:

6.1 Definition of vibrations.

6.2 Vibration in mechanical systems and its consequences.

6.3 Types of vibrations.

6.4 Causes of vibrations.

6.5 Remedies for vibration causes.

Topic-7 Material Handling:

7.1 Needs of material handling.

7.2 Types of material handling equipment.
- i) Hoisting equipment
- ii) Conveying equipment
- iii) Surface and overhead equipment

7.3 Criteria for selection.

7.4 Selection of suitable material handling equipment for the given situation.

5. LABORATORY EXPERIENCES:

Mechanical Engineering:

1. Demonstrate a reciprocating air compressor.
2. Demonstrate the air washer.
3. Study of steam humidifier.
4. Demonstrate the centrifugal pump.
5. Demonstrate the reciprocating pump.
6. Demonstrate manually controlled and automatic controlled flow valves.
7. Study of belt & chain drive system.

8. Study of gear train.

9. Study of dust collection systems of textile industry.

10. Study of different conveying systems of textile industry.

11. Study of air blowers.

[B] ELEMENTS OF ELECTRICAL ENGINEERING:

1. SCHEME OF TEACHING

Topic No.	Name of Topic	No. of Hours		
		Lect.	Pract.	Total
1.	D.C.Circuits	03	04	07
2.	A.C.Circuits	03	06	09
3.	D.C.Machines	05	06	11
4.	A.C.Machines	05	04	09
5.	Illumination	03	02	05
6.	Photo Electric DeviceS & Digital controls	04	02	06
7.	Transducers & Electrical wiring	05	04	09
	Total	28	28	56

2. OBJECTIVES:

1. Know the importance of D.C. fundamentals.

2. Know the importance of A.C. fundamentals.

3. Understand the working principle, construction and application of rotating electrical machines.

4. Understand the working principle, construction and applications of transformer.

5. Appreciate the importance of various protective devices applied for the machines.

6. Understand the importance of electronic circuit used in control system.

3. TOPICS AND SUBTOPICS:

Topic-1 D.C.circuits:

1.1 Definition of DC circuits and the sources available in textile mills with standard voltage.

1.2 Define EMF, current, resistance, specific resistance and ohm's law.

1.3 Simple calculations of energy bills in textile mills.

Topic-2 A.C.circuits:

2.1 A.C. fundamentals.

2.2 Generation of 3-Phase voltage.

2.3 3-Phase star and Delta connections.

2.4 Power in 3-Phase circuit and simple problems on it.

Topic-3 D.C.Machines:

3.1 Working principle construction and applications of D.C. motor and generators in textile.

3.2 Speed control of D.C.motor.

3.3 D.C. shunt motor starter and connection with motor.

Topic-4 A.C.Machines:

4.1 Working principle, construction & types of transformers.

4.2 Accessories of power transformer.

4.3 Auto transformer.

4.4 Working of induction motors.

4.5 Types and application of different types of induction motors in textile industry.

4.6 Different types of induction motor starters like D.O.L., Auto transformer and star delta.

Topic-5 Illumination:

5.1 Laws of illumination.

5.2 Define flux, intensity, solid angle and plane angle.

5.3 Direct and Indirect Illumination system.

5.4 Simple problem on Illumination.

5.5 Tube light wiring used in textile industry.

5.6 Different light soruces and reflection.

Topic-6 Photoelectric Devices and Digital Controls

6.1 Construction and working of photo cell and photo diode.

6.2 Simple operating control circiut using photo/solar cell

6.3 Automatic light operated relay using photo devices.

6.4 Use of digital control in textile processes.

Topic-7 Transducers and Electrical Wiring:

7.1 Definition, and classification of different types of transducer and their application for mesurement like PH 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 types of earthing.

7.5 Shock and shock treatment.

7.6 Connection of meters like A-meter, Volt meter, Watt meter, pf meter, frequency meter, enegry meter and Maximum demend.

4. LABORATORY EXPERIENCES :

1. Varification of OHM's law
2. Measurement of power in D.C. Circuits
3. Measurement of power and pf in single phase A.C. circuit (RL, RC or RLC)
4. Varification of series and parallel laws of resistance
5. Speed control of D.C. shunt motor
6. Direction of rotation of D.C. shunt motor
7. Determination of turns ration single phase transformer
8. Study different types of starter used for three phase induction motor
9. Varification of relatioship between line value and phase value in star connection
10. Excercise on staircase wiring
11. Calibration of single phase energy meter
12. Excercise on tube light wiring and testing
13. Study of different types of light sources
14. Characteristics of photo diode

5. REFERENCES:

Sr.No.	Name of books	Authors
1.	Thermodynamics	P.K.Nag
2.	Heat engine	Shah & Pandya
3	Thermal engineering	P.L.Belany
4.	Refrigeration & Air conditioning	P.L.Belany
5.	Air conditioning systems	A.R.Arora
6.	Applied Thermodynamics	Estope
7.	Pumps operation and maintenance	Tyler & Hicks
8.	Hydraulics	R.C.Patel
9.	Fluid mechanics & hydraulics	R.S.Khurani
10	Theory of machines	R.C.Patel
11.	Theory of machines	R.S.Khurani
12.	Material handling equipment	M.Rudenko
13.	Material handling	John Immer
14.	Air conditioning in Textile	ATIRA
1.	Fundamentals of Electrical Engg.	B.L.Theraja
2.	Fundamentals of Electrical Engg.	V.K.Mehta
3.	A text book of Electrical Engg.	S.L.Uppal
4.	Elementary Electrical Engg.	M.L.Gupta