GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
Course Curriculum
MECHANICAL ENGINEERING FOR TEXTILE

(Code: 3332901)

Diploma Programme in which this courses offered	Semester in which offered
Textile Manufacturing Technology & Textile Processing Technology	**3rd Semester**

1. RATIONALE

As a supervisor, the diploma Engineers are required to install, operate and maintain textile equipment, which have mechanical systems, like- gears, shafts, bearings, couplings, etc. As well as textile industry uses many mechanical equipment, like- steam boilers, air compressors, fluid pumps, material handling equipment, etc for its working. The basic knowledge of these equipments should be with a fresh diploma graduate for effective functioning in textile industry. Besides equipment, the diploma Engineers should also be exposed to hazards of textile industry, and necessary preventive measures. This course aims at providing such knowledge and skills to achieve the industry required competencies.

2. COMPETENCY (Programme Outcome according to NBA Terminology)

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency:

- **Operate textile machines and material handling equipments and do their preventive maintenance by applying basic knowledge & skills of mechanical engineering.**

3. 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	
2	0	2	4	70	30	20	30	150

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

4. DETAILED COURSE CONTENTS

Unit	**Major Learning Outcomes** (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Properties of Steam.	1a. Describe properties of team & its applications in textile industries	1.1 Attributes of Steam- Sensible, latent and total heat of steam. Application of steam in Textile industries and processes. 1.2 Types of steam. 1.3 Dryness fraction of wet steam. 1.4 Calculations on different types of steam.
Unit– II Air-Compressors	2a. Describe construction & working of different air compressors, its applications	2.1 Use of compressed air 2.2 Types of air compressors- Reciprocating, slide van & screw types 2.3 Construction of different air compressors 2.4 Use of filters & moisture-oil separators 2.5 Loading & unloading of compressors.
Unit– III Air Psychometry	3a. Calculate Relative humidity of air.	3.1 Definition of dry bulb, wet bulb and dew point temperature 3.2 Humidity, specific humidity, relative humidity. 3.3 Methods of humidification - Unit type humidifier, central station type 3.4 Importance of humidity in textile industries. 3.5. Calculation of Relative humidity from Dry Bulb & Wet Bulb temperature.
Unit–IV Pumps And Valves	4a.Describe construction & working of Reciprocating, Rotary, & Centrifugal pumps. 4b.Calculate discharge & head of pump. 4c.Describe construction & working of ball, butterfly, globe, gate, and diaphragm valves. 4d.Describe applications of different valves.	4.1 Fluid pumps: types (Reciprocating, Rotary, centrifugal), construction, working 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. Valves: construction and working of ball, butterfly, globe, gate, and diaphragm valves. 4.6 Applications of valves in textile industries
Unit-V Power Transmissions	5a.Describe power transmission by Couplings, chain-sprockets, belts-pulleys, universal joints, clutches, & gears. .	5.1 Mechanical power transmission –Modes, construction, working, & applications of Couplings, chain-sprockets, belts-pulleys, universal joints, clutches, & gears. 5.2 Belt and rope drive system. 5.3 Power transmission by spur, helical, bevel, worm & worm gear, rack & pinion & chains. 5.4 Calculations for speeds in different modes of P.T.
Unit–VI Vibrations	6a. Describe vibrations & its effects. 6b. Describe causes & remedies of vibrations on machines.	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.
Unit VII	7a.Describe needs & types	7.1 Needs of material handling.

Unit	**Major Learning Outcomes** (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Material Handling	of material handling equipment. 7b.Describe use of hoisting &various conveying equipment. 7c.Describe various surface & overhead material handling equipment.	7.2 Types of material handling equipment. 7.3 Hoisting equipment 7.4 Conveying equipment 7.5 Surface equipment - Pallets, Manual carts, Fork lift trucks, conveyors- Belt, Chain, Magnetic, etc. overhead- Cranes- Jib, Gantry, Bridge, etc. 7.6 Criteria for selection. 7.7 Selection of suitable material handling equipment for the given situation.
Unit-VIII Preventive Maintenance & Industrial Safety	8a.Describe corrective maintenance & its demerits. 8b.Explain Preventive maintenance & its advantages. 8c.Explain needs & importance of safety. 8d.Describe causes of fire in textile industry & fire prevention and fighting methods.	8.1 Definition, Steps, needs and advantages of preventive maintenance. 8.2 Difference between preventive and Corrective maintenance. 8.3 Frequency cycle. 8.4 Typical forms for preventive maintenance. 8.5 Understanding of safety and Major accidents: causes, types, results and control 8.6 Safety awareness & Safety colour code 8.7 Fire prevention and fire fighting methods. 8.8 Safety training.

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – 2.5 Hours)			
			R Level	U Level	A Level	Total
I.	Properties of Steam	04	00	6	4	10
II.	Air Compressors & Blowers.	04	00	6	4	10
III.	Air Psychometry	04	00	6	4	10
IV.	Pumps and Valves	04	00	6	4	10
V.	Power Transmissions.	04	00	6	4	10
VI.	Vibrations	02	00	4	0	04
VII.	Material Handling	03	00	4	4	08
VIII.	Preventive Maintenance & Industrail Safety	03	00	4	4	08
Total		**28**	**00**	**42**	**28**	**70**

Legends: R = Remember; U = Explain; 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.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

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

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	**Practical/Exercise** (Course Outcomes in Psychomotor Domain according to NBA Terminology)	**Approx Hours Required**
1	I.	Demonstrate construction & working of a reciprocating air compressor.	03
2	II.	Demonstrate construction & working of a air filter	02
3	III.	Demonstrate construction & working of a of steam humidifier.	02
4	IV.	Demonstrate construction & working of a centrifugal pump	03
5	IV	Demonstrate construction & working of a reciprocating pump	03
6	IV	Demonstrate construction & working of a manually controlled and automatic controlled flow valves	02
7	V.	Demonstrate construction & working of a belt & chain drive system	02
8	V.	Demonstrate construction & working of a gear box/gear train.	02
9	V.	Demonstrate construction & working of a dust collection systems of textile industry.	02
10	VI.	Demonstrate different conveying systems of textile industry	02
11	IV.	Demonstrate construction & working of air blowers	02
12	VII.	Prepare the preventive maintenance schedule of any machine	03
		Total	**28**

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like: course/topic based seminars, internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects etc.

a. Internet based assignment topic wise.

b. Preparation of chart on topic wise

c. Visit of textile mill to study various mechanical equipments.

d. Visit to any ventilation/humidification plant in textile unit.

e. Study of preventive maintenance systems in textile units.

f. Study of fire fighting equipment in conventional textile and modern textile units.

8. SPECIAL INSTRUCTIONAL STRETERGY (If Any)

i. Arrange a visit to nearby textile industry and explain the working of pumps, compressors, valves, humidifiers, material handling equipment etc. and discuss their maintenance schedule and common maintenance problems.

ii. Show educational video/animation films on working of pumps, compressors, valves, humidifiers and material handling equipment. CD and internet

9. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	P.K.Nag	Thermodynamics	
2	Shah & Pandya	Heat engine	
3	P.L.Belany	Thermal engineering	
4	P.L.Belany	Refrigeration & Air conditioning	
5	A.R.Arora	Air conditioning systems	
6	Estope	Applied Thermodynamics	
7	Tyler & Hicks	Pumps operation and maintenance	
8	R.C.Patel	Hydraulics	
9	R.S.Khurani	Fluid mechanics & hydraulics	
10	R.C.Patel	Theory of machines	
11	R.S.Khurani	Theory of machines	
12	M.Rudenko	Material handling equipment	
13	John Immer	Material handling	
14	ATIRA	Air conditioning in Textile	
15	Higgins & Merrow	Maintenance Engineering Handbook	
16	W. Wayne Worick	Higgins & Merrow	
17	N.P.C.(Dr.A.N.Saxena)	Safety and good house keeping	

B. List of Major Equipment/ Instrument

Thermal Engineer Lab & pumps, compressors, valves etc. (models may also serve the purpose).

C. List of Software /Learning Websites-

Search engines could be used to locate textile machines related sites. Following is list of some of the useful websites.

i. http://en.wikipedia.org
ii. http://www.buildingcontrolworkbench.com/Portals/1/GrayBook/Gpsychum.htm
iii. http://en.wikipedia.org/wiki/Transmission_(mechanics)
iv. http://www.powertransmission.com/
v. http://en.wikipedia.org/wiki/Pump
vi. http://en.wikipedia.org/wiki/Valves
vii. http://en.wikipedia.org/wiki/Vibrations
viii. http://www.gobookee.net/working-principle-of-compressor/
ix. http://moistureseparator.com/animation.htm
x. https://www.google.co.in/#sclient=psy-ab&q=maitenance+and+safety&oq=maitenance+and+safety&gs_l=serp.3..0i13l4.627.7156.1.7645.18.17.1.0.0.0.495.3942.0j9j3j4j1.17.0...0.0.0..1c.1.17.psy-ab.nE1fnBZLtoo&pbx=1&bav=on.2,or.r_qf.&fp=fef76a32f21e5ea1&biw=1360&bih=677

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. Y. M. Gandhi** , HOD Department of Textile Manufacturing , Shri B.P.T.I, Bhavanagar
- **Prof. M. H. Vyas**, Lecturer in Department of Textile Manufacturing, R.C Technical Institute, Ahmedabad
- **Prof. B. B. Bhatt**, Lecturer in Department of Textile Manufacturing, R.C Technical Institute, Ahmedabad
- **Prof. B. L. Thakor,** Lecturer Department of Mechanical Engineering, R C Technical Institute, Ahmedabad
- **Prof. R. D. Panchal,** Lecturer Department of Electrical Engineering R C Technical Institute, Ahmedabad

Coordinator and Faculty Member from NITTTR Bhopal

- **Dr. C. K. Chugh**, Professor, Department of Mechanical Engineering
- **Prof. S. K. Gupta,** Professor and Coordinator for State of Gujarat.