GUJARAT TECHNOLOGICAL UNIVERSITY

Programme Name: Diploma Engineering
Level: Diploma
Branch: Diploma in Renewable Energy
Course /Subject Code: DI01064011
Course /Subject Name: Basics of Mechanical Engineering

w.e.f. Academic Year:	2024-25
Semester:	1st
Category of the Course:	ESC-02

Prerequisite:	Zeal to learn the subject
Rationale:	Now a days as an advancement of technology interdisciplinary knowledge is must require for the engineering diploma holders. An engineering diploma holder expected to look after many activities at work place, which may be of interdisciplinary Knowledge other than own discipline plays important role in the development of individual as well as society. This course mainly encompasses the major areas of mechanical engineering which are required to perform tasks such as selection of hand tools, power tools, hydro- pneumatic devices/equipment, I.C. Engines, pumps, air compressors, boilers and material handling equipment used for various purposes. This course is designed in such a way that practical performed in this course will develop basic skills to perform well in industry as well as in field work.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT LEVEL
01	Use relevant mechanical power and hand tools in real life applications	A
02	Identify and comprehend the different sources of energy, their conversion processes.	U
03	Explore the working principles of different prime movers like IC Engine, Boilers, etc.	R
04	Select relevant power transmission mode in simple engineering situation	A
05	Identify and comprehend various hydro-pneumatic devices/equipment, brakes, clutch and couplings.	A

Teaching and Examination Scheme:

			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.	**Introduction & Basic Mechanical Tools – Application:** Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature. Basic Mechanical Components and its applications like bolts, nuts, washers, bearings, valves, bushes, springs, levers, rivets, keys, o' rings, oil seals, shafts, axles. Different Pipe fittings and its applications. Hand tools and its application like different types of spanners, pliers, screw drivers, chisels, files, hacksaw, hammers. Power tools concepts-applications, its advantages and disadvantages. Concept of industry 4.0	**04**	**12**
2.	**Energy conversion:** Prime movers and its types, Fuels & Calorific Values, Basic Concept of Hydro, Solar and Wind power plant.	**03**	**10**
3.	**Steam Boilers:** Introduction, I.B.R, Classification of boilers, Cohran and Babcock and Wilcox boiler, only Functioning of different mountings and accessories.	**02**	**15**
4.	**Internal Combustion Engines:** Introduction, Difference between I.C. Engine and E.C. Engine, Classification of I.C. Engine, Main Components of Engine and their functions, working four-stroke cycle Petrol/Diesel engines, Comparison between Petrol cycle and diesel cycle. Basic concept of CNG and EV. (No Numerical)	**05**	**15**

5.	**Pumps:** Types, Construction and working of Reciprocating, and Centrifugal pumps, Importance of Priming.	**04**	**12**
6.	**Air compressor**. Working principle, Types, Application. Construction and working of single stage reciprocating air compressor.	**04**	**12**
7.	**Transmission of Motion and Power:** Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive.	**04**	**12**
8.	**Couplings, Clutches and Brakes:** Concept and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc).	**04**	**12**
	Total	**30**	**100**

Note: Unit No. 4 of the above syllabus are to be covered in Practical Hours.

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
35	40	25			

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(asperRevisedBloom'sTaxonomy)

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.

Suggested Course Practical List:

Sr No	List of Practical	No of Hours
1	Demonstrate use of various mechanical items, spanners, hand tools and power tools. Student will prepare the report which will include sketches of each item demonstrated with specifications and applications.	**04**

2	Make simple pipe layouts using pipes and pipe fittings as per given drawing.	**02**
3	Demonstration of various types of boilers.	**04**
4	Demonstration of different boiler mountings and accessories	**02**
5	Demonstration of four stoke petrol/diesel engines.	**04**
6	Assemble/dismantle centrifugal and reciprocating pump. (Any one)	**02**
7	Assemble/dismantle centrifugal, reciprocating compressor model. (Any one)	**02**
8	Assemble/dismantle different brakes, clutches and couplings.	**04**
9	To understand different arrangement and application of various power transmission drives. Assemble/dismantle different brakes, clutches and couplings.	**04**

List of Laboratory/Learning Resources Required

--Bolts, nuts, washers, bearings, valves, bushes, springs, levers, rivets, keys, o' rings, oil seals, shafts, axles.

-- Different Pipe fittings

-- Different Hand and Power tools

-- Models of Lancashire and Babcock and Wilcox boilers,

-- Models of various mountings and accessories.

-- Models of various types of IC engines, Single cylinder four stroke petrol/ diesel engine.

-- Centrifugal /Reciprocating pumps/Test rig.

-- Reciprocating air compressors/Test rig.

-- Models of various types of brakes, coupling, clutches, drives

--Charts/Models of various material handling equipment.

Suggested Project List:

-- Gear: Build model of different gears from cardboard.

-- Boilers: Build model of different mountings with suitable material.

-- IC Engine: Collect different original I.C. Engine parts and identify material of it.

-- Pump: Collect leaflets of pump from market, analyze and compare specifications

-- Air Compressor: Collect leaflets of air compressor from market, analyze and compare specifications.

-- Coupling: Build model of different couplings from cardboard, wood, plastic or any suitable material

Suggested Activity:

-- Prepare report/chart on any actual industrial boiler based on industrial visit

-- Prepare report on CNG and Electrical vehicle, air pollution by petrol, diesel and CNG.

-- Calculate velocity ratio of any actual drive.

References/Suggested Learning Resources:

(a) Books:

1. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
2. Basic Mechanical Engineering by Pravin Kumar, Pearson Education
3. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
4. Elements of Mechanical Engineering by Sadhu Singh, S. Chand Publication
5. Introduction to Engineering Materials by B.K. Agrawal, McGraw Hill Publication, New Delhi
6. Elements of Mechanical Engineering by P. S. Desai and S. B. Soni, Atul Prakashan

(b) Open-source software and website:

1. https://nptel.ac.in
2. www.vlab.co.in
3. http://www.howstuffworks.com/ -- Tech stuff
4. http://en.wikipedia.org/wiki/Boiler