SARVAJANIK UNIVERSITY
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Sarvajanik University
Sarvajanik College of Engineering & Technology, Surat
Bachelor of Technology (B. Tech.)

B. Tech. Semester I/II

Subject Name: Basic Mechanical Engineering **Subject Code: BTME12109**

Type of course: **Engineering Science**
Prerequisite: No Prerequisite
Course Outline: The course is designed to understand basic principles of mechanical engineering and its application in various fields of engineering and industries. Students will learn and understand application of energy sources and power plants, thermal engineering, refrigeration and air conditioning, IC engine, engineering materials, motion and power transmission elements, mechanical measurements and fluid machines. Students will know the emerging fields of mechanical engineering.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
2	0	2	3	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course.

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Introduction to Mechanical Engineering:** Elements of mechanical engineering and application of mechanical engineering, emerging fields of mechanical engineering: Industrial automation, mechatronics, biomechanical engineering, robotics, nanotechnology, hybrid and electric vehicle, Evolution of Industry 1.0 to Industry 5.0.	02	06%
2	**Energy Sources and Power generation:** Introduction and applications of Energy sources, non-renewable and renewable energy sources. Power generation: Introduction, Properties of steam and gas, Boilers and Power plant components, Coal based power plants, Gas based Power Plants, Hydroelectric power plants, Nuclear	06	24%

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	Power Plants. Concept of solar and wind power plants.		
3	**Introduction to Thermal Engineering:** Properties, laws of thermodynamic, Modes of heat transfer. **Refrigeration & Air Conditioning:** Refrigerant, Vapour compression refrigeration system, Vapour absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.	06	24%
4	**Internal Combustion Engines:** Introduction, Classification, Engine details, four-stroke/ two-stroke cycle, Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies. Otto Cycle, Diesel Cycle.	04	12%
5	**Motion and Power Transmission:** Methods of drives, Power transmission elements, Types of drives: belt drive, gear drive, rope drive and chain drive, gear trains, simple mechanisms with robotic arm mechanism.,	03	09%
6	**Turbines, Pumps, Compressors and Fans:** Introduction, classification and working of Turbines, Pumps, fans, and Compressors.	04	12%
7	**Mechanical Measurements:** Principles of measurements, methods of measurement, linear measurement, temperature measurement, velocity measurement, pressure measurement, force, speed and torque measurements	03	09%
8	**Engineering materials:** Properties of materials, Applications of Ferrous, Nonferrous metals and alloys. Properties and use of non-metallic materials like Timber, glass, silica, graphite, diamond, plastic and polymers, composites etc.	02	06%

Percentage Distribution of Marks as per Bloom's Taxonomy (Theory/Practical):

Percentage Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	35	25	10	--	-

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyse, **E:** Evaluate **C:** Create and above Levels

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.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Basic Mechanical Engineering	Pravin Kumar	Pearson	2018	Second
2.	Basic Mechanical Engineering	G. Shanmuga m& S Ravindran	McGraw Hill	2010	First
3.	Basic Mechanical Engineering	M.P. Poonia, S.C. Sharma & T.R. Banga	Khanna Publishing House. ISBN: 9789386173331	2018	First
4.	Fundamental of Mechanical Engineering	G. S. Sawhney	PHI Learning Private Limited ISBN-978-203-5133-2	2015	Third
5.	An Introduction to Mechanical Engineering	Jonathan Wickert, K emper Lewis	CENGAGE LEARNING	2019	Fifth
6.	An Introduction to Mechanical Engineering: Part 1	Michael Clifford	CRC Press	2009	NA
7.	Mechanical Engineering for Makers: A Hands-On Guide to Designing and making physical Things	Brian Bunnell, Samer Najia	MAKE	2020	NA

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Infer the role, scope, importance and applications of mechanical engineering.	10

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-2	Explain the significance of thermodynamic processes and its applications in energy conversion and conservation	35
CO-3	Identify and select various motion and power transmission elements for a particular application.	15
CO-4	Understand working of fluid machines.	15
CO-5	Understand properties of engineering materials and carry out mechanical measurements.	25

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PS03
CO-1	1	1	1	1	3	1	2	1	2	1	0	1			
CO-2	3	2	2	2	1	1	1	1	0	1	0	1			
CO-3	2	1	2	2	1	1	1	1	2	1	0	1			
CO-4	1	1	0	2	1	1	1	1	0	1	0	1			
CO-5	2	1	1	2	3	1	3	1	1	1	0	1			
Rationale*	**9**	**6**	**6**	**9**	**9**	**5**	**8**	**5**	**5**	**5**	**0**	**5**			

Rationale*: This course will give basic understanding of mechanical engineering principles and their application in the various engineering fields. Also, it helps to understand modern engineering systems, and its performance towards sustainable development.

LIST OF PRACTICALS:

1. Measurement of linear and angular distances, temperature, velocity and pressure, using measuring instruments.
2. Demonstration of conventional turbine used in hydro power plants.
3. Demonstration of Petrol and Diesel Engines.
4. Measurement of performance parameters of window and split air conditioner (dry bulb, wet bulb temperature and relative humidity of atmosphere).
5. Demonstration of Robotics arm for object displacement.
6. Determine the mechanical properties of material.

7. Demonstration of motion and power transmission elements.

Major Equipment:

Single cylinder two stroke /four stroke petrol/ diesel engine, Thermometer, Thermocouples, sling psychromotor, Manometer and Pressure gauge, Vernier Calliper, Micro meter, sine bar, Anemometer, Tachometer, Domestic refrigerator, Window air conditioner/split air conditioner, Motion and power transmission elements, Turbines, Universal Testing Machines, Hardness testing machine, Robotic arm, Centrifugal pump test rig.

List of Open Source/learning website:

- https://nptel.ac.in/courses/112/104/112104113/
  - It covers the basics of mechanical engineering and SI units.
- https://nptel.ac.in/courses/112/107/112107242/
  - It covers the basic concept of measurement.
- https://nptel.ac.in/courses/112/103/112103262/
  - Lecture 1 & 2 cover the introduction and classification of I. C. Engine
- https://nptel.ac.in/courses/112/107/112107291/
  - Unit 1 covers the energy scenario and basic concept.

List of Open Source Software: Nil