GUJARAT TECHNOLOGICAL UNIVERSITY

BACHELOR OF ENGINEERING SYLLABUS

1st Year, Subject Code : 3110006

Semester/Year	**: 1**
Category of the Course	**: Engineering Science**
Subject Name & Code	**: Basic Mechanical Engineering (3110006)**

Prerequisite : Zeal to learn the subject

Rationale : Understanding of basic principles of Mechanical Engineering is required in various field of engineering.

Teaching and Examination Scheme :

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	ESE (V)	PA(I)	
3	0	2	4	70	30	30	20	150

Content :

Sr	Topic	Total Hrs.
1	**Introduction:** Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth law and First law.	4
2	**Energy:** Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydro, Solar, Wind, and Bio-fuels, Environmental issues like Global warming and Ozone depletion.	3
3	**Properties of gases:** Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined gas law, Gas constant, Relation between c_p and c_v, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Polytrophic process.	5
4	**Properties of Steam:** Steam formation, Types of steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of steam tables, steam calorimeters.	6
5	**Heat Engines:** Heat engine cycle and Heat engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles.	5
6	**Steam Boilers:** Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and accessories.	-
7	**Internal Combustion Engines:** Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies.	4
8	**Pumps:** Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming.	3

9	**Air Compressors:** Types and operation of Reciprocating and Rotary air compressors, significance of Multistage.	**3**
10	**Refrigeration & Air Conditioning:** Refrigerant, Vapor compression refrigeration system, Vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.	**4**
11	**Couplings, Clutches and Brakes:** Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc).	**-**
12	**Transmission of Motion and Power:** Shaft and axle, Different arrangement and applications of Belt drive; Chain drive; Friction drive and Gear drive.	**-**
13	**Engineering Materials:** Types, properties and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer.	**4**

Note : Topic No. 6, 11 and 12 of the above syllabus are to be covered in Practical Hours.

Distribution of marks weightage for cognitive level :

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**40**	**40**	**-**	**-**	**-**

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 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

Course Outcome :

Sr. No.	CO statement	Marks % weightage
CO-1	Discuss the various sources of energy and basic terminology of Mechanical engineering	14
CO-2	Make calculations for commonly used working fluids i.e. ideal gases and steam	22
CO-3	Analyze various heat engine cycles and understand construction and working of IC engines	20
CO-4	Discuss working and applications of steam boilers and various energy conversion systems	28
CO-5	Discuss various power transmission elements and properties of various engineering materials with their applications	16

List of Experiments :

1. To understand construction and working of various types of boilers.
2. To understand construction and working of different boiler mountings and accessories.
3. To understand construction features of two/four stoke petrol/diesel engines
4. To determine brake thermal efficiency of an I. C. Engine.
5. To understand construction and working of different types of air compressors.
6. To demonstrate vapor compression refrigeration cycle of domestic refrigerator OR window airconditioner OR split air conditioner.
7. To understand construction, working and application of clutches, coupling and brakes
8. To understand different arrangement and application of various power transmission drives

Major Equipment : Models of Cochran, Lancashire and Babcock and Wilcox boilers, models of various mountings and accessories, Models of various types of IC engines, Single cylinder two stroke /four stroke petrol/ diesel engine, models of pumps, compressors, Domestic refrigerator/window air conditioner/split air conditioner, models of various types of brakes, coupling, clutches, drives.

List of Open Source Software/learning website : https://nptel.ac.in, www.vlab.co.in