Subject Code: 01ME0101
Subject Name: Elements of Mechanical Engineering
B. Tech. Year- I (Semester - 1)

Type of course : Engineering Science

Prerequisite : Zeal to learn the subject.

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

Course Outcome :
After learning the course, the students will be competent
1. To understand basic terminologies and fundamentals of mechanical system by correlating science concept.
2. To apply the governing laws of mechanical engineering to find solution of different systems.
3. To identify the broad context of Mechanical engineering problems and identifying possible contributing factors.
4. To identify functional characteristics of various mechanisms.
5. To Analyze the various energy conversion cycles and systems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks			Practical Marks		
THEORY	TUTORIAL	PRACTICAL	C	ESE(E)	IA	CSE	Viva (V)	Term Work (TW)	
3	0	2	4	50	30	20	25	25	150

Content:

Sr. No.	Content	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.	04
2	**Properties of gases:** Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, polytropic process.	06

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3	**Properties of steam:** Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters	**06**
4	**Heat Engines:** Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto and Diesel cycles.	**06**
5	**Steam Boilers:** Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and accessories	**04**
6	**Internal Combustion Engines:** Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies	**04**
7	**Turbo machines:** Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming and air compressors	**04**
8	**Refrigeration & Air Conditioning:** Refrigerant, Vapor compression refrigeration system, vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioner	**04**
9	**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)	**04**
10	**Transmission of Motion and Power:** Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive	**04**

Distribution of Theory Marks

R Level	**U** Level	**A** Level	**N** Level	**E`** Level	**C** Level
20	**30**	**25**	**15**	**10**	**--**

Legends: R: Remember**; U:** Understand**; A:** Apply**; N:** Analyze**; E:** Evaluate**; C**: Create

List of Experiments :

1. To understand and appreciate significance of mechanical engineering in different fields of engineering.
2. To understand construction and working of different boilers, Boiler mountings and accessories.
3. To understand construction and working of Petrol engines & Diesel Engine (Two Stroke & Four Stroke both).
4. To understand construction and working of different types of Turbo Machines (Pump & Compressors).
5. To demonstrate vapour compression refrigeration cycle of domestic refrigerator OR window air conditioner OR split air conditioner.
6. To understand construction, working and application of clutches, coupling and brakes.
7. To determine brake thermal efficiency of an I. C. Engine.
8. To solve numerical of Properties of gases and properties of steam.

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9. To understand different arrangement and application of various power transmission drives.
10. To solve numerical of heat engines.

List of Assignment:

1. Theory and Example on Properties of gases.
2. Theory and Example on Properties of steam.
3. Theory and Example on Heat engine.
4. Theory on pump.

Reference books:

1. Basic Mechanical Engineering by Pravin Kumar, Pearson.
2. Thermal Science and Engineering by Dr. D.S. Kumar, S.K. Kataria& sons,Publication New Delhi.
3. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi.
4. Elements of Mechanical Engineering by Sadhu Singh S. Chand Publication.

List of Open Base Software / learning website:

1. http://nptel.iitm.ac.in
2. http://vlab.co.in/

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