

Subject Code: 01ME1101

Subject Name: Elements of Mechanical Engineering

B. Tech. Ist Year Semester: I

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 the basic terminology of Mechanical systems.
2. To able to make elementary calculations of ideal gases and steam and heat engine cycles.
3. To understand working and construction of different boilers and mountings and accessories.
4. To analyze the performance of I.C. engines.
5. To understand working and construction of pump and various refrigeration cycles.
6. To understand various power transmission elements.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				
L	T	P		Theory Marks			Practical Marks	
				ESE(E)	IA	CSE	Viva (V)	Term Work (TW)
3	0	2	4	50	30	20	25	25

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	08
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	08
4	Steam Boilers: Introduction, Classification, Cochran Boiler, Babcock and Wilcox boiler, Working of different mountings and accessories	08
5	Pump: Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming.	-

6	Internal Combustion Engines: Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies	08
7	Refrigeration & Air Conditioning: Refrigerant, Vapour compression refrigeration system, vapour absorption refrigeration system, Window and split air conditioner.	-
8	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)	-
9	Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive	06

Note: Unit no. 5, 7 and 8 needs to be conducted during Lab sessions.

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E Level	C Level
30	40	20	10	-	-

Legends: R: Remembrance; **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate, **C:** Create

List of Experiments:

1. To conduct the performance test on centrifugal pump.
2. To conduct the performance test on double acting reciprocating pump.
3. To demonstrate vapour compression refrigeration cycle and to determine its COP.
4. To demonstrate vapour absorption refrigeration cycle and to determine its COP.
5. To demonstrate 4 stroke Petrol Engine.
6. To demonstrate 4 stroke Diesel Engine.
7. To demonstrate working of shoe brake.
8. To demonstrate working of gear box.
9. To determine brake thermal efficiency of an I. C. Engine.
10. To demonstrate Bomb calorimeter and determine the calorific value.
11. To identify process parameters and make elementary calculation for constant volume process, constant pressure process and isothermal process.
12. To identify process parameters and make elementary calculation for adiabatic and polytropic process.

List of Assignment:

1. Steam boiler
2. Turbo machines
3. Internal combustion engine

Reference books:

1. Elements of Mechanical Engineering by Dr. Nikunj Rachchh and Chirag Parekh, McGraw Hill Education Private Limited.
2. Basic Mechanical Engineering by Pravin Kumar, Pearson.
3. Thermal Science and Engineering by Dr. D.S. Kumar, S.K. Kataria & sons, Publication New Delhi.
4. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi.
5. 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/>