INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)**
SEMESTER	**1**
COURSE TITLE	**ELEMENTS OF MECHANICAL ENGINEERING**
COURSE CODE	**01ME1101**
COURSE CREDITS	**4**

Objective:

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

2 The course aims to provide fundamental knowledge about basic terminologies used in mechanical system, analysis of various properties of gases and steams, various energy conversion cycles and systems, steam boilers, pump, compressors, refrigeration and air conditioning systems, I.C. engines, tools of transmission and powers.

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

Course Outcomes: After completion of this course, student will be able to:

1 Students will be able to apply the basic terminology of mechanical systems to solve simple engineering problems

2 Students will be able to apply the knowledge of working principles and construction of pumps and various refrigeration cycles to solve basic engineering problems

3 Students will be able to apply understanding of working and construction of different boilers, mountings, and accessories for selection in various engineering applications

4 Students will be able to apply the concepts of power transmission elements to select suitable components for mechanical power transmission in practical applications

5 Students will be able to apply the principles of ideal gas laws and steam properties to perform fundamental engineering calculations in practical applications

6 Students will be able to analyze the performance parameters of I.C. engines and interpret their impact on engine efficiency and operation

Pre-requisite of course: Zeal to learn the subject

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

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Contents : Unit	Topics	Contact Hours
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	**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	5
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	5
4	**Steam Boilers** Introduction, Classification,, Cochran Boiler, Babcock and Wilcox boiler,, Working of different mountings and accessories	5
5	**Internal Combustion Engines** Introduction, Classification , Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines , Indicated power, Brake Power, Efficiencies	5
6	**Transmission of Motion and Power** Shaft and axle , Belt drive , Chain drive, Friction drive , Gear drive	6
7	**Pump** Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming	4
8	**Refrigeration & Air Conditioning** Refrigerant, Vapor compression refrigeration system , vapor absorption refrigeration system , Window and split air conditioners	4
9	**To understand construction, working and application of couplings, clutches and brakes** Construction and application of couplings , construction and application of clutches and brakes	4
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**To conduct the performance test on centrifugal pump.** To conduct the performance test on centrifugal pump.	2
2	**To conduct the performance test on double acting reciprocating pump.** To conduct the performance test on double acting reciprocating pump.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	**To demonstrate vapour compression refrigeration cycle and to determine its COP.** To demonstrate vapour compression refrigeration cycle and to determine its COP.	2
4	**To demonstrate vapour absorption refrigeration cycle and to determine its COP.** To demonstrate vapour absorption refrigeration cycle and to determine its COP.	2
5	**To demonstrate 4 stroke Petrol Engine.** To demonstrate 4 stroke Petrol Engine.	2
6	**To demonstrate 4 stroke Diesel Engine.** To demonstrate 4 stroke Diesel Engine.	2
7	**To demonstrate working of shoe brake.** To demonstrate working of shoe brake.	2
8	**To demonstrate working of gear box.** To demonstrate working of gear box.	2
9	**To determine brake thermal efficiency of an I. C. Engine** To determine brake thermal efficiency of an I. C. Engine	2
10	**To demonstrate Bomb calorimeter and determine the calorific value.** To demonstrate Bomb calorimeter and determine the calorific value.	2
11	**To identify process parameters and make elementary calculation for constant volume process, constant pressure process and isothermal process.** To identify process parameters and make elementary calculation for constant volume process, constant pressure process and isothermal process.	2
12	**To identify process parameters and make elementary calculation for adiabatic and polytropic process.** To identify process parameters and make elementary calculation for adiabatic and polytropic process.	6
Total Hours		**28**

Textbook :

1 Basic Mechanical Engineering, Pravin Kumar, Pearson Education India, 2013

2 Elements of Mechanical Engineering, Dr. Nikunj Rachchh and Chirag Parekh, McGraw Hill Education Private Limited., 2015

References:

1 Fundamentals of Mechanical Engineering, Fundamentals of Mechanical Engineering, G. S. Sawhney, PHI learning private limited, 2015

2 Thermal Science And Engineering, Thermal Science And Engineering, D. S. Kumar, S. K. Kataria & Sons, 2009

References:

3 Introduction to Mechanical Engineering, Introduction to Mechanical Engineering, Michael J. Clifford, Richard P. Sturges, and William A. Antaki, CRC Press, 2017

4 Elements of Mechanical Engineering , Elements of Mechanical Engineering , Sadhu Singh , S Chand & Company Limited , 2010

5 Fundamental of Mechanical Engineering, Fundamental of Mechanical Engineering, G.S. Sawhney, PHI Publication, 2015

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
30.00	40.00	20.00	10.00	0.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students.

2 The course instructor shall train students through interactions, demonstration, brainstorming, group tasks, assignments and quizzes etc.

3 Students will use supplementary resources such as online videos and books.

4 The course instructor shall train students through slides, worksheets and marker board.

Supplementary Resources:

1 http://nptel.iitm.ac.in

2 http://vlab.co.in/

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