Syllabus for Bachelor of Technology
Mechanical Engineering

Subject Code: 01ME0404

Subject Name: Engineering Thermodynamics

B.Tech. Sem- IV

Type of course: Engineering Science

Prerequisite: Nil

Rationale: Thermodynamics is the introductory course on Thermal Science and Engineering. It comprises the understanding of certain natural laws and energy interaction prominently heat and work transfer.

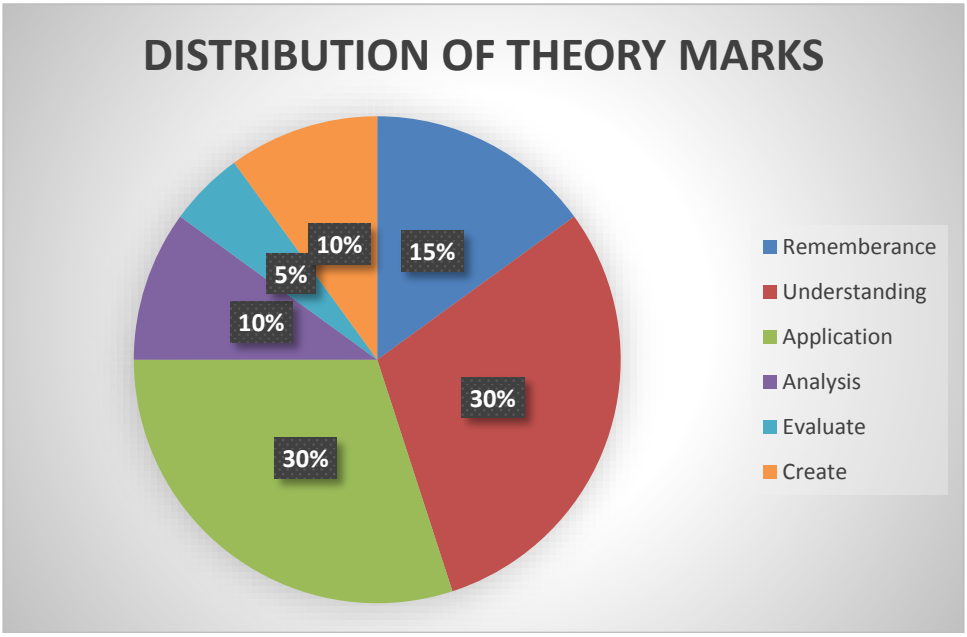
Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva (V)	Term work (TW)	
4	2	0	5	50	30	20	25	25	150

Content:

Sr. No.	Content	Total Hrs	%Weightage
1.	**Introduction:** Concept of Continuum, Macroscopic and Microscopic approach, Control Volume, Thermodynamic System, Types of Systems, Surrounding, Universe, Boundaries, State, Point and Path Function, Thermodynamic Properties, Process, Cycle, Quasi – Static Process, Thermodynamic Equilibrium, Pure Substance, Vapour-Liquid-Solid Phase in a Pure Substance, Heat and Heat Capacity, Energy and Work Transfer, Free Expansion Work, Types of Work Transfer.	4	8
2.	**Laws of Thermodynamics:** Zeroth law, First law for closed system, Energy, Specific Heat Capacities, Enthalpy, PMM-I, Steady flow energy eqution, Application of First Law, First Law Limitations. Second Law: Thermal Energy Reservoir, Heat Engine, Refrigerator and Heat Pump, Kelvin-Planck and Clausius Statements of Second Law, Equivalence of Kelvin-Planck and Clausius Statements, PMM-II, Reversibility and Irreversibility, Causes & types of Irreversibility, Condition for Reversibility, Carnot Cycle, Reverse Carnot Cycle, Carnot's theorem & its corollary, Kelvin Scale, Third Law of Thermodynamics.	12	22
3.	**Entropy:** Clausius' Theorem, Entropy-A Property of System, Inequality of Clausius, Entropy Change in Irreversible Process, Entropy Change in	6	12

	Various Thermodynamics Process, Entropy Principle and It's Applications, Entropy Generation in Closed and Open System, Entropy and Disorder.		
4.	**Availability:** Concept of Exergy, Available and Unavailable Energy, Exergy of a Source and Finite Body, Exergy Destruction in Heat Transfer Process, Dead State, Exergy of a Closed System and Steady Flow System, Second Law Efficiency.	**6**	**12**
5.	**Vapour Power Cycle:** Carnot & Rankine Cycle, Comparison of Rankine and Carnot Cycle, Efficiency Calculation of Rankine Cycle, Mean Temperature of Heat Addition, Factors Affecting Efficiency of Rankine Cycle, Reheat, Regenerative, Reheat-Regenerative Cycle, Feedwater Heaters. Air standard Efficiency and Comparison of Otto, Diesel and Dual Cycle.	**16**	**30**
6.	**Ideal and Real Gases:** Properties of Ideal and Real Gases, Equation of State, Avogadro's Law, Vander Waal's Equation of State, Reduced Properties, Law of Corresponding States, Compressibility Chart, Gibbs-Dalton law, Internal Energy, Enthalpy and Specific Heat of Gas Mixtures.	**8**	**16**



References Books:

1. P.K.Nag, Engineering Thermodynamics, McGraw Hill Education

2. R. K. Rajput, Engineering Thermodynamics, EVSS Thermo Laxmi Publications
3. E.Rathakrishnan Fundamentals of Engineering Thermodynamics, PHI,2005
4. Y. A. Cengel and M. A. Boles, Thermodynamics an Engineering Approach, McGraw Hill Education
5. G. Van Wylen, R. Sonntag and C. Borgnakke, Fundamentals of Classical Thermodynamics, John Wiley & Sons
6. Holman J.P, Thermodynamics, McGraw Hill Education
7. Krieth, Engineering Thermodynamics, CRC Press
8. Jones and Dugan, Engineering Thermodynamics, PHI Learning Pvt. Ltd.
9. M. Achuthan, Engineering Thermodynamics, PHI Learning Pvt. Ltd.

Course Outcome:
After learning the course the students should be able to:

1. Understand basic terms used in thermodynamics.
2. Understand the laws of thermodynamics and their significance
3. Apply the principles of thermodynamics for the analysis of thermal systems
4. Understand various vapor power cycles.
5. Understand the properties of gas mixtures

List of Open Source Software/learning website:

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