MEE1003	ENGINEERING THERMODYNAMICS	L	T	P	J	C
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Pre-requisite	**NIL**	**Syllabus version**				
		v. 1.1				

Course Objectives:

1. Familiarize with the concepts of 1st and 2nd Laws of Thermodynamics.
2. Evaluate the properties of pure substances and mixtures.
3. Understand and analyze power and refrigeration cycles.

Expected Course Outcome:

Upon successful completion of the course the students will be able to

1. Identify thermodynamics systems, point functions and path functions.
2. Solve engineering problems using zeroth and first laws of thermodynamics.
3. Analyse the heat and work interactions by applying the concepts of entropy principles and exergy.
4. Analyse thermodynamic systems involving pure substances and mixtures.
5. Calculate thermodynamics properties based on thermodynamics relations.
6. Analyse basic thermodynamic cycles of various systems.

Student Learning Outcomes (SLO):	**SLO 2,5,9**

Module:1	**Basic Concepts in Thermodynamics**	**3 hours**

Basic concepts of Thermodynamics - Thermodynamics and Energy - Closed and open systems - Properties of a system - State and equilibrium - Processes and cycles - Forms of energy - Work and heat transfer - Temperature and Zeroth law of thermodynamics.

Module:2	**First law of thermodynamics**	**3 hours**

Energy balance for closed systems - First law applied to steady – flow engineering devices

Module:3	**Second Law of Thermodynamics and Exergy**	**6 hours**

Limitations of the first law of Thermodynamics - Kelvin-Planck and Clausius statements and its equivalence- Refrigerators, Heat Pump–COP - Perpetual Motion Machines - Reversible and Irreversible process Carnot's Theorem - Entropy - The Clausius inequality - Availability and irreversibility - Second law efficiency-Quality of Energy

Module:4	**Properties of Pure Substance and Mixtures**	**5 hours**

Property diagram for water-phase change processes-refrigerants-real gases-Compressibility factor-Composition of gas mixtures - Mass and mole fractions - Dalton's law of additive pressures - Amagat's law of additive volumes - Evaluating properties of gas mixtures

Module:5	**Thermodynamic relations**	**2 hours**

Gibbs and Helmholtz function-Maxwell's relations-Clapeyron equations-general relations of properties

Module:6	**Gas power cycles**	**4 hours**
Air standard assumptions - Otto cycle - Diesel and Dual cycles - Brayton cycle		
Module:7	**Vapor and Refrigeration Cycles**	**5 hours**
Rankine cycle-reheat-regeneration- Vapor compression refrigeration cycle		
Module:8	**Contemporary issues:**	**2 hours**
	Total Lecture hours:	**30 hours**

Text Book(s)	
1.	Yunus A. Cengel, Thermodynamics: An Engineering Approach, 8th Edition, McGraw - Hill Education, 2017.
Reference Books	
1.	P. K. Nag, Engineering Thermodynamics, 6th Edition, McGraw - Hill Education, 2017.
2.	Michael Moran and Howard Shapiro, Principles of Engineering Thermodynamics, 8th Edition, Wiley, 2015.

Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar			
Recommended by Board of Studies	17-08-2017		
Approved by Academic Council	47	Date	05-10-2017