AMITY UNIVERSITY
UTTAR PRADESH

Course Code: THERMODYNAMICS

Course Code: MAE212

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
2	-	-	-	02

Credit Units: 02

Course Level: UG

Course Objectives:

Objective of this course is to impart in depth understanding of the principles of thermodynamics and heat transfer. This course also helps students understand the application of basic fluid mechanics, thermodynamic, and heat transfer principles and techniques, including the use of empirical data, to the analysis of representative fluid and thermal energy components and systems encountered in the practice of electrical, electronic, industrial, and related disciplines of engineering.

Pre-requisites:

Basic Concepts of Physics, General Chemistry and Mathematics (Differential Equations, Integration and Calculus)

Course Contents/Syllabus:

	Weightage (%)
Module I: Basic concepts	**15%**
1. Thermodynamic system **2. Intensive and extensive properties** **3. Cyclic process** **4. Zeroth Law of Thermodynamics,** **5. Work and heat** **6. Flow work**	
Module II: First Law of Thermodynamics	**15%**
1. Mechanical equivalent of heat **2. Internal energy** **3. Analysis of non-flow system** **4. Flow process and control volume** **5. Steady flow energy equation** **6. Flow processes**	

Module III: Second Law of Thermodynamics and Entropy	**20%**
1. Heat Engine, heat pump **2. Kelvin Planck and Clausius statement of Second Law of Thermodynamics** **3. Perpetual motion machine** **4. Reversible cycle- Carnot Cycle** **5. Clausius inequality**	
6. Entropy **7. Principle of entropy increase** **8. Concepts of availability, irreversibility.**	
Module IV: Air-Cycles	**20%**
1. Carnot cycle **2. Otto cycle** **3. Diesel cycle** **4. Dual cycle** **5. Stirling cycle** **6. Erricsson cycle** **7. Brayton cycle** **8. Reversed Carnot cycle.**	
Module V: Properties of Steam	**15%**
1. Use of steam tables, wet steam, superheat steam, **2. Different processes of vapour,** **3. Mollier Diagram**	
Module VI: Reciprocating Air compressors	**15%**
1. Single stage compressor, Isothermal efficiency, adiabatic efficiency, clearance volume, volumetric efficiency, **2. Multi-stage compression with intercooling.**	

Student Learning Outcomes:

Upon successful completion of this course, the student will be able to:

1. Identify and use units and notations in thermodynamics.
2. Identify and explain the concepts and role of the following thermodynamic properties of matter: internal energy, enthalpy, entropy, temperature, pressure and specific volume;
3. State and illustrate the first and second laws of thermodynamics.
4. Apply the first and second laws of thermodynamics to formulate and solve engineering problems for (i) closed systems, (ii) open systems under steady-state and transient conditions, and (iii) power cycles.
5. Demonstrate knowledge and understanding of: Theoretical and practical constraints on the performance of internal combustion engines, gas-turbines, steam and vapour cycles, and combined cycles.
6. Compute changes in thermodynamic properties due to: mixing, throttling, compression, expansion, heat exchange, and combustion.
7. Determine operating conditions for thermodynamic cycles in order to optimize power or efficiency.
8. Design machines for improved efficiency using thermodynamic reasoning.
9. Use thermodynamic tables, charts and equation of state (e.g. the ideal gas law) to obtain appropriate property data to solve thermodynamics problems.

Pedagogy for Course Delivery:

The course pedagogy will include lectures, numerical practice, concept quizzes, tutorials, etc.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100%	NA	100%

Theory Assessment (L&T):

	Continuous Assessment/Internal Assessment				End Term Examination
Components (Drop down	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- P.K. Nag, "Engineering Thermodynamics", Tata McGraw Hill
- Onkar Singh, Applied Thermodynamics, New Age Publications.
- Dhomkundwar Kothandaraman, "A Course in Thermal Engineering", Dhanpat Rai Publications

References:

- Cengel & Boles, "Thermodynamics" 7th Edition, 2011, Tata McGraw Hill.
- Incropera, "Engineering Thermodynamics", John Wiley
- Sonntag/Van Wylen, Fundamentals of Thermodynamics, Wiley
- Engel, T. and Reid, P., Thermodynamics, Statistical Thermodynamics & Kinetics, Pearson Education, 2006
- Rahul Gupta, Engineering Thermodynamics, Asian Books P. Ltd.
- Y.V.C. Rao, Engineering Thermodynamics, Khanna Publications

Any other Study Material:

1. Steam Tables (With Mollier Diagram In S.I. Units) By R.S. Khurmi