Engineering Thermodynamics

1.1 Course Number: CH161

1.2 Contact Hours: 3-1-0 Credits: 11

1.3 Semester -Offered: 1st Year-Odd

1.4 Prerequisite: Basic physics, mathematics (basic multivariable calculus).

1.5 Syllabus Committee Members: Dr. V S Sistla, Dr. A. Ranjan

2. OBJECTIVE:

- understand the laws of thermodynamics and how it is reflected in the systems under equilibrium, and the natural and engineered processes.
- understand the way the laws of thermodynamics govern chemical transformations.
- understand how to calculate the thermodynamic properties of the materials.
- understand importance of equations of state.
- understand how thermodynamic laws are applied to various cyclic industrial processes.
- understand the statistical interpretation of entropy.

3. COURSE CONTENT:

(Unit wise distribution of content and number of lectures)

Unit	Topic	Lectures
1	Equilibrium and non-equilibrium. Systems and surroundings. Static and quasistatic processes. Thermodynamic properties: Extensive and intensive. Internal energy. Heat. Work. Zeroth law.	4
2	First law of thermodynamics. Applications of First Law to closed and flow systems.	6
3	Second Law: Clausius and Kelvin-Planck statement. Carnot cycle. Entropy. Second law statement in terms of entropy.	4
4	Applications of the second law.	3
5	Availability	4
6	Maxwell relationship and thermodynamic property relationship for materials.	6
7	Equations of state.	5
8	Chemical Reactions.	5
9	Thermodynamic cycles of industrial interest.	3
	Total	**40**

4. READINGS

4.1 TEXT BOOKS:

1. An Introduction to Thermodynamics. Y. V. C. Rao. Universities Press.
2. Cengel, Y.A. and Boles, M.A., Thermodynamics: An Engineering Approach, McGrawHill, New York, 1988.

5. OUTCOME OF THE COURSE:

After the completion of course, the students will be able to:

- apply the first law of thermodynamics to processes of industrial scale.
- calculate the feasibility and thermodynamic limit on efficiency imposed by the second law and thereby analyze the effectiveness of a given process.
- compute thermodynamic properties of the material.
- solve problems related to heat and work exchange which may involve phase change.