Source : https://www.newscientist.com/definition/second-law-thermodynamics/

22ME203 ENGINEERING THERMODYNAMICS

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Engineering Mathematics.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers a basic understanding of heat and work interactions for various thermodynamic processes. The objective of this course is to impart knowledge on different forms of energy and restrictions imposed by the first and second law of Thermodynamics on conversion of energy from one form to another and also analysis of various thermodynamics systems for heat input, work output, etc.

MODULE-1

UNIT-1 **6L+6T+0P=12 Hours**

Concepts, Laws of Thermodynamics and Analysis: Basic concepts and laws of Thermodynamics, Corollaries, perpetual machines, Laws of Thermodynamics applied to open and closed systems.

UNIT-2 **10L+10T+0P=16 Hours**

Analysis of heat engines, turbines, measurement/modeling and simulation of thermal systems.

PRACTICES:

- Analyze the open and closed type of thermodynamic systems.
- SFEE.
- Problems on first law of thermodynamics.
- Problems on second law of thermodynamics.

MODULE-2

UNIT-1 **8L+8T+0P=16 Hours**

Pure Substances Andgas Mixtures: Properties of pure substances, P-v-T- surfaces, Phase transformations, Mollier charts, Ideal and Real Gases: Equation of State, Vander Waals Equation of State, Compressibility charts, Variable specific heats, Gas tables. Gas Mixtures: Dalton's law of partial pressure, T-dS relations, Maxwell relations.

UNIT-2 **8L+8T+0P=16 Hours**

Power Cycles and Their Analysis: Power Cycles: Otto cycle, Diesel cycle, Dual cycle, Thermal Efficiency, Mean Effective Pressures on Air standard basis, Comparison of cycles, Stirling cycle, Atkinson cycle and Ericsson cycle.

Case studies: analysis of IC engines, exhaust gases, measurement and analysis, modeling and simulation

PRACTICES:

- Analyze the behavior of real and ideal gases
- Formulate Maxwell relations.
- Problems on power cycles.
- Modeling and simulation of IC engines.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Detail the influence of various processes on the thermodynamic properties.	Apply	1	1, 2, 4, 5, 9, 10, 12
2	Apply the thermodynamic laws in practical applications.	Apply	1, 2	1, 2, 5, 9, 10
3	Evaluate the efficiencies and properties of thermodynamic systems.	Evaluate	1, 2	1, 2, 3, 5, 9, 10
4	Explore the practical applications of thermodynamics.	Analyze	1,2	1, 2, 5, 9, 10, 12
5	Formulate thermodynamic solutions for emerging technologies.	Analyze	1, 2	1, 2, 3, 4, 5, 9, 10, 12

SKILLS:

- ✓ *Classify thermodynamic systems based on mass and energy interactions.*
- ✓ *Apply thermodynamic laws to analyze performance of various devices and cycles.*
- ✓ *Evaluate properties of steam for sub-cooled, super-heated and wet conditions.*

TEXT BOOKS:

1. Moran, Michael J., Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey. "Fundamentals of Engineering Thermodynamics". John Wiley & Sons, 2010.
2. Cengel, Yunus A., Michael A. Boles, and Mehmet Kanoğlu., "Thermodynamics: An Engineering Approach". McGraw-Hill Publications, 9th Edition, 2019.

REFERENCE BOOKS:

1. Robert T Balmer, "Modern engineering thermodynamics". Academic Press, 2011.
2. Mahesh MRathore,"Thermal Engineering. Tata McGraw-Hill Education, 2010.