AEPC2001 AERO ENGINEERING THERMODYNAMICS (3-0-0)

Course Objectives: "This course aims to provide students with a thorough understanding of thermodynamic principles and their specific applications in the field of aeronautical engineering so that students will be able to analyze thermodynamic systems and processes relevant to aerospace applications, such as propulsion systems and high-altitude flight conditions."

Module I: Fundamental Concepts and Thermodynamics Laws 06 Hours

Review of First and Second laws, First law analysis of steady and transient flow control volumes, Entropy generation, Entropy balance for closed systems and steady flow systems.

Module II: Availability and Exergy Balance 06 Hours

Available energy, Quality of energy, Availability for non-flow and flow process, Irreversibility, Exergy balance, Second law efficiency.

Module III: Vapour Power Cycles 06 Hours

Vapour Power Cycles: The Carnot vapor cycle and its limitations, The Rankine cycle, Means of increasing the Rankine cycle efficiency, The reheat cycle, The regenerative feed heating cycle, Cogeneration (Back pressure and Pass-out turbines).

Module IV: Gas Power Cycles 06 Hours

General Thermodynamic property relations: The Maxwell relations, The Clapeyron equation, The TdS relations, Isothermal compressibility and volume expansivity, The Joule-Thomson coefficient.

Gas Power Cycles: Air standard cycles- Otto, Diesel, Dual Combustion cycles, Simple Brayton cycle.

Module V: Pure substance & Perfect Gas Laws 06 Hours

Pure substance; definition, two property rule, vapour formation; P-V, P-T, P V T diagrams, critical and triple points, T-S and H-S diagrams, steam tables, dryness fraction, problems. Vapor processes; evaluation of W, dE, Q, dH for various processes, problems. Steam calorimeters; separating, throttling and combined calorimeters, problems

At the end of the course, students will be able to:

CO's	Course Outcomes
CO-1	Describe the basic concepts of thermodynamics and heat -work interaction
CO-2	Illustrate the laws and principles of thermodynamics and its applications.
CO-3	Analyze and examine the properties of entropy, Ideal gases and real gases, psychometric and pure substances.
CO-4	Describe and analyze performance of air standard cycles,
CO-5	DescribeIC enginesand psychrometric properties

Text Books:

1. Rathakrishnan E. Fundamentals of Engineering Thermodynamics; PhI Learning Pvt. Ltd-New Delhi; 2nd revised edition; ISBN-10: 812032790X; (2005).
2. P K Nag , Engineering Thermodynamics; Tata McGraw Hill Education Private Limited; 4th Edition; ISBN-10 0070260621; (2008).

Reference Books:

1. Yunus A. Cengel and Michael A. Boles. Thermodynamics: An Engineering Approach; McGraw-Hill College; 4thedition; ISBN-10: 0072383321; (2001).
2. Ernst Heinrich Hirschel. Basics of Aerothermodynamics (Progress in Astronautics and Aeronautics); Springer. ISBN-10: 3540672370; (2005).
3. Rogers GFC and Mayhew Y. Engineering Thermodynamics: Work and Heat Transfer; Longman; 4thEdition; ISBN-10: 0582045665; (1992).
4. Rayner Joel. Basic Engineering Thermodynamics; Pearson India; 1stEdition; ISBN-10: 8131718883; (2008).