II CHE 242 Chemical Engineering Thermodynamics-I

Course Outlines

- **Title:** Chemical Engineering Thermodynamics-I
- **Code Number:** CHE242
- **Semester:** 4th
- **Credit hours:** 2
- **Pre-requisites course requirements/ skills:** CHEM125
- **Learning Outcomes:**

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

  1. Describe the fundamentals concepts of chemical and engineering thermodynamics.
  2. Understand energy analysis of closed and open systems.
  3. Examine thermodynamic cycles
  4. Analyse energy production systems and refrigeration

- **Contents**

  Unit I: First Law of thermodynamics and Properties of Pure Substances

  1.1 Fundamentals of thermodynamics
  1.2 Intuitive systematic problem-solving technique
  1.3 Constant-property processes, reversible and irreversible processes.
  1.4 Phase diagrams
  1.5 Ideal-gas equation of state and compressibility factor for real gases and the procedures for determining thermodynamic properties
  1.6 Energy analysis of Closed systems including the examination of the moving boundary work and concepts of specific heats, internal energy
  1.7 Enthalpy of ideal gases as well as solids or liquids

  Unit II: Second and third laws of thermodynamics

  2.1 Concept of thermal efficiency
  2.2 The increase of entropy principle, entropy change of pure substances
  2.3 Thermodynamic analysis of steady- flow equipment
  2.4 Concept of energy and its applications

  Unit III: Power refrigeration cycles

1.1 Vapor and gas power cycles
    1.1.1 Carnot vapor cycle
    1.1.2 Rankine cycle
    1.1.3 Otto cycle
    1.1.4 Diesel cycle
    1.1.5 Brayton cycle
    1.1.6 Combined gas–vapor power cycles
    1.1.7 Reversed Carnot cycle
    1.1.8 The ideal vapor-compression refrigeration cycle
    1.1.9 Actual vapor-compression refrigeration cycle
1.2 Factors to increase the efficiency of power cycles
1.3 Concepts of refrigerators and heat pumps
1.4 Liquefaction

- **Teaching-learning Strategies**

  The teaching and learning strategy has been designed on the understanding of concepts and the ability to critically analyze and apply the learned content through lectures, discussion, activities, case studies using computer, multi-media and writing board instructional aids.
  Lectures: 2 hours per week

- **Assignments- Types and Number with calendar**

  A minimum of two assignments to be submitted before the written exam of final term

- **Assessment and Examinations**

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written examination at the mid-point of the semester.
2.	Formative Assessment	25%	It includes: classroom participation, attendance and assignments.
3.	Final Assessment	40%	Written examination at the end of semester.

- **Textbook and reference readings**

1. Cengel, Y.A., Boles, M.A. (2019), "Thermodynamics: An Engineering Approach", 9th Edition, McGraw Hill
2. Smith J.M., Van Ness H. C., Abbott M.M., Swihart, M.T. (2022), "Introduction to Chemical Engineering Thermodynamics", 9th Edition, McGraw Hill.
3. Eastop T.D., McConkey A. (1993), "Applied Thermodynamics for Engineering Technologists" 5th Edition Wiley & Sons
4. Daubert, T.E. (1985), "Chemical Engineering Thermodynamics"1st Edition McGraw Hill
5. Koretsky M. (2013), "Engineering and Chemical Thermodynamics", 2nd Edition, Wiley & Sons.