



COURSE NAME: Engineering Thermodynamics

COURSE NUMBER: EGR*214

CREDITS: 3 CREDITS

CATALOG DESCRIPTION: This course covers energy concepts and balances; basic definitions including the first and second laws of thermodynamics; ideal and real gases; thermodynamic properties; and introductory cycle analysis.

PREREQUISITES: PHY* 221 and MAT* 254

General Education Competencies Satisfied:

HCC General Education Requirement Designated Competency Attribute Code(s):

None

Additional CSCU General Education Requirements for CSCU Transfer Degree Programs:

None.

Embedded Competency(ies):

None.

Discipline-Specific Attribute Code(s):

None

Course objectives:

General Education Goals and Outcomes:

None

Course Specific Objectives:

- Determine state property changes for pure substances and ideal gases
- Compute the amount of energy transferred by heat
- Determine amounts of energy transferred by work for closed systems containing a pure substance or an ideal gas
- Compute heat transfer rate and/or shaft power of the flow of a pure substance or of an ideal gas through a control volume
- Use isentropic efficiency to analyze the operation of actual adiabatic turbines, compressors, nozzles, and pumps.
- Compute energy transfer rates and thermal efficiency for ideal Rankine cycles.

COURSE CONTENT:

- A. Introduction
 - a. Units and systems

- b. Temperature and pressure
 - c. Units and problem solving
- B. Energy, Energy Transfer and General Energy Analysis
 - a. Energy, heat and work
 - b. First Law of Thermodynamics
 - c. Energy conversion efficiency
- C. Properties of Pure Substances
 - a. Phases of a pure substance
 - b. Phase-change processes
 - c. Property states and tables
 - d. Ideal and real gasses
- D. Energy Analysis of Closed Systems
 - a. Energy balance
 - b. Specific heats
 - c. Internal energy and enthalpy
- E. Mass and Energy Analysis of Control Volume
 - a. Conservation of mass
 - b. Steady-flow systems
 - c. Steady-flow engineering devices
 - d. Unsteady-flow systems
- F. Second Law of Thermodynamics
 - a. Thermal energy reservoirs and heat engines
 - b. Refrigerators and heat pumps
 - c. Reversible and irreversible processes
 - d. Carnot cycle and devices
- G. Entropy
 - a. Increase of entropy
 - b. Isentropic processes and efficiencies
 - c. Entropy change of liquids, solids and ideal gasses
- H. Special Topics
 - a. Work and potential
 - b. Gas cycles

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