EASTERN ARIZONA COLLEGE
Thermodynamics
Course Design
2014-2015

Course Information

Division	Mathematics
Course Number	EGR 255
Title	Thermodynamics
Credits	3
Developed by	Dr. John H. Bailey/Revised by Tom Palmer
Lecture/Lab Ratio	3 Lecture/0 Lab

Transfer Status

ASU	NAU	UA
Elective Credit	ME 291	AME 230

Activity Course	No
CIP Code	14.0101
Assessment Mode	Pre/Post Test (10 Questions/100 Points)
Semester Taught	Upon Request
GE Category	None
Separate Lab	No
Awareness Course	No
Intensive Writing Course	No

Prerequisites

Prior or concurrent enrollment in MAT 220 required

Educational Value

Mechanical and Aerospace engineering disciplines require some knowledge of Thermodynamics; all engineers benefit from a basic understanding of the principles discussed in this course.

Description

Thermodynamics is a basic science that deals with energy and energy changes. This course covers the basic principles of Thermodynamics and presents real-world applications and problems so that students can gain an understanding of physical and chemical changes that are influenced by the energy of systems.

Supplies

Scientific Calculator

Competencies and Performance Standards

1. Demonstrate an understanding of the basic concepts of Thermodynamics by using these concepts in problem solving activities.

Learning objectives

What you will learn as you master the competency:

a. Demonstrate an understanding of closed and open systems.

b. Be able to explain intensive and extensive system properties.

c. Define the state of a system and determine whether it is at equilibrium.

d. List the various forms of energy and give examples of energy interactions.

e. Describe measurement techniques for temperature and pressure.

Performance Standards

Competence will be demonstrated:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Performance will be satisfactory when:

- You can understand the properties and definitions of closed and open systems.
- You can understand how to define and use the concepts of intensive and extensive system properties
- You can define the state of a system and tell whether it is at equilibrium.
- You can understand and list the various forms of energy and possible interactions.
- You can understand measurement techniques for temperature and pressure.

2. Demonstrate an understanding of the properties of pure substances and the energies involved in changing the state of a pure substance.

Learning objectives

What you will learn as you master the competency:

a. Demonstrate an understanding of changes of phase and the Thermodynamic mechanisms governing phase changes.

b. Demonstrate the ability to read phase diagrams, look up necessary data, and construct phase diagrams.

c. Demonstrate an understanding of the concept of Enthalpy.

d. Demonstrate knowledge of the Equations of State and their use.

Performance Standards

Competence will be demonstrated:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Performance will be satisfactory when:

- You can understand the concepts of phase and phase change.
- You can read and draw property diagrams for phase change processes.
- You can understand and can extract information from phase diagrams.

- You can understand and can use the concept of Enthalpy.
- You can understand the Equations of State and can use these equations in calculations.

3. Demonstrate an understanding of Energy transfer and the means by which it is accomplished.

Learning objectives

What you will learn as you master the competency:

a. Demonstrate an understanding of heat transfer processes and be able to identify adiabatic processes.

b. Demonstrate an understanding of the various forms of work.

c. Demonstrate problem solving abilities using the concept of conservation of mass.

Performance Standards

Competence will be demonstrated:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Performance will be satisfactory when:

- You can understand the mechanisms of heat transfer and can define adiabatic process.
- You can understand the engineering definition of work and the various forms of work.
- You can understand the concept of conservation of mass and can use this as an aid in problem solving.

4. Demonstrate an understanding of and an ability to use the First Law of Thermodynamics.

Learning objectives

What you will learn as you master the competency:

a. Demonstrate an understanding of conservation of energy and be able to explain the First Law of Thermodynamics.

b. Demonstrate energy balance calculations.

Performance Standards

Competence will be demonstrated:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Performance will be satisfactory when:

- You can understand the concept of conservation of energy and the First Law of Thermodynamics.
- You can perform an energy balance for a closed system as well as systems with both steady and unsteady flow.

5. Demonstrate an understanding of and an ability to use the Second Law of Thermodynamics.

Learning objectives

What you will learn as you master the competency:

a. Be able to explain the concept of entropy.

b. Use the concept of entropy as a basis for efficiency calculations.

c. Solve problems related to the exchange of heat.

d. Explain the concept of perpetual motion and demonstrate the impossibility of such.

e. Draw and describe the Carnot Cycle.

Performance Standards

Competence will be demonstrated:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Performance will be satisfactory when:

- You can understand and can explain the concept of Entropy.
- You can understand the basis for efficiency calculations.
- You can solve problems related to refrigerators and heat pumps.
- You can use the Thermodynamic principles to explain the impossibility of perpetual motion machines.
- You can understand the Carnot Cycle.

6. Demonstrate an understanding of Entropy and Entropy changes during real processes

Learning objectives

What you will learn as you master the competency:

a. Be able to calculate and diagram entropy changes of pure substances and ideal gases.

b. Demonstrate the calculation of an entropy balance.

Performance Standards

Competence will be demonstrated:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Performance will be satisfactory when:

- You can calculate the change in Entropy of a pure substance and can read and draw property diagrams involving Entropy.
- You can calculate the Entropy change of Ideal Gases.
- You can perform an entropy balance.

7. Demonstrate an understanding of the work potential of various types of Energy.

Learning objectives

What you will learn as you master the competency:

a. Define the concepts of reversible and irreversible work.

b. Demonstrate the use of energy balance calculations to solve realistic problems.

Performance Standards

Competence will be demonstrated:

- On assigned activities
- On written exams

On a two hour cumulative final exam

Performance will be satisfactory when:

- You can understand the concepts of reversible and irreversible work.
- You can use Energy balance calculations to solve various real-world problems.

Types of Instruction

Lecture/Discussion

Grading Information

Grading Rationale

Each instructor has the flexibility to develop evaluative procedures within the following parameters.

1. Written Exams (other than the final exam) must represent at least 60% of the final course grade.
2. Final Exam must represent at least 20% of the final course grade.
3. The Post Test is to be embedded in the final exam and must represent at least 10% of the final course grade (i.e., must comprise at least 50% of the Final Exam).
4. Other Activities may represent at most 20% of the final course grade.

Grading Scale

A 90%-100%

B 80%-89%

C 70%-79%

D 60%-69%

F Below 60%