

Materials 441: Thermodynamics of Materials I

Course Description: 3 Cr. U/G., The laws of thermodynamics; statistical interpretation of entropy; thermodynamic functions; behavior of gases; phase equilibria in one component system; reactions involving gases. Prereq: Jr St; Math 233(P) & Physics 210(P).

Textbook:

D. R. Gaskell, Introduction to the Thermodynamics of Materials, 3rd edition, Taylor & Francis (1995).

Prerequisites by Topics:

- Differential and integral calculus
- Trigonometric, exponential and logarithmic functions
- Concepts of heat and work

Course Objectives:

- Students will be able to analyze behavior of solids, liquids and gases in terms of their thermodynamic properties.
- Students will be able to understand the three laws of thermodynamics.
- Students will be able to apply the thermodynamic functions to the behavior of solids, liquids and gases.

Topics Covered:

- Thermodynamic variables
- First law of thermodynamics
- Second law of thermodynamics.
- Third law of thermodynamics
- Ideal gas law
- Carnot cycle, heat engine
- Reversible and irreversible processes
- Statistical interpretation of entropy
- Chemical equilibrium

Project:

None

Written Communications

None

Oral Communications

None

Laboratory Exercises

Demonstration of an irreversible reaction (crystallization of sodium acetate in water). Hand warmer.

Class/Laboratory Schedule: List the number of lectures, lab sessions, etc., and the amount of time devoted to each.

3 hours of lectures and discussion per week

Methods of Assessment:

- Homework
- Class examinations

Resources Commonly Available:

- Instructor
- Textbook
- Library material
- Hand-outs

Desirable Student Competencies:

- Students will be able to apply the three laws of thermodynamics to the behavior of solids, liquids and gases.
- Students will be able to use thermodynamics functions to determine the behavior of solids, liquids and gases.

Contribution of Course to Meeting the Professional Component:

The course develops the ability for rigorous thinking and systematic problem solving.

Relationship to Program Objectives:

This course meets the following program outcomes:

1-i, ii and 2-v, vi, vii

The outcomes are being evaluated through homework, examinations, class discussions, laboratory experiments.

All outcomes are continuously strongly addressed throughout the course.

A Student will meet the outcomes satisfactorily by obtaining a grade of "C" or better in the course.

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