University of Arkansas – Fort Smith
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General Syllabus:

PHYS 3503 Classical Thermodynamics

Credit Hours: 3 Lecture Hours: 3 Laboratory Hours: 0

Prerequisite: PHYS 2923 University Physics II

Effective: 2018~2019

I. Course Information

A. Catalog Description

Begins with the definition of the thermodynamic variables and will use these to define: equations of state, thermal equilibrium, the laws of thermodynamics with application to special systems including the ideal gas, the van der Waals gas, the Carnot cycle, heat engines, magnetic systems, phase transitions, and superfluids.

B. Additional Information

The course is a mathematically rigorous treatment of classical systems, with emphasis on sophisticated problem solving. A primary goal is to learn to approach difficult problems in a scientific fashion. It builds on material from previous courses in physics and mathematics.

II. Student Learning Outcomes

A. Subject Matter

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

1. Evaluate the basic principles of classical thermodynamics.
2. Evaluate and discuss the origins and relationships between basic principles of classical thermodynamics.
3. Calculate and solve problems involving thermodynamic relationships such as, but not limited to, equations of state, entropy and temperature; pressure, volume and temperature, Cyclic processes, reversible, irreversible processes and phase transitions.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills
Critical Thinking Skills: Students will identify a problem or issue and will research, evaluate, and compare information from varying sources in order to evaluate authority, accuracy, recency, and bias relevant to the problems/issues. The student will generate solutions/analysis of problems/issues evaluated and will assess and justify the solutions and/or analysis.

Communication Skills (written and oral)
Students will communicate proficiently. The student will compose coherent documents appropriate to the intended audience and effectively communicate orally in a public setting.

Ethical Decision Making
Students will model ethical decision-making processes. The students will identify ethical dilemmas and affected parties and will apply ethical frameworks to resolve a variety of ethical dilemmas.

Global & Cultural Perspectives
Students will reflect upon cultural differences and their implications for interacting with people from cultures other than their own. The students will demonstrate understanding or application of their discipline in a global environment and will demonstrate how their discipline impacts or is impacted by different cultures.

III. Major Course Topics

A. Temperature scales and thermometry
B. Equations of state for simple systems, with an emphasis on the ideal gas
C. Mathematical techniques for classical thermodynamics, in particular the use of partial derivatives
D. Heat, work, internal energy and the First Law of Thermodynamics
E. Heat capacity
F. Thermodynamic cycles, heat engines and refrigerators
G. Entropy and the Second Law of Thermodynamics
H. Introduction to Kinetic theory and Statistical mechanics.