# King Fahd University of Petroleum & Minerals

## *Mechanical Engineering Department*

## ME 203: THERMODYNAMICS I

Summer Semester 2005-2006 (053)

*The Department is committed to providing highest quality education in mechanical engineering, conducting world-class basic and applied research, addressing the evolving needs of industry and society, and supporting the development of more competitive and new industry in the Kingdom of Saudi Arabia*

***Instructor:*** ***Dr. H Al-Qahtani, Office # 22-125.3, Phone 2846***
***Email Address:*** ***QahtaniH@kfupm.edu.sa***

***Office Hours:*** UMT 3:20-4:10

***Catalog Data:*** System and control volume concepts. Properties of a pure substance. Work and heat. The first law of thermodynamics as applied to a system and a control volume, internal energy, enthalpy. The second law of thermodynamics. Carnot cycle, entropy, reversible and irreversible processes. Applications of steady state steady-flow, uniform-flow, and other processes.
***Prerequisites: MATH 102, PHYS 102.***

***Textbook:*** Yunus A. Cengel and Michael A. Boles. ***THERMODYNAMICS: An Engineering Approach***, *4th* Ed. McGraw Hill, 2002.

***References:*** ***1***) Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen, ***FUNDAMENTALS OF THERMODYNAMICS.*** *5th* Ed., 1998 John Wiley & Sons.
***2***) W. Z. Black and J. G. Hartley. ***THERMODYNAMICS***, Harper Collins Publishers.
**3**) Michael J. Moran and Howard N. Shapiro. ***FUNDAMENTALS OF ENGINEERING THERMODYNAMICS*** *2nd* Ed. John Wiley & Sons, 1994.

***Objectives:***

*1) To familiarize the students with basic concepts of the first and second laws of Thermodynamics and their applications in engineering problems.*
*2) To provide the student with a comprehensive treatment of classical Thermodynamics.*
*3) To prepare the student to effectively use thermodynamics in the practice of engineering.*

***Course Breakdown:***

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|---|---|---|
| 1. | Basic Concepts and Definitions | (3 classes) |
| 2. | Properties of Pure Substances. | (8 classes) |
| 3. | Work and Heat. | (4 classes) |
| 4. | The First Law of Thermodynamics. | (9 classes) |
| 5. | The Second Law of Thermodynamics. | (3 classes) |
| 6. | Entropy and Applications | (8 classes) |
| 8. | Tests | (3 classes) |

***Evaluation:***

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| 1st class Test | 10 % | (Sunday, July 9, 2006) |
| Midterm Exam | 20 % | (Tuesday, July 25, 2006) |
| 2nd class Test | 15 % | (Saturday, August 12, 2006) |
| Quizzes (minimum 3) | 15 % | |
| Homework | 10 % | |
| Final Exam | 30 % | |
| Total | 100 % | |

***Attendance****:* Attendance will be strictly observed and each absence will result in a deduction of *0.5* point of the final grade.

***Homework:*** Homework will be assigned at the beginning of each week and is due a week later. Late homework will not be accepted.

**Student Learning Outcome**

*Course Objective 1*

1. Students will demonstrate a basic understanding of the nature of the Thermodynamic processes for pure substances and ideal gases.

2. Students will demonstrate a basic understanding of the first law of Thermodynamics and its applications to systems and control volumes.

3. Students will demonstrate a basic knowledge of the second law of Thermodynamics and its applications to systems and control volumes.

*Course Objective 2*

1. Students will demonstrate ability to use the first law of Thermodynamics for energy conservation analysis of different Thermodynamic processes of systems and control volumes.

2. Students will demonstrate ability to use the second law of Thermodynamics for entropy balance analysis of different Thermodynamic processes of systems and control volumes.

3. Students will demonstrate ability to evaluate the thermal performance of different heat engines and refrigeration cycles through the calculation of their thermal efficiency or coefficient of performance.

*Course Objective 3*

1. Students will demonstrate the ability to present short written reports on first and second law analyses of different Thermodynamic processes of systems and control volumes.