ME 2210  THERMODYNAMICS

Term:  Winter 2005, Call # 20200
       11:45-13:45, TTh , 1500 Engineering,

Instructor:  Trilochan Singh,  2101 Engineering
            577-3845, e-mail  address: tsingh@eng.wayne.edu

Office Hours:  2:30-4:30 pm MTTh, other times by appointment
GTA Office hours: Gurmeet Singh, aq7670@wayne.edu , 2116 Engineering, 313-833-1183

Pre-requisites:  MAT 2020 and PHY 2175

Text:  Thermodynamics , Cengels and Boles

Reference:  Thermodynamics, Sonntag and Van Wylen
            Thermodynamics, M.J. Moran and H.N. Shapiro

COURSE LEARNING OBJECTIVES:

Students who successfully complete BE 2210 will be able to:

* calculate thermodynamic properties of pure systems and their relationships {Chapt 1and 2, Quiz 1, A, C; 1,2}

* understand the First Law of Thermodynamics as an expression of the conservation of mass and
  energy for closed systems and open systems and formulate the first law in equation form
  (energy/mass balance) for closed systems and open systems {Chapt. 3 and 4, Quiz 3,4, test1,A, B, C: 1,2}

* calculate work done, heat transfer, changes in internal energy, enthalpy, kinetic energy, potential energy for closed systems and open systems undergoing various processes with working medium as ideal gases as well as non-ideal gases. {chapter 3,4, Quiz 2,3,4, test 1, A, B, C, D, 1,2,3}

* understand the concept of Second Law of Thermodynamics (feasibility of process) and Entropy
  and apply these to determine thermodynamic properties for closed systems and open systems
  undergoing various processes {Chapt 5,6, quiz 5-8, test2,A, B, C, D; 1,2,3}

* apply above concepts and principles for identifying, formulating and solving engineering
  problems and preliminary design/analysis of simple systems like tanks, piston cylinder assembly,
  HVAC systems, pipes etc.  {Design type problems, Chapt 2-6,HW Chpt13, A, B, C, D, I; 1,2,3,4}

*apply the basic principles of measurement, data analysis, learned through “hands –on “
  laboratory experience {B, D, E, H; 3,5}

RELATIONSHIP OF COURSE TO PROGRAM EDUCATIONAL OUTCOMES:

Strongly contributes to the BSME Program Educational Outcomes that successful students will:

* be able to understand scientific principles and apply them to the practice of engineering (A);
* be able to communicate effectively (B);
• possesses the problem-solving skills, background, and confidence necessary to educate themselves continually throughout their careers (C);

Contributes to the following BSME program outcomes that successful students will:

* be able to apply computers as tools for engineering (D)
* be able to apply the basic principles of measurement, data analysis, and design of experiments learned through “hands-on” laboratory (E)
* be able to practice engineering with ethical standards and a responsibility to the society (F)
* be able to work as part of a team (H);
* be able to apply design process to engineering problems, including the consideration of different technical alternatives while bearing in mind cost, environmental concerns, safety, and other constraints (I);

GRADE: 2 Tests 25% (10%, 15%), Final 20%, 10 quizzes 30%, Design/Computer problems and HW 10%, 10% Lab Report, 5% for term paper regarding contemporary issues, the global impact of engineering,
Grade: A: 90% and above B: 80-89%, C: 70-79%, D: 60-69% . +/- grades will be allocated for marginal cases.

The average score of quizzes, tests and final must be 60% or better in order to pass the course

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<tr>
<th>WEEK OF</th>
<th>MATERIAL TO BE COVERED</th>
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<tr>
<td>1. January 10</td>
<td>Chapter 1, Basic Concepts</td>
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<td>2. January 17</td>
<td>Chapter 2, Properties Pure Substance, Quiz 1</td>
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<td>3. January 24</td>
<td>Chapter 3, Energy and the First Law, Quiz 2</td>
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<td>4. January 31</td>
<td>Chapter 3 continued, Quiz 3</td>
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<td>5. Feb 7</td>
<td>Ch. 3 continued, Quiz 4</td>
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<td>6. Feb 14</td>
<td>Ch. 3 comp, start Ch. 4, Quiz 5</td>
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<td>7. Feb 21</td>
<td>Chapter 4, continue, Test 1</td>
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<td>8. Feb 28</td>
<td>Chapter 4 and Chapter 13,</td>
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<td>9. March 7</td>
<td>Chapter 13, Gas Vapor Mixture, Quiz 6</td>
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<td>10. March 21</td>
<td>Chapter 13, Second Law, Quiz 7</td>
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<td>11. March 28</td>
<td>Chapter 5, Second Law, Quiz 8</td>
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<td>12. April 4</td>
<td>Chapter 6, Entropy, Quiz 9</td>
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<td>13. April 11</td>
<td>Chapter 6, Entropy, Test 2</td>
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<td>14. April 18</td>
<td>Chapter 6, Quiz 10</td>
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<td>15. December 13</td>
<td>Final Friday April 29, 2005 10:40-1:10pm</td>
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Lab weeks 5-11 (Room 1325 Engineering Building)
Group #1,3,5,7,9  2:30pm to 4:00pm T Th, Each group consists of 4 students
#2,4,6,8,10  4:00-5:30pm T Th and so on
The lab assignments require a formal report, word-processor generated and of professional quality.

Each quiz will consist of one problem (25 minutes) at the end of class on Thursdays
Quizzes and Tests will be Open book (Text book only), closed notes.
Design Projects reports must be typed.
No make up exam/quiz will be given. The minimum penalty for academic dishonesty is failure in the course.

Photocopies of the textbook will not be allowed in the class. Such photocopies are illegal and are in violation of U.S. copyright laws.

Last day to drop a class with tuition refund is Monday September 16, 2002. There is no tuition refund for any class dropped after September 16, 2002.

College of Engineering does not allow withdrawal from courses after the fifth week of class except under exceptional circumstances. This requires the permission of the Associate Dean of the College of Engineering. Failing a class is not an acceptable excuse for withdrawal after 5th week.

**STUDENT CONDUCT:**
It is the responsibility of each student to adhere to the principles of academic integrity. Academic integrity means that a student is honest with him/herself, fellow students, instructors, and the University in matters concerning his or her educational endeavors. Thus, a student should not falsely claim the work of another as one's own, or misrepresent him/herself so that the measures of one's academic performance do not reflect his/her own work or personal knowledge. In this regard, cheating will not be tolerated. Cheating includes (but is not limited to) any communication (written or oral) during examinations and sharing of work, such as using the same models or computer programs or copying work. All homework and projects must be an individual effort unless specifically noted. **STUDENTS WHO CHEAT ON ANY ASSIGNMENT OR DURING ANY EXAMINATION WILL BE ASSIGNED A FAILING GRADE FOR THE COURSE.** Therefore avoid all appearance of improper behavior! Students who witness cheating should report the incident to the instructor as soon as possible. Students are also welcome to discuss any concerns related to cheating with Dr. Gibson, Chair of Mechanical Engineering.

**HOME WORK:**
Homework to be due on Thursday after the completion of chapter.

**Chap 1:** 1- 69, 70, 73, 75, 85, 89, 137, 143, 144, 145 (4th Edition)

**Chap 2:** 2-26, 30, 38, 39, 46, 53, 57, 59, 70, 72, 75, 121, 122, 123, 125, 127 (4th Ed.)
Design Problems: 3-191, 193 (3rd Edition) or 2-145, 146 (4th Ed)

**Chap 3:** 3-20, 29, 31, 43, 53, 56, 61, 87, 89, 88 and 4-5, 9, 11, 17, 20, 22, 32, 36, 40 (4th Edition)
Design Prob; 3-110, 111 (4th Edition)

**Chap 4:** 61, 65, 71, 79, 84, 90, 96, 104, 110, 114, 120, 149, 153, 154, 163, 166, 167, 239, 257 (4th Edition)
Design Prob; 4-212, 293 (4th Edition)

**Chap 5:** 5-36, 55, 62, 64, 103, 118, 143 (4th Edition)
Design Prob; 5-119, (3rd Edition) or 5-117 (4th Edition)


SUGGESTED HOME WORK: (NOT TO BE SUBMITTED)
Chapter 1: 8, 9, 28, 33, 40, 43, 45, 82, 84 (3rd Ed.) or 8, 9, 30, 46, 69, 73, (4th Ed.)
Chapter 3: 2, 4, 5, 7, 8, 16, 19, 33, 34, 36, 38, 41, 43, 46, 57, 58, 64, 70, 75, 78, 81, 83, 86, 101, 105, 107, 112, 115, 117, 153, 154, 155, 161 (3rd Ed.) or 2, 4, 5, 7, 8, 14, 15, 18, 20, 24, 27, 31, 43, 44, (4th Ed.)
Design Prob. 4-159 (3rd Ed.) or 4-293 (4th Ed.)
Chapter 5: 2, 3, 4, 8, 11, 12, 14, 18, 22, 25, 52, 57, 63, 83, 86, 88, 90, 97, 100, 103, 105, 109 (3rd Ed.) or 2, 3, 4, 7, 9, 10, 11, 14, 18, 21, 50, 55, 62, 80, 84, 86, 88, 95, 98, 101, 103, 107 (4th Ed.)
Computer Prob 5-119 or 158 (3rd Ed.) or 5-117, 177 (4th Ed.)
Chapt 8: 8-36, 38, 46, 50, 76, 82, 93 (3rd Ed.) or 8-36, 38, 47, 49, 73, 79, 92 (4th Ed.)
Chapt 13: 13-15, 17, 27, 29, 38, 60, 64, 69, 85, 87 (3rd Ed.) or 13-16, 19, 29, 31, 44, 68, 73, 78, 90, 98 (4th Ed.)

Term Paper (4-6 pages) Contemporary Issues, the Global Impact of Engineering:
Find an article (energy related preferably) published in some newspaper/magazine in 2003-2005 that raises a concern regarding either the environment or international commerce and where engineering issues are involved.
Enclosed are copies of articles. You may chose one of these as topic (such as advances in Materials, advances in powertrain etc.)
Once you have found the article, then do further research, citing all sources you used, to summarize the state of art, and how the particular advances have affected the society, environment, trade etc. You may try to answer the following
Why this topic?
What are the arguments in favor?
What are the arguments against?
Are there any public relation issues?
Are their political issues?

Coclusions/Summary

Term Paper due First Tuesday of November 2003.

GOAL OF MECHANICAL ENGINEERING BS DEGREE PROGRAM:

MECHANICAL ENGINEERING BS GRADUATES WILL BE ABLE TO APPLY BASIC ENGINEERING PRINCIPLES TO DESIGN, SPECIFY THE MANUFACTURE OF, EVALUATE THE PERFORMANCE OF, AND IDENTIFY AND SOLVE PROBLEMS OF MECHANICAL SYSTEMS AND PROCESSES.

BSME Program Educational Outcomes:

The main objective of our undergraduate program is to provide an outstanding curriculum and learning environment, so that, following completion of our undergraduate program, BSME graduates will:
A) be able to understand scientific principles and apply them to the practice of engineering;
B) be able to communicate effectively;
C) possess the problem-solving skills, background, and confidence necessary to educate themselves continually throughout their careers;
D) be able to apply computers as tools for engineering;
E) be able to apply the basic principles of measurement, data analysis, and design of experiments, learned through “hands-on” laboratory experience;
F) be able to practice engineering with ethical standards and a responsibility to society;
G) be able to develop creative solutions to engineering problems;
H) be able to work well as part of a team;
I) be able to apply the design process to engineering problems, including the consideration of different technical alternatives while bearing in mind cost, environmental concerns, safety, and other constraints;
J) be able, based on their first-hand design experience, to analyze, construct, test, and evaluate an engineering design.

In support of these educational outcomes of the program, faculty members will seek outstanding levels of achievement in their research and engineering practices. Further, to foster professionalism, we will encourage students to be active participants in ASME, Pi Tau Sigma, SAE and other student professional organizations.

In addition, students in all required BSME courses will be asked to fill out questionnaires during the semester in order to help the instructors
assess the degree to which the Course Learning Objectives are being met. Students in the third-year project design course ME 4250 and in the capstone design course ME 4500 will also be asked to complete a questionnaire to determine to what extent desired BSME program Outcomes are being achieved.
Thank you for your cooperation.