Chemical Engineering Thermodynamics I
ChE 06310
Mondays, Wednesdays, and Fridays 10:50 am – 12:05 pm
Rowan Hall Auditorium

INSTRUCTOR: Mariano J. Savelski, Ph. D.
Professor
Department of Chemical Engineering
332 Rowan Hall
Office phone: 256-5317
email: savelski@rowan.edu

TEXT: Chemical, Biochemical, and Engineering Thermodynamics

The student companion site can be found at
http://bcs.wiley.com/he-bcs/Books?action=index&itemId=0471661740&bcsId=2932

OFFICE HOURS
Students are welcome (and encouraged) to come as needed. If I am in my office and not on the phone or with another student, I will make time for you. At minimum, we will arrange a time to meet that will accommodate both of our schedules.

RESPONSIBILITIES
To succeed in this class, you should read the relevant material before coming to class, make a reasonable effort to do the assigned homework, hand in what you accomplish, and ask questions on points that you do not understand. I will lecture on points in the book and on supplemental topics, attempt to answer all serious questions, make myself available to anyone needing extra help, administer fair but demanding exams, and grade and return assignments in a reasonable time.

GRADING: 3 exams (15% L, 20% M, 30% H) 65%
Final Exam 30%
Professional Behavior* 5%
Homework (extra credit) 5%
ABSOLUTE GRADING SCALE
In this course we would like to create an atmosphere of positive cooperation between students. In addition, most of the exercises in this course will require you to work in teams and you will be expected to help each other learn the material. To encourage and support cooperative learning you will be graded on an absolute grading scale as given below. The net result is that it is in your interest to help your classmates become successful engineers. You will learn through teaching others.

<table>
<thead>
<tr>
<th>Letter Grade ranges</th>
<th>Percentages between</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100</td>
</tr>
<tr>
<td>B</td>
<td>80-89</td>
</tr>
<tr>
<td>C</td>
<td>70-79</td>
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<tr>
<td>D</td>
<td>60-69</td>
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POLICIES
1. Regular attendance is expected as your class participation will be evaluated and graded.
   You are responsible for all material whether you are in class or not. If you will be absent, you should notify the instructor via email at least 24 hrs before class.

2. Students are expected to be ready for class at the beginning of the class period. 
   *I have a zero tolerance policy to being late to class (including examination days)*
   No student will be admitted late as this constitutes a disturbance to class activities. If a student insists on walking in late, this behavior will result in a grade of zero for the Professional Behavior portion of the final grade.

3. *Cell phones should be stowed at the beginning of the class period.

4. Late work of any kind will not be graded.

5. Each student will be assigned to a collaborative study group. If every member of that group scores above 83 on an exam, each group member will receive four bonus points on the exam.

HOMEWORK GRADING
Team Homework will be periodically assigned. Homework will NOT be accepted without the correct cover sheet (You will use the homework assignment sheet from Blackboard as cover sheet). Each team will have to turn in the complete homework on the due date to receive the 4 (four) points of homework baseline credit (partial work will receive NO baseline credit).
Occasionally, homework problems will be chosen and graded following the assignments grading criteria (see below). Every team will be graded on the same chosen problems. The points obtained will be in addition to the 4 (four) points of baseline credit,
for example: one problem is graded, the problem has two parts, part a) and part b), each part will be graded out of 4 points, you submitted your homework on time, therefore, you can get up to 12 points in that particular assignment.

Solutions will be scored according to the following scale:

- 4 points – Correct solution method, equations and tables properly cited, units clearly shown throughout the entire problem, and correct numerical answer.
- 3 points – Correct solution method, equations and tables properly cited, units clearly shown throughout the entire problem, and incorrect numerical answer.
- 2 points – Incorrect solution method OR equations and/or tables are NOT all properly cited OR units are missing in two or more instances.
- 0 points - Problem not done.

At the end of the semester homework points will be added and normalized based on the maximum attainable points.

The grade received on all team assignments is a “raw score”. Raw scores will be adjusted according to each individual’s contribution to the overall team effort. Each team member will be evaluated by every member of the team, including him/herself. The adjusted score (not the raw score) will be used in calculation of course grades. Thus, the student who consistently demonstrates a higher level of effort may be rewarded. Likewise, the student who does not contribute substantially to team assignments may be penalized.

Please be aware that the adjustment of grades for team assignments can substantially impact the overall course grade, either positively or negatively.

EXAMS
Three exams will be given. The exams will be weighted on an individual basis: 15% (for your lowest score), 20%, and 30% (for your highest score).

All exams are comprehensive with an emphasis on material covered since the previous exam. In addition, a comprehensive final exam will be given during Finals Week. All exams will be open-book and notes unless otherwise announced. Absence at examination time is excusable only if deemed so by the Dean of Students Office (it may be required to present documentation proving illness of the student or similar emergency). An unexcused absence from an exam will result in a zero grade on that exam.

If you feel that a test problem has been graded improperly (except for misadding points), you must resubmit the problem within 72 hours along with a written appeal and explanation. Upon receipt of this formal appeal, I will regrade the problem. This means that your score may go up or down.
PROFESSIONAL BEHAVIOR
All students are expected to behave professionally, unprofessional behavior includes but is NOT limited to, being late to class, walk in and out of class while in session, cell phone/smart phone use (any kind of use) in class, working on assignments foreign to the class, sleeping in class, disrupting the class, chatting in class, and horseplay.

ACADEMIC MISCONDUCT
Any student engaged in an act of academic misconduct, which includes but is NOT limited to, cheating, plagiarism, use of written or oral offensive language, tempering with other student’s files, and tempering with other student’s computer accounts, will receive a grade of F for this course. Depending on the nature of the offense, the student’s case may also be forwarded to the Dean of Students for University review. If another student is knowingly involved in the offense, he or she will receive the same penalty.

STUDENTS WITH DISABILITIES: If you have a documented disability that may have an impact on your work in this class, please contact me. Students must provide documentation of their disability to the Academic Success Center in order to receive official University services and accommodations. The Academic Success Center can be reached at 856-256-4234. The Center is located on the 3rd floor of Savitz Hall.

IMPORTANT DATES

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<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Room</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>09-28</td>
<td>10:50 AM</td>
<td>ROW 117</td>
<td>Exam 1</td>
</tr>
<tr>
<td>10-26</td>
<td>10:50 AM</td>
<td>ROW 117</td>
<td>Exam 2</td>
</tr>
<tr>
<td>11-30</td>
<td>10:50 AM</td>
<td>ROW 117</td>
<td>Exam 3</td>
</tr>
<tr>
<td>Finals Week</td>
<td>TBA</td>
<td>TBA</td>
<td>Final Exam</td>
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WITHDRAW SIGNATURE SCHEDULE FOR ALL COURSES
Withdrawal
Sept 13 - Oct 21 ................. (W) ............... Student, Professor

Late Withdrawal
Oct 22 - Nov 22 ............ (WP/WF) ............. Prof, Dept Chair

Hardship Withdrawal
Nov 23 - Dec 20 .......... (WP/WF) .. Prof, Dept Chair, Dean
INSTRUCTIONAL OBJECTIVES

These are the instructional objectives for the first module. Students completing the first module of the course should be able to:

- Define the terms internal energy, potential energy, kinetic energy, work, heat, entropy, and reversibility in their own words.
- Describe in words the physical behavior of an ideal gas and identify practical situations in which the ideal gas law would be a reasonable approximation.
- Use the steam table to quantify the inter-relationships between P, V, T, U, H and S for liquid water and steam.
- Apply energy and entropy balances to calculate work, heat, and changes in energy and entropy for open and closed systems.
- Describe the functions of process equipment such as pumps, turbines, throttling valves, compressors and heat exchangers, and apply energy and entropy balances to any of these systems.
- List and explain the steps in the following cycles: Carnot, Rankine, Refrigeration, Linde liquefaction, and Internal combustion.
- Quantify the overall efficiency or performance of any of the above cycles, as well as the individual steps within the cycle.

These are the instructional objectives for the second module:

- Write a total derivative expression that relates an intensive property of interest (H, U, S etc.) to known information.
- Transform a total derivative expression into a function of measurable properties using such tools as fundamental property relationships, Maxwell’s equations, triple product rule, and expansion rule.
- Use the generalized Z charts or an equation of state to quantify the relationship between P, V, T and \( \rho \).
- Find \( \Delta H \), \( \Delta S \) etc. for a process, given an equation of state that describes the working fluid.
- Explain in words what a departure function measures.
- Use departure functions to find \( \Delta H \), \( \Delta S \) etc. for a process, given an equation of state describing the fluid and its ideal gas heat capacity.
- Explain in words what the fugacity measures.
- Estimate the boiling point of a pure compound at a specific pressure, or the vapor pressure at a specific temperature.
- Compute the fugacity of a vapor or liquid at a particular set of conditions, given an equation of state that describes the liquid or vapor.
- Relate the fugacities of two phases that are in equilibrium with each other.
- Use the Poynting correction factor to approximate liquid fugacity.