Course Syllabus
CH3510 - Thermodynamics, Equilibrium and Kinetics
Spring 2010

Instructor Information

Instructor: Marta Włoch, PhD, Assistant Professor
Office Location: 701A Chem Sci
Telephone: Office – (906)487-1602
E-mail: wloch@mtu.edu
Office Hours: Thursday 3pm-4pm, or by appointment

Course Identification

Course Number: CH3510-0A
Course Name: Thermodynamics, Equilibrium and Kinetics
Course Location: 101 Chem Sci
Class Times: MWF 1:05pm – 1:55pm
Prerequisites: CH1120 or CH1122 or (CH1160 and CH1161) and MA2160 and PH2200(C)

Course Description/Overview

This course will introduce concepts which are used to explain and interpret observations on the physical and chemical properties and behavior of matter. PChem1 course covers two areas of physical chemistry: thermodynamics and chemical kinetics.

Course Learning Objectives

To provide students with a foundation in the thermodynamics principles governing chemical phenomena and to develop skills such as quantitative reasoning, problem solving, and rigorous and exact thinking.

Course Resources

Course Website(s)
- http://www.chemistry.mtu.edu/pages/courses/
- mailing list pchem1-l@mtu.edu

Required Course Text
**Grading Scheme**

**Grading System**

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
<th>Grade points/credit</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93% &amp; above</td>
<td>4.00</td>
<td>Excellent</td>
</tr>
<tr>
<td>AB</td>
<td>88% – 92%</td>
<td>3.50</td>
<td>Very good</td>
</tr>
<tr>
<td>B</td>
<td>82% – 86%</td>
<td>3.00</td>
<td>Good</td>
</tr>
<tr>
<td>BC</td>
<td>76% – 81%</td>
<td>2.50</td>
<td>Above average</td>
</tr>
<tr>
<td>C</td>
<td>70% – 75%</td>
<td>2.00</td>
<td>Average</td>
</tr>
<tr>
<td>CD</td>
<td>65% – 69%</td>
<td>1.50</td>
<td>Below average</td>
</tr>
<tr>
<td>D</td>
<td>60% - 64%</td>
<td>1.00</td>
<td>Inferior</td>
</tr>
<tr>
<td>F</td>
<td>59% and below</td>
<td>0.00</td>
<td>Failure</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student’s control. A grade of incomplete may be given only when approved in writing by the department chair or school dean.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Conditional, with no grade points per credit; given only when the student is at fault in failing to complete a minor segment of a course, but in the judgment of the instructor does not need to repeat the course. It must be made up within the next semester in residence or the grade becomes a failure (F). A (X) grade is computed into the grade point average as a (F) grade.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Grading Policy**

Grades will be based on the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Sets</td>
<td>30%</td>
</tr>
<tr>
<td>Mid-Term Exams (2 exams x 20% each)</td>
<td>40%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Course Policies**

The course will be graded on the basis of four homework assignments, two mid-term examinations and a final examination. Homework will be collected in lecture on a due date once per three weeks. Absolutely no late homework will be accepted. A student absent from an exam without a satisfactory explanation will receive a grade of 0.0. Additional information about this course, syllabus, homework assignments, solutions, etc. can be accessed from the course website.

Cell phones, Blackberries, iPods, PDAs, or any other electronic devices are not to be used in the classroom. Please make sure to bring a calculator with you to class. Calculators on other devices are strictly prohibited during the exams. Information exchanges on these devices during class are also prohibited and violate the Academic Integrity Code of Michigan Tech.
**University Policies**

Academic regulations and procedures are governed by University policy. Academic dishonesty cases will be handled in accordance the University's policies.

If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following:

*Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office, at 487-2212. For other concerns about discrimination, you may contact your advisor, department head or the Affirmative Action Office, at 487-3310*

**Academic Integrity:**
http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html

**Affirmative Action:**
http://www.admin.mtu.edu/aoa/

**Disability Services:**
http://www.admin.mtu.edu/urel/studenthandbook/student_services.html#disability

**Equal Opportunity Statement:**

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**Course Tentative Schedule**

Week

1. mathematical techniques, units of measurement, ideal gases
2. equation of state, energy, work, heat
3. 1st law of thermodynamics, enthalpy, heat capacities, $C_v$ and $C_p$
4. Joule-Thompson experiment, phase and chemical changes, Hess's law
5. spontaneous changes, entropy, **mid-term exam**
6. Carnot cycle, 2nd law of thermodynamics, 3rd law of thermodynamics
7. Gibbs and Helmholtz free energies, Maxwell relations, pressure and temperature dependence of $G$,
phase diagrams, phase stability, chemical potential (\(\mu\))

Clapeyron equation, partial molar quantities, mid-term exam

thermodynamics of mixing, Raoult's and Henry's laws, colligative properties

activities, Debye-Hückel law, multicomponents phase diagrams, interpretation of phase diagrams

reaction Gibbs energies, equilibrium constants, cell reaction and half reaction

Nernst equation, standard electrode potentials, reaction rates and rate law

integrated rate law, Arrhenius equation, chain reaction

The final exam is scheduled on Wednesday, April 28, 2010, from 12:45pm to 2:45pm, in room 101 in the ChemSci building.