Stony Brook University
Department of Chemistry

Syllabus CHE 301

This course is the first half of a two-semester overview of modern physical chemistry, introducing students to the quantitative study of microscopic and macroscopic chemical systems. We focus mainly on the fundamentals of chemical thermodynamics, but also briefly go over the concept of molecular energy levels as related to statistical thermodynamics.

Lecture: Trevor Sears, Jin Wang, TA: TBD
Undergraduate TAs: Lidor Fogul, Guangyang Liu, Abegale Nelson
Mon., Wed., Fri., Engineering 143 11:00-11:53 AM
Mon. Engineering 143, 7:00-8:20PM.

Office Hours: Trevor Sears Chem. Rm 559 Wed. 6:00-7:00 pm or by appointment
Jin Wang Chem. Rm XXX, office hours TBD
TA: TBD, office hours TBD Chemistry Learning Center.
Undergraduate TAs: Hours TBD

Course Outcomes: By the end of this course:
1. Students will be comfortable dealing with multi-variable calculus, and the mathematical formulations of the laws of thermodynamics.
2. Students will understand the connection between the atomic or molecular properties of materials and the statistical properties of ensembles, including how to calculate various averaged properties.
3. Students will understand the concepts of heat and energy, the difference between adiabatic and isothermal changes and how to calculate work.
4. Students will be familiar with the concept of entropy, Gibbs and Helmholtz energies and be able to solve problems involving chemical and physical processes in which these quantities change.
5. Students will be familiar with the concept of chemical potential, how it is related to Gibbs energy and chemical and physical equilibrium, and how it is applied to the case of simple mixtures, redox reactions and electrochemical cells.
6. Students will understand the concept of reaction order and how to obtain integrated rate equations.
7. The application of these skills to problems of practical interest such as efficiency of machines, voltaic and fuel cells and climate change is emphasized throughout the course.

Add/Drop: Please either make a commitment to stay in the course, or drop the course by the end of the third week (Sept. 10th). Oct. 25 is last day to withdraw (W grade recorded)

This is the first part of a two semester course is intended for Junior or Senior students who have sufficient background in Calculus/Physics and are interested in quantitative study of the problems in chemistry. Those students who want a complete overview of the field, but less calculation-demanding physical chemistry course, should consider taking CHE 312, which is a one semester physical chemistry course offered in the spring semester with emphasis on Biochem.

Texts:
   The core material is Chapters 1-6 and parts of 19,20.

2. “*Student's Solutions Manual to accompany "Atkins' "Physical Chemistry"*”  
   It contains the detailed solution for list (a) problems in the textbook.

3. Lecture notes and other reading materials. These will be posted on blackboard as time goes by..

**Exams:**

We will have 3 mid-exams. The tentative dates for the mid-exams are:

(1) Monday Sep. 30, 7-8:20 PM, *Chapter* (1, 2, 20, 9th Ed)
(2) Monday Oct. 28, 7-8:20 PM, TBA. *Chapter* (3, 4, 5.1-5.5, 9th Ed)
(3) Monday Dec. 2, 7-8:20 PM, TBA. *Chapter* (5.6-5.13, 6 9th Ed)

Final: As per University Timetable, currently scheduled for December 12th 11:15-1:45 pm

All tests and the final are *closed book* and *no notes*. A formula sheet will be provided for each test, and a copy will be available approximately one week before the test on the class web page.

You are allowed to use pen or pencil, eraser, and calculator (see above). *Everything else*, including *cell phones* which must be *turned off*, must be placed *under* the seat.

**No make-up tests.**

You must take all tests and the final, unless you have a verifiable, legitimate reason for missing a test, e.g., a doctor’s note. Otherwise, your score for the missed test or final will be a zero.

**Gradings:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeworks &amp; quizzes</td>
<td>30%</td>
</tr>
<tr>
<td>Mid-terms</td>
<td>30%</td>
</tr>
<tr>
<td>Final</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Weekly Quizzes:**

Open book and notes quiz, every *Wednesday*, during the last 15 min. of the lecture, to be handed at the end of the class. **Bring calculators!** These quizzes will be graded, and will have a weight on the final grade. They will cover material included in the previous three lectures.

**Homeworks:**

There are no shortcuts. To learn P. Chem., you must practice problem-solving. It is impossible to learn by osmosis (e.g., watching me work problems, hearing about problems from your friends, thinking about problems while watching TV, etc.). Many have tried, all have failed. One thing is absolutely certain, your exam performance will reflect your knowledge of the material covered in this course and therefore will be closely related to the effort and time you invest in problem solving before the exam.

Homework problems will be posted on the course Blackboard web-site. Unless otherwise stated, completed homework will be due by **5pm Friday at the end of the following week. These homeworks will be graded, and will have a weight on the final grade as above.**

**Mathematical level:**

We will make liberal use of mathematical results and manipulations to develop the theoretical and computational skills to make quantitative predictions. Consequently, it is assumed that students are comfortable with the principles of calculus, vector analysis and elementary differential equations. Basic knowledge of Newtonian mechanics is assumed. We will cover some refresher material at the start of the course.
Reading:
You must read the assigned chapter of the textbook before coming to class. It is your responsibility to acquire the factual contents of the course. The lecture will highlight the essential information of the textbook and focus on the conceptual understanding and problem solving. Lecture notes are available for your convenience on the class web page. All lectures will include a few class problems.

Calculator:
You need a simple “scientific” calculator for this class. **Palm-size, laptop or other portable computing devices are not permitted during tests or the final.** If the screen of your device is larger than 6 square inches or if the device has a (mini-) typewriter keyboard, the calculator will not be allowed. Sharing of calculators during tests or the final is not permitted.

Material to be covered:
- Introduction to thermodynamics
- The Properties of Gases.
- Basics of chemical Kinetics.
- The First Law of Thermodynamics
- Physical Transformations of Pure Substances
- Simple Mixtures & Phase Diagrams
- Chemical Equilibrium
- Electrochemistry

Information on the Web
Our course web page is located at: http://blackboard.sunysb.edu. You need to be able to access this site in order to download the laboratory manuals and see announcements. In order to log into this website, you will need your Blackboard user name and password. You can go to one of the SINC Sites to look up your user name. If your password does not work, you can go to the Main Library Rm S1460 to have your password reset. Once you have logged into Blackboard, you must correct your e-mail address and change your password. There are multiple SINC Sites (public computer labs on campus supported by Instructional Computing), for details (locations & schedules), go to: http://www.sinc.sunysb.edu/Sinc.

Announcements, staff information, the course manual, reference material, grades, and this document will be found on the Blackboard site.

Make sure your e-mail address is up-to-date in Blackboard. This will occasionally be used to contact you for last-minute announcements or with regard to your work.

Disabilities:
If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services (631) 632-6748 or
http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities/asp.

**Academic Integrity:**

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

**Critical Incident Management:**

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.