CHEM 0960
General Chemistry for Engineers 1

Fall 2017

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Course Objectives

Fundamental concepts and principles of chemistry are important to engineers. Knowledge on chemistry will help engineers to communicate with chemists, and more importantly, to understand the properties of working objects. To gain such knowledge, we will have two semesters of Chemistry covering a relatively broad yet important range of topics. Learning objectives related to specific topics will be listed in the lecture slides as each chapter goes. Upon successful completion of this course, you should gain some "global" skills as follows:

- Be able to communicate chemistry using basic chemistry vocabulary.
- Predict material properties using basic concepts and principles of chemistry.
- Explain scientific methods and how theory is constructed and tested via experimental efforts, particularly in chemistry.
- Demonstrate both qualitative and quantitative problem solving skills using knowledge on structural chemistry, stoichiometry, thermochemistry, chemical equilibrium, and reaction kinetics.

Required Textbook

- *Chemistry: Atoms First, 3rd edition* by Julia Burdge and Jason Overby. Textbooks should have been ordered for you by the Admin office.

Class Format

We will adopt a study format combining both lecture and group study feature in intensive individual practice and student - instructor interaction. We also use flipped class to maximize your learning effectiveness.

For a typical class, you will be assigned to watch several short videos before you come to the lecture. Those videos address basic concepts and principles as part of the materials discussed in lecture. In lectures, after a briefly review of the video content, the majority of the time is for new concepts, principles, and some problems demos. DO WATCH those videos to avoid confusion in lectures.

Following the lecture is a group study for a studio assignment, which is to solve a problem set before class ends. You will work in groups where in-group discussion is encouraged. Try to solve the problems together instead of breaking it into parts and everyone works on a part alone. At the end of the class, you should check with an instructor (professor or teaching assistant) before you leave the classroom. This is pass / not-pass work which contributes to your overall grade.

For the homework which you do after class, you can still discuss with other students, but you should complete it INDEPENDENTLY, meaning that you can't copy others' work or let others copy yours.

Recitation

There will be a one-hour recitation each week where you can discuss with an instructor of problems and/or concerns you encounter during your study. Although this session is not required to attend, I highly encourage you to come provided the fact that students who attend recitations in a regular basis have a better grade.

Grades

Exams 1 & 2	200 pts
Final Exam	200 pts
Homework	35 pts
Studio Homework	30 pts
Total	460 pts

There will be two exams spread evenly before the beginning of the semester and the final exam. Each exam will last one and a half hour and covers all the content after the previous exam. You should expect your first exam at the mid-October.

The final exam is three hours long and will cover all the content thought out the course, with a slightly emphasize on the content after the second 1.5 hour exam.

Studio assignment and homework will be given weekly to help you practice and check your mastery of class content. Remember that altogether they take 13% of the total grade, failure on doing those can cost you a letter grade (A to B, B to C, etc.)!

If you have any questions for any of your grades, you should contact me within three days after that grade is released. Any requests for regrading will be denied after this three-day period.

Letter Grade

Final letter grade will be given according to the following scheme:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
≥ 88%	≥ 85%	≥ 81%	≥ 78%	≥ 75%	≥ 71%	≥ 68%	≥ 65%	≥ 61%	≥ 55%	≥ 50%	< 50%

Grades might be curved at the end of semester if class average is low. However, this is not guaranteed. You should only rely on your performance in all the assignments and exams.

Absence and Makeups

In principle, any absence in class or exams is not allowed except for irresistible causes (diseases, accidents, deaths, etc.). For other reasons, you should contact me in advance. Make-up exams will not be guaranteed.

Failure of the Course

If you unfortunately failed the course, you can either retake the course or pass a make-up exam at the beginning of the following semester. Based on your performance in the make-up exam, a "D" can be expected as the final grade. Poor performance results in retaking the course.

Copyrights

If not specifically pointed out, all materials used in this course are copyrighted, meaning that you do not have the right to copy any of the materials for any purpose other than your own personal academic use without my explicit permission. The copyrighted materials used in this course include but do not limit to syllabi, exams, class slides, problem sets, and other handouts.

Academic Integrity

Upon accepting admission to SCUPI, you immediately assume to follow the SCUPI academic integrity guidelines, which can be obtained from the Admistrative office. The guidelines should be followed on homework, examinations, and other academic work. Violations of these guidelines may result in zero points for an exam or failure for the course.

Study Tips

- Do your homework ON YOUR OWN!!! You can discuss with a friend, but do the homework independently. Make sure you can solve similar problems after completion.
- Come to class and take notes. You may find it's hard to understand your instructor. Keep on trying. Even if you have learned some of the topics in high school, don't assume they are identical to what we will discuss in class.
- Attend recitation sessions with questions.
- Consult a text book in Chinese if you have trouble understanding the required text book. However, make sure you learn all the terminology in English. The exam is in English!
- Study your notes every day. Memorizing basic facts, terms, and principles helps!
- You are always more than welcome to visit my office hours.

Course Schedule

Week	Description
1	Introduction; scientific method; units; significant figures; Factor Label
2	Atomic structure; atomic masses; the periodic table; masses and moles
3	Quantum theory and the electronic structure of atoms; wave properties of light and particles
4	The Schroedinger equation and atomic numbers; orbitals, the *aufbau*, and the periodic table.
5	Electron configurations and the periodic table; periodic trends
6	Ionic and covalent compounds; Lewis dot structures; bonding in ionic compounds; nomenclature; covalent bonding;
7	Representing molecules; organic molecules; octet rule; electronegativity and polarity; Lewis

	structures and formal charge
8	Resonance; exceptions to the octet rule
9	Midterm Examination
10	Molecular Geometry; intermolecular forces; geometry and polarity; hybrid orbitals and multiple bonds
11	molecular orbital theory; Sigma and Pi bonds; delocalized bonding
12	Chemical Reactions; balancing equations; combustion analysis; trends in reactivity
13	Aqueous solutions; solubility; acid-base reactions; redox reactions and oxidation numbers; balancing redox reactions; solution concentrations; pH scale; titrations
14	Thermodynamics of chemical reactions; enthalpy and entropy; calorimetry; Hess's law.
15	Gases; kinetic molecular theory; ideal gas law and laws in between PV=nRT; real gases; Dalton's law of partial pressure.
16	Liquids and Solids; both have vapor pressures; amorphous vs crystalline solids; types of crystalline solids; phase changes, phase diagram
17	Final Examination