Syllabus (expanded)

CHEM 344: Physical Chemistry II (for Biochem.) – 3 hours
Lectures: Fall 2012, Mon, Wed, Fri, 2:00-2:50 p.m., 230 SES

Lecturer: Prof. Tim Keiderling
5407B SES, 6-3156, best contact: e-mail: tak@uic.edu
Office Hours: M & W – 3 p.m. to ?? (i.e. after class) or appointment
Course Web Site: http://www.chem.uic.edu/tak/Chem34412/

Teaching Assistants: Anjan Roy <aroy6@uic.edu>, Weiying Zhu <wzhu3@uic.edu>
Located in 4340 and 4344 SES, 6-2685, they will grade problem sets, tests and quizzes and help with problem solving
Office Hours: Wed 10 am, Thurs. 10 am and 2 pm, sessions meet in 4342 SES (if it becomes available)
These may change! other times only by appointment

Prerequisites: Chemistry 340 (or 342) – grade of C or higher – plus Math 181 and one year of college physics
Class Attendance: required, random attendance checks, along with quizzes, will be used to monitor attendance and can impact grade

Organized Problem/review sessions can be arranged with the graders anytime if interest develops in semester,
Additional special sessions will be scheduled to specifically help prepare for exams

Textbook: Peter Atkins & Julio de Paula, Physical Chemistry for the Life Sciences, Freeman (2nd Ed) 2011. This was the text, for Chem 340, Sp 2012. This was our best compromise text for the two semester course. Tinoco (see below) may be better for kinetics, but Atkins is superior for QM.
Problem sets, and Quizzes, will be partly based on this text
Supplemental text, may be purchased or reviewed in library:
J. E. House, Fundamentals of Quantum Mechanics, Academic, paper, successor to Hanna in style (if you can find Hanna’s book used, it will be a better buy). House was ordered for bookstore, but earlier, simpler edition should be available cheaper (paper)

Note: the course material we will cover is available in many different Physical Chemistry texts. Problem sets will reflect biochemically oriented texts, but the presentation of lectures will be more broadly based. However other texts may be clearer for you to read (or you may own them). You do not need to own the chosen textbook, but you should have access to it for the homework/examples.
Alternate bio-oriented Physical Chemistry texts:
Ignacio Tinoco, Kenneth Sauer, James C. Wang and Joseph D. Puglisi, Physical Chemistry: Principles and Applications In Biological Sciences Prentice Hall, This was 2007 and 2010 text, because it is a solid book, good examples, and it has a nice kinetics section that students have liked, but its QM section is incomplete – Some problem sets will be in part from this book and from various other sources.
Thomas Engel, Gary Drobny, Philip Reid, *Physical Chemistry for the Life Sciences* Prentice Hall, This was the text in Chem 340-344 in 2009. We felt it had many good qualities, and reflected much of modern biophysical chemistry, but there are a frustrating number of errors in it, as with all new books. Its coverage of quantum chemistry is much better than usual for Phys. Chem. books, but students found it hard to follow. The kinetics section is not good enough, so the Tinoco book was particularly useful in the first month for students last year. NOTE: has some nice problems that use the Web-based approach, and also link to animations

David Eisenberg & Donald Crothers, *Physical Chemistry with Applications to the Life Sciences*, Benjamin, -- one of the earlier bio-oriented texts, pretty good, probably out of print.

**General Physical chemistry texts:**

Peter Atkins, *Physical chemistry*, any edition, Oxford?


For Quantum I think some specialized books have a real advantage for students just starting to learn QM and recommend you survey them in library reserve, and if interesting look for them used and cheap! on various web sites (e.g. Amazon.com, bestbookbuys.com, abebooks.com, ebay.com, half.com). My experience is that the concepts of quantum mechanics strike some students as strange and reading it from different points of view can help overcome the “fear factor”. Our text actually has pretty extensive QM coverage, it is a matter of seeing the same topic in different language that can help here. The particular choice of alternate text is not vital, but titles emphasizing the words Introduction or Fundamentals are hints, and inclusion of Chemistry is a good sign:

J. E. House, *Fundamentals of Quantum Mechanics*, Academic, paper, successor to Hanna in style, and earlier edition should be available cheaper

S. M. Blinder, *Introduction to Quantum Mechanics*, Elsevier, printed nicely, but not cheap

Mark A. Ratner, George C. Schatz, *Introduction to Quantum Mechanics in Chemistry*, Prentice Hall—hardback, higher quality and tougher level

Peter Atkins, *Molecular Quantum Mechanics*, Oxford, this is a deeper text, offers good physical insight

Clifford E. Dykstra, *Introduction to Quantum Chemistry*, Prentice Hall (paper)

Melvin W. Hanna, *Quantum Mechanics in Chemistry*, Benjamin (has 3 editions, paper, my favorite Introduction, out of print)—should be cheap on used book market

Daniel C. Harris & Michael D. Bertolucci, *Symmetry and Spectroscopy*, Dover (cheap) -- Chem 444 text, terrific to read, topics are just focused on molecular spectroscopy

**NOTE:** I will attempt to establish a reserve shelf for Chem. 344 in Daley library, but not sure if/when it will work

**Topics and Goals:** We will continue exploring from where you left off in Chem. 340, i.e. I assume you now know thermodynamics, and in Chem. 344 we will go on to microscopic behavior and dynamics by use of biologically relevant examples to explore fundamentals of kinetics and quantum chemistry with spectroscopic applications. The goal is for you to learn about the fundamentals of chemistry from a theoretical or principles point of view,
and to be able to apply these general principles you have learned to mathematically making predictions and evaluations of physical data for chemical systems. This skill is evaluated both through problem solving in Homework and Quizzes and, in addition, by ability to explain your understanding as probed in Examinations. That is probably too much to cover in a 3-hour semester course, but we will hit highlights and try to make the connection to biochemistry apparent. See chart with correlation of texts.

**Examinations:** All examinations are closed book. Ideally we will have 2 1-hour exams in class and a 2 hour Comprehensive Final Exam during Finals week (these will be scheduled early in semester). Due to problems of fairness in exams in previous years, there will be NO EXTRA SHEETS allowed with equations or any other information during the tests. They will be completely closed book exams, for which I will provide a list of equations.

**Tentative Schedule:**
- 2nd Hour Exam: late Oct or early Nov, tentatively Fri., Nov. 2
- Final exam during Finals week – University will schedule – Dec. 10-14, For all, exact times to be set and announced.

**Homework:** It is vital that you learn to solve problems to master physical chemistry, therefore homework is mandatory but is graded for effort only. To test your learning of problems sets, a set of regularly announced quizzes will be given (roughly on alternate Fridays) that are directly related to the problem sets. These are graded for performance (correctness). Forming study groups can be a useful means of learning the material, but if you copy someone’s else solution to a problem you will not learn it and your exam will show it. Besides we will know it! **Homework generally will be due on Friday, at the beginning of class, but there may be exceptions, which will be announced.**

**NO MAKE-UP QUIZZES AND NO LATE HOMEWORK WILL BE ACCEPTED!**

**Web Site** will be used to post homework, answers and exam help plus occasional notes

http://www.chem.uic.edu/tak/Chem34412/

or link - www.chem.uic.edu then - Courses then Undergraduate then- Chem 344 (I hope this will work!)

**NOTE:** nothing but exams handed out in class on paper, all materials will be on web -- electronic

**Grading:**
- Quiz (score) 100 points
- Homework (effort) 50 points
- First Hour Exam: 100 points
- Second Hour Exam: 100 points
- Final Exam: 200 points

**Final grade will be based on sum of all of these components, with the weighting shown above and scores will be scaled to correct exam scores to reflect the weighting.**

**Mid term grades will not be given, but advice will be provided after the first exam to estimate equivalent letter grades.**

**Drop/Add deadline:** Friday Sept. 7, (?) -- Late Drop (Dean’s or W) date: Fri. Nov. 2 (??)
Academic integrity is a vital component of becoming a professional scientist, and it starts with behavior in class, doing the work assigned, and reaches its most critical stage in examinations. **No cheating, copying, sharing of information during exams or quizzes will be tolerated.** Any student found doing so is subject to discipline appropriate for the offense and aligned with the UIC Student Disciplinary Policy (see [www.uic.edu/depts/dos/studentconduct.html](http://www.uic.edu/depts/dos/studentconduct.html));

Students learn in many ways, but in class all must be able to hear and see the lecturer and the presentations, thus attendees disrupting the class by talking or other activities may be asked to leave.

**Students with disabilities** who require accommodations for access and participation in this course must be registered with the Office of Disability Services (ODS). Please inform me immediately and contact ODS at 312/413-2183 (voice) or 312/413-0123 (TTY). [or link to disability services](http://www.uic.edu/depts/oar/campus_policies/disability_notification.html)

Students may consult the Registrar’s Web site for a list of registration and records policies. ([http://www.uic.edu/depts/oar/current_students/campus_policies.html](http://www.uic.edu/depts/oar/current_students/campus_policies.html))