Chemistry 521/421    Fall 2013
Atomic and Molecular Structure (Quantum Mechanics)
Instructor: Prof. Ed Castner  Office: WL-184  ed.castner@rutgers.edu
Time: Tuesdays and Thursdays, 5:00-6:20  Location: WL-260
Text: *Elements of Quantum Mechanics*, by Michael D. Fayer

This syllabus is only a rough guide to what material will be covered, and when. You should read the relevant chapters in the book *Elements of Quantum Mechanics* *before* the lectures. I strongly recommend that you also download and print the lecture notes from the Sakai site before class. This will enable you to annotate the notes, without having to record each equation yourself.

Homework problems for the relevant chapter should be done immediately following lecture, so that any questions that may arise can be addressed immediately, thus preventing you from falling behind on the material. Any updates or changes to this schedule will be posted on Sakai.

**Course syllabus**

Lecture 1   Tuesday, 9/3  Six postulates of QM; Chapter 1, *Elements*
Lecture 2   Thurs., 9/5  Chap. 2, *Elements*: wavefn., kets (bras), operators
Lecture 3   Tues., 9/10  Chap. 3, *Elements*: free particles, wavepackets
Lecture 4   Thurs., 9/12  Chap. 4, *Elements*: Dirac's Quantum Condition; Uncertainty
Lecture 5   Tues., 9/17  Chap. 5, *Elements*: Schrödinger equation
Lecture 6   Thurs., 9/19  Chap. 5, *Elements*: particles in potentials- tunneling; ionization
Lecture 8   Thurs., 9/26  Chap. 6, *Elements*: harm. osc.- Dirac- raising/lowering operators
Lecture 9   Tues., 10/1  **Exam 1- in class**
Lecture 10  Thurs., 10/3  Chap. 7, *Elements*: H atom
Lecture 11  Tues., 10/8  Chap. 7, *Elements*: more on H atom
Lecture 12  Thurs., 10/10 Chap. 8, *Elements*: time-dep. 2-state problems
Lecture 13  Tues., 10/15 Chap.9, *Elements*: perturbation theory. Non-degenerate, 1st order
Lecture 14  Thurs., 10/17 Chap.9, *Elements*: perturbation theory. 2nd order, degenerate.
Lecture 18  Thurs., 10/31 Chap. 13, *Elements*: matrix representation
Lecture 19  Tues., 11/5  Chap. 13, *Elements*: more on the matrix representation
Lecture 20  Thurs., 11/7  **Exam 2- in class**
Lecture 22  Thurs., 11/14 Chap. 14, *Elements*: more on density matrices
Lecture 24  Thurs., 11/21 Chap. 15, *Elements*: more on angular momentum

*no class on Thursday, 11/28/2013: Thanksgiving, U.S. National Holiday*

Lecture 26  Tues., 12/3   Chap. 16, *Elements*: more on electron spin
Lecture 27  Thurs., 12/5 Chap. 17, *Elements*: covalent bonds- H₂⁺ and H₂
Lecture 28  Tues., 12/10 Chap. 17, *Elements*: more on covalent bonds

Final Exam  Sat. 12/14  3-hour final exam