Syllabus
Physical Chemistry - Second Semester – Chem 332 - Spring 2012
Tues/Thurs 9-10:15 – Innovation Hall room 133
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see web page for office hours, slide files, announcements, etc. - **http://osf1.gmu.edu/~rcozzens/**
Text – Physical Chemistry – Adkins – 8th or 9th Edition (7th will do if you already have it)

Chem 332 is the second semester of Physical Chemistry and deals with topics not covered the first semester, especially those related to Quantum Mechanics, Statistical Mechanics, Spectroscopy and Kinetics. The general subject order follows below. For the most part, editions 7-9 are nearly interchangeable, except for page and chapter numbering and some inserted text. Correlate the general outline below with appropriate chapters in the text and the slides used in lecture which will be available on the web page.

- Introduction to Quantum Mechanics
  - Light, Wave Nature of Matter, Wave Equations, Mathematics and Approximations of Wave Equations, Electronic Structure of Atoms and Molecules, and Electronic, Rotational and Vibrational Quantum Levels and Transitions between them
- Statistical Mechanics and Partition Functions
  - The Link Between the Microscopic World of Energy of Atoms/Molecules and the Macroscopic World of Thermodynamics Properties of Materials and the Driving Force of Chemical Processes
- Spectroscopy and Molecular Structure
  - Applications of Electronic Structure to Atoms Molecules, Origin and Interpretation of Spectra, NMR, ESR, Vibrational, Rotational, Electronic, Photoelectron, X-ray, Mossbauer, etc.
- Photochemistry and Photophysics
  - Interaction of Light and Matter and the Chemical Reactions that Result
  - Lasers – How They Work and What They Can Do
- Application of Quantum Mechanics and Dynamics to Chemical Kinetics and the Rate and Mechanism of Chemical Reactions
- Misc. Topics as Time and Interest Permit
- Student Paper on Selected Topics (class size will likely prohibit student oral presentations – to be determined)

In general, the course begins where the first semester ended. It will be assumed that the student has a thorough understanding of equilibrium and thermodynamics covered the first semester. Lecture notes/slides, will generally be available on the web page http://mason.gmu.edu/~rcozzens/ . Some material will be introduced and discussed in lecture that may not be on the slides and new materials may be introduced during classroom discussions. Students should attend class and take notes to supplement lecture slides. The web page will be updated every week or so. Check for announcements, modifications to slides, sample questions, etc.

Although the class is taught in lecture format, discussions are encouraged which may lead to periods in a "seminar-like" format. Now and then there may be an invited speaker depending on subject and availability. Near the end of the semester each student will write a short paper and prepare slide for a presentation to the class. Actual presentations may not be given due to class size (yet to be determined). Slides attached to the report should be well designed and thought-out PowerPoint slides. Paper topic will be selected about mid-semester in consultation with the course instructor.

Grading will be based on 2 tests (25% each), paper (15%), homework (10%) and comprehensive final exam (25%). Tests and exam have take-home components (allowing time for computer generation of graphs, calculations, etc. at home over a few days to a week) and in-class components. There will not be a lot of graded homework but students are strongly encouraged to do many problems from various sources on there own to develop quantitative problem solving skills necessary in the field of Physical Chemistry and to perform well on tests. Without doing significant practice problems, tests may be found difficult. Test and exam content are based on lecture material and related readings from the text and for the most part are quantitative in nature. Portions or all of tests and final may be in a "take home" format due to calculation time and the need of a computer. Students are assumed to be proficient in the use of Excel. Do not miss many classes. Be on time. Stay ahead. Take notes. Do practice problems.

The goal is for students to gain a working knowledge regarding the nature and effect of quantized energy relationships of atoms and molecules and the resulting impact on the behavior and interaction of matter and the energy as it drives reactions and processes. Students should leave the course with a clear "feel" for the quantized energy of atoms and molecules and its effect on thermodynamics, kinetics and spectroscopy. Students need to rapidly and accurately solve quantitative problems and know where and how to locate information. The goal is to develop concept understanding. Portions of tests are openbook/takehome. The efficient use of Excel spread sheets for calculations is necessary.

Dates of Interest: First class Tues Jan 24, Last Drop Day Feb 24, Spring Break Mar 13-16, Last Class May 4, Final Exam Tues May 15 7:30-10:15, Test Dates (subject to change) Test 1 Tues Feb 23 (in-class & take-home due), Test 2 Tues Apr 17, Paper due May 3