COURSE CHEM 347
COLLOIDS AND SURFACE CHEMISTRY

GENERAL INFORMATION

Course instructor	Dr. Gregory Jerkiewicz CHE 311, Chernoff Hall Phone: 533-6413 E-mail: gregory.jerkiewicz AT chem.queensu.ca
Summary	A detailed list of topics is given in the detailed course outline – see below. The course links the physical chemistry of surfaces and colloids to the most recent developments in materials science and engineering.
Web site	**http://www.chem.queensu.ca/courses/08/CHEM347/**
Lectures	Room: **Mackintiosh-Corry E229** Schedule: **Monday 8:30, Wednesday, 10:30, Friday 9:30** Lectures: Mondays & Wednesdays Tutorials: Fridays
Office hours	An office hour that suits the class and the instructor will be established at the beginning of the course.
Required textbook	**Lectures**: P. Atkins, J. de Paula, *Physical Chemistry*, 8th Edition, W. H. Freeman & Co., New York (2006) **Tutorial sessions**: P. Atkins, C. A. Trapp, C. Giunta, M. P. Cady, *Student Solutions Manual for Physical Chemistry*, 8th Edition, W. H. Freeman & Co., New York (2006)
Marking	Two in-class quizzes: **2 × 10% = 20%** Quiz 1: Quiz 2: Midterm examination: **30%** Final examination: **50%** Total **100%**

Academic Integrity & Plagiarism

Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities http://www.queensu.ca/secretariat/senate/policies/princpri/).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (Regulation 1.), on the Arts and Science website (see http://www.queensu.ca/calendars/artsci/Regulation_1____Academic_Integrity.html), and from the instructor of this course.

Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

Course Outline

1. Physical Transformations of Pure Substances
Stability of phases; phase boundaries; three typical phase diagrams; thermodynamic criterion of equilibrium; dependence of stability on the conditions; location of phase boundaries; Ehrenfest classification of phase transitions; impact on engineering and technology. ***Chapter 4, pp.117 – 135***.

2. Phase Diagrams
Definitions; phase rule; vapor pressure diagrams; temperature-composition diagrams; liquid-liquid phase diagrams; liquid-solid phase diagrams; impact on materials science and engineering. ***Chapter 6, pp. 174 – 199***.

3. Materials: Macromolecule and Aggregates
Mean molecular masses; mass spectrometry; laser light scattering; ultra-centrifugation; electrophoresis; viscosity; different levels of structure; random coils; structure and stability of synthetic polymers; structure of proteins and their stability; colloids; micelles and biological membranes; surface films; impact on nanometric materials science and engineering. ***Chapter 19, pp. 652 – 696.***

4. Molecules in Motion
Molecular motion in gases: the kinetic model of gases; collision with walls and surfaces; the rate of effusion; transport properties of a perfect gas. Molecular motion in liquids: experimental results; the conductivity of electrolyte solutions; the mobility of ions; conductivities and ion-ion interactions. Diffusion: the thermodynamic view; the diffusion equation; diffusion probabilities; the statistical view. ***Chapter 21, pp. 747 – 782.***

5. Processes at Solid Surfaces
Surface growth and composition; physisorption and chemisorption; adsorption isotherms; rate of surface processes; mechanisms of heterogeneous catalysis; catalytic activity at surfaces; electrode-solution interface; rate of charge transfer; voltammetry; electrolysis; working galvanic cells; fuel cells; corrosion; impact on materials science and engineering. ***Chapter 25, pp. 909 – 958.***

Format of the Quizzes, and Midterm and Final Exams

The quizzes, and midterm and final exams will have an open lecture notes format (*not open textbooks or any additional material!*). The students will be requires to solve several problems such as those given in the textbook at the end of each chapter. Suggested homework and examples of problems will be provided as the course advances.