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CHEM 542.01: The Physical Chemistry of Natural Waters

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Chemistry 542: The Physical Chemistry of Natural Waters

Fall Semester 2000

Professor: Dr. Mike DeGrandpre, CP 313. Office hours: Wed. and Fri. 10:30-11:30 a.m.

Course overview: The course is intended for graduate students who are interested in aquatic chemistry and/or applied physical chemistry. A strong background in chemistry is assumed but we will spend some time reviewing basic thermodynamic and kinetic concepts. The course will focus primarily on thermodynamic models (i.e. equilibrium-based models) for understanding and describing the chemical composition of natural waters. We will use spreadsheet programs as our modeling platforms although you are welcome to use programming languages such as BASIC or FORTRAN. Since the course is structured around quantitative computations, student grades will be primarily based upon successful completion of homework problems. A term paper (discussed below) and final exam will also be part of the final grade.

Required Text: *Aquatic Chemistry Concepts,* James F. Pankow, 1991, Lewis Publishers. Additional helpful text: *Aquatic Chemistry -Chemical Equilibria and Rates in Natural Waters* - Werner Stumm and James J. Morgan, Wiley-Interscience (or any other aquatic chemistry or geochemistry book you might have).

Grading:		
	Homework	50%
	Class participation	10%
	Term paper	20%
	Final exam	20%

Term paper: The term paper should be a review of a topical aquatic chemistry problem reported in the scientific literature. The subject area should **not** be directly related to your thesis research and must be okayed by me. The paper text should be 5-7 pages single spaced including abstract and figures (but not references). I will give you a handout describing the text format (font size, etc.). References and citations within the text should be in a journal format of your own choosing (e.g. *Limnology and Oceanography, Journal of Geophysical Research, Environmental Science and Technology*, etc.). The paper will be critically-evaluated and returned to you for revision. You must have your paper "accepted" to receive a passing grade in the course. The paper should be turned in by the end of the third week in November to allow time for revisions.

	Tentative Lecture Schedule **Chemistry 542** **Fall Semester 2000**	
Week	**lecture subject**	**Reading**
Sept. 4	course overview review of solution thermodynamics and kinetics	Ch. 1,2
Sept. 11	review of solution thermodynamics and kinetics pH, acids and bases	Ch. 1,2,3
Sept. 18	multi-equilibria calculations	Ch. 3,4,5
Sept. 25	multi-equilibria calculations	Ch. 3,4,5
Oct. 2	multi-equilibria calculations pH as a master variable	Ch. 5,6
Oct. 9	acid-base behavior (titrations, buffer intensity)	Ch. 6,7,8
Oct. 16	inorganic carbon equilibria	Ch. 9
Oct. 23	inorganic carbon equilibria	Ch. 9
Oct. 30	solubility models	Ch. 11
Nov. 6	solubility models	Ch. 11,12,13
Nov. 13	solubility models	Ch. 11,12,13,14
Nov. 20	macroscopic particle solubility Thanksgiving break	Ch. 15
Nov. 27	complexation reactions	Ch. 18
Dec. 4	redox reactions	Ch. 19
Dec. 11	redox reactions (pe-pH diagrams) course review	Ch. 19,20
Dec. 198 Finals week	Final (3:20-5:20 Tuesday Dec. 19)	all of the above