HWR 417A/517A – Fundamentals of Water Quality – Fall 2011


These texts will be supplemented with additional material from other sources.

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Office Hours:        MWF 10 AM – 1PM or by appointment
Course location:    Harvill 204
Online content:     http://d2l.arizona.edu (you will need your UA Net ID and password)
Class meetings:     class will meet MWF at 1PM
Final Exam

Course Goals:
1) A qualitative understanding of the physical and chemical controls on waters composition.
2) Develop a quantitative framework from which to attack geochemical problems
3) Learn the fundamental laws of equilibrium geochemistry.
4) Be briefly introduced to the kinetic concepts that govern rate limited processes.
5) Learn how to apply chemical concepts to the broader understanding of hydrology.

Grading: Undergraduate

3 Mid-terms 30%
Homework    30%
Presentation 10%
Final exam   30%

Grading: Graduate

3 Mid-terms 30%
Homework    25%
Paper Review 10%
Presentation 10%
Final exam   25%

Paper Review/Presentation: You are charged with finding one peer-reviewed article of interest to you. Chemical concepts must play a central role in the discovery process that the paper describes. Article can have been published in any peer-reviewed journal. You MUST pass this article by me for my APPROVAL before moving forward on writing your review paper and preparing your presentation. I prefer to receive articles electronically by PDF. Graduate students must both make a presentation and write a review. Undergraduates need only make a
presentation. All homework and exams will have work that graduate students must do and that undergraduates may do.
August 22nd  Introduction and Water Origins – Paper review *AP1-10*
August 24th  Tracers and mixture modeling *Supplemental*
August 26th  Introduction to Isotopes and Stable Isotopes of Water *AP 31-41*
August 29th  Isotopic Fractionation *AP31-41* HW 1 due
August 31st  Introduction to Radioactive Decay *AP 72-75*
September 2nd  Radiogenic Isotopes in Hydrology *AP218-231*
September 7th  Chemical Thermodynamics *AP-1-21*
September 9th  Equilibrium Chemistry *AP 119-123* HW 2 due
September 12th  Activity coefficient Ionic Strength *AP 123-127*
September 14th  Aqueous Complexes; *AP 127-131*
September 16th  Saturation Indices and ΔG Uncertainty *AP 131-132*
September 19th  **Computer Lab Harshbarger 110** PHREEQC *AP 135-142*
September 21st  **Mid term #1**
September 23rd  Carbonate system (Sign-Ups) *AP 175-228* HW3 due
September 26th  Carbonate System: pH and carbonate equilibrium coefficients *AP 175-183*
September 28th  Carbonate System: Titration and Alkalinity Open-Closed Systems *AP*
September 30th  Chemical Kinetics *AP 152-169, AP 210-218, H43-61*
October 3rd  Chemical Kinetics *AP 152-169, AP 210-218, H43-61* HW4 due
October 5th  Weathering: Budgets *AP 375-394*
October 7th  Weathering: Sierra Nevada Case Study *Supplement on d2l*
October 10th  Weathering: Kinetics and Thermodynamics *AP 395-409* Clays: HW5 due
October 12th  PHREEQC for weathering
October 14th  **Student Presentations**
October 17<sup>th</sup>  Mid-Term #2
October 19<sup>th</sup>  Clays: Colloids, Surface Area, *AP 241-251,252-311*  HW6 due
October 21<sup>st</sup>  Student Presentations
October 24<sup>th</sup>  CEC, Isotherms *AP 311-344*
October 26<sup>th</sup>  Redox: Introduction *AP 415-438*
October 28<sup>th</sup>  Student Presentations
October 31<sup>st</sup>  Redox Conditions and Eh-pH diagrams *AP 439-478*  HW7 due
November 2<sup>nd</sup>  Redox Conditions - Role of Hydrology *Supplement on d2l*
November 4<sup>th</sup>  Student Presentations
November 7<sup>th</sup>  Organics Contaminants  *AP 489-534*
November 9<sup>th</sup>  Organics in Multi-Phase Systems *outside reading*  HW8 due
November 14<sup>th</sup>  Fugacity Approach *outside reading*
November 16<sup>th</sup>  Brines and Acid Rain *outside reading AP 405-410 AP 26-31*
November 18<sup>th</sup>  Student Presentations
November 21<sup>st</sup>  Mid Term #3
November 23<sup>rd</sup>  No Class
November 28<sup>th</sup>  Integrating Tracers and processes *Supplemental reading*  HW9 due
November 30<sup>th</sup>  Student Presentations
December 2<sup>nd</sup>  Student Presentations  HW10 due
December 5<sup>th</sup>  Integration  San Pedro
December 7<sup>th</sup>  Final review
December 12<sup>th</sup>  Final exam 10:30 AM same place