LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No. 08-7V. 07-43v	UWUCC Action-Date: AP-10/14/08	Senate Action Date: App-2/24/09

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person	Email Address
Michael A. Poage	mpoage@iup.edu
Proposing Department/Unit	Phone
Geosciences - Natural Sciences and Mathematics	724-357-5627

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

1. Course Proposals (check all that apply)

____New Course ____Course Prefix Change ____Course Deletion

__X__Course Revision __X__Course Number and/or Title Change __X__Catalog Description Change

GEOS 332 Geochemistry	GEOS 311 Geochemistry
***Current** Course prefix, number and full title*	***Proposed** course prefix, number and full title, if changing*

2. Additional Course Designations: check if appropriate

_____ This course is also proposed as a Liberal Studies Course.

_____ This course is also proposed as an Honors College Course.

_____ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

____Catalog Description Change ____Program Revision

____New Degree Program ____Program Title Change ____Other

____New Minor Program ____New Track

***Current** program name*	***Proposed** program name, if changing*

4. Approvals		**Date**
Department Curriculum Committee Chair(s)		2/4/08
Department Chair(s)		2/4/08
College Curriculum Committee Chair		2-11-08
College Dean		2-11-08
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	Gail S Sechrist	10/14/08

* where applicable

Received SEP 25 2008 Liberal Studies

Received FEB 14 2008 Liberal Studies

Part II. Description of Curricular Change

1. SYLLABUS OF RECORD

I. Catalog Description

GEOS 311 Geochemistry (3c-3l-4cr)

Prerequisite: CHEM 111, Grade of C or better in GEOS 201 and GEOS 202

An introduction to low-temperature chemistry of the earth's surface and near-surface; includes discussions of chemical activity, solution chemistry, organic geochemistry, trace elements, stable and radiogenic isotope geochemistry, and the chemistry of natural waters.

II. Course Objectives

At the end of this course students will be able to:

1) Use fundamental concepts of thermodynamics and equilibrium chemistry to understand the chemistry of natural waters.
2) Summarize acid-base and redox chemistry as applied to natural systems.
3) Integrate their understanding of above-mentioned content areas in the design of remediation strategies for contaminated waters.
4) Demonstrate knowledge of stable isotope fractionation and the applications of oxygen, hydrogen, carbon, nitrogen and sulfur isotopic systems to modern problems in the geosciences.
5) Explain radioactive isotope decay and the applications of radiometric isotope age-dating, radiogenic isotope tracers, and cosmogenic isotopes to modern problems in the geosciences.

III. Course Outline

Lecture

Part A (16 academic hours): Aqueous Geochemistry

1. Introduction to thermodynamics
2. Equilibrium and activity coefficients
3. Acids, bases and alkalinity
4. Redox chemistry and Eh-pH diagrams
5. Chemistry of natural waters
6. Contaminant remediation methods

Exam 1 (1 academic hour)

Part B (12 academic hours): Stable Isotope Geochemistry

1. Oxygen isotope geochemistry and applications
2. Hydrogen isotope geochemistry and applications
3. Carbon isotope geochemistry and applications
4. Nitrogen isotope geochemistry and applications
5. Sulfur isotope geochemistry and applications

Exam 2 (1 academic hour)

Part C (12 academic hours): Radiogenic Isotope Geochemistry

1. Radiometric age-dating
2. Radiogenic isotopes as natural tracers
3. Cosmogenic isotope geochemistry
4. Short-lived radionuclide geochemistry

Final exam during final exam period.

Laboratory Exercises (3 academic hours each)

Week 1: Field Site Visit

Week 2: Remediation Proposal
Week 3: Field Sampling
Week 4: Lab Analysis
Week 5: Aqueous Problem Set #1
Week 6: Aqueous Problem Set #2
Week 7: Lab Midterm Exam
Week 8: Field Sampling
Week 9: Lab Analysis
Week 10: Stable Isotopes
Week 11: Stable Isotopes
Week 12: Radiogenic Isotopes
Week 13: Radiogenic Isotopes
Week 14: Lab Final Exam

IV. Evaluation Methods

Each component of the course will contribute to final grade as follows:

Exam 1	20%
Exam 2	20%
Final Exam	20%
Laboratory Exercises	10%
Laboratory Midterm Exam	15%
Laboratory Final Exam	15%
Total	100%

V. The final grade for this course will be determined using the following schedule:
A=90-100%; B=80-89%, C=70-79%, D=60-69%, F=<60%

VI. Attendance Policy

The attendance policy will conform to IUP's undergraduate course attendance policy.

VII. Required textbooks, supplemental books and readings

Walther, J.V. *Essentials of Geochemistry*. Sudbury, MA: Jones and Bartlett Publishing, 2005.

VIII. Special resource requirements

There are no special resource requirements for this course.

IX. Bibliography

In addition to the required textbook and supplemental readings from current literature, the following will be used to develop the course curriculum:

Berner, E.K. and Berner, R.A. (1996) *Global Environment: Water, Air, and Geochemical Cycles*: Prentice Hall, Upper Saddle River, NJ, 376p.

Brownlow, A.H. (1996) *Geochemistry*: Prentice Hall, Upper Saddle River, NJ, 580p.

Drever, J.I. (1997) *The Geochemistry of Natural Waters*: Surface and Groundwater Environments: Prentice Hall, Upper Saddle River, NJ, 436p.

Faure, G. (1986) *Principles of Isotope Geology*: John Wiley and Sons, New York, 589p.

Gregory, R.T. (2002) *Stable Isotope Tracers of Global Cycles*: in Encyclopedia of Physical Science and Technology, 3rd edition, v. 15, Academic Press, San Diego, p. 695-713.

Hoefs, J. (1996) *Stable Isotope Geochemistry*, Springer-Verlag, Berlin, 212p.

Langmuir, D. (1997) *Aqueous Environmental Geochemistry*: Pearson Prentice Hall, Upper Saddle River, NJ, 600p.
Lide, D.R. ed. (2003) *Handbook of Chemistry and Physics*, 84th edition: CRC Press, Cleveland, 2616p.
Manahan, S.E. (2000) *Environmental Chemistry*: Lewis Publishers, Boca Raton, Fl, 898p.
Richardson, S.M. and McSween, H.Y. (1989) *Geochemistry: Pathways and Processes*: Prentice Hall, Upper Saddle River, NJ, 488p.
Stumm, W. and Morgan, J.J. (1996) *Aquatic Chemistry: Chemical Equilibria and Rates in Natural Waters*: John Wiley and Sons, NY, 1022p.

2. SUMMARY OF PROPOSED REVISIONS

The original format for the class was two hours of lecture and three hours of laboratory work per week for three credits (2c-3l-3cr). The new course will have three hours of lecture and three hours of laboratory work per week for four student credit hours (3c-3l-4cr). The additional hour of lecture per week reflects the overall growth of the field of geochemistry since the course was originally developed and will specifically allow for the addition of radiogenic isotope geochemistry to the course curriculum. Prerequisite changes include the removal of CHEM 112, and the addition of Grade of C or better in GEOS 201 Foundations of Geology and GEOS 202 Quantitative Methods in the Geosciences. The course number change reflects the Geoscience Department's new course numbering system.

3. JUSTIFICATION/RATIONALE

The field of geochemistry is one of the fastest growing fields in the geosciences with many important problems of the modern age (climate change, water quality) being quantified through geochemical studies of various Earth systems. This course has traditionally focused on the geochemistry of natural waters (see old syllabus of instruction below) with one week devoted to stable isotope geochemistry. The new course will maintain this focus (16 lecture hours), add substantially to depth of coverage of stable isotope geochemistry (12 academic hours), and add radiogenic isotope geochemistry to the curriculum (12 academic hours). To present this material adequately, a third lecture hour per week is necessary.

4. OLD SYLLABUS OF RECORD

There is no available syllabus of record for this course. An old syllabus from 1987 is provided here (see below).

Part III. Letters of Support or Acknowledgment

The Chemistry has been informed of the prerequisite change to this course (see attached email). No other departments or programs are affected by these revisions.

GEOCHEMISTRY
SPRING 1987

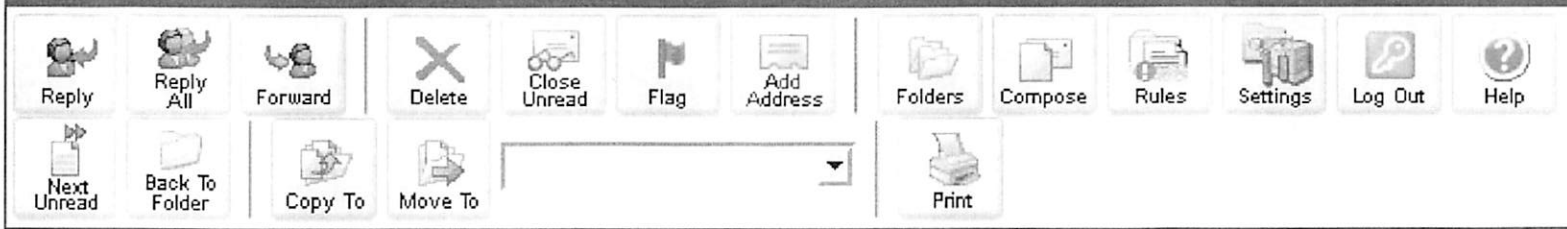
Instructor:	Karen Rose Cercone
Office:	112 Walsh (also known to hang out in 339 Weyandt)
Office Hours:	Monday 2:15-5:15 Tuesday 10:30-11:30 Wednesday 4:15-5:15
Course Objectives:	Introduce the basic principles of low-temperature aqueous geochemistry and review the practical geologic problems which geochemical analysis can solve.
Course Mechanics:	Three 1-hour exams (essay and problem-solving) will each be worth 100 points; a 20-minute seminar report will also count 100 points; 10 problem sets and/or article reviews will be worth 10 points each.
Laboratory:	Each week on Wednesday you will be given either a problem set to solve or a scientific article to review (in a written paragraph or two). These lab assignments are due the following Monday and will be graded and returned by that Wednesday so we can discuss them in lab. Lab periods after the two Monday exams will be used to hand the exams back and discuss them, so that there will be no lab assignment due on those Mondays.
Text:	Drever, The Geochemistry of Natural Waters. Until it arrives in the bookstore, xeroxes of assigned chapters will be placed on the reserve shelf in Walsh 104. Additional xeroxes of lab-assigned articles and chapters from other texts for optional reading will also be put on this shelf.

GEOCHEMISTRY SYLLABUS
SPRING 1987

	LECTURE TOPIC	LAB TOPIC	READING IN DREVER
1/21	Terms and units	Working terms	Chapters 1&2
23	Thermodynamics		
26	Gibbs Free Energy	Acids and bases	
28	Chemical Potential		
30	Activity coefficients		
2/ 2	Equilibrium constants	Carbonate chemistry	
4	Acids and bases		Chapters 3
6	pH control by carbonates		
9	Alkalinity	Precipitation	
11	Complexes and chelates		
13	Stability and minerals		Chapters 5
16	Stability Diagrams	Fluid Mixing	
18	Kinetics		Chapter 6
20	"Equilibrium" in groundwater		
23	FIRST HOURLY EXAM	Discussion	
25	Organic geochemistry		Chapter 12
27	More organic geochemistry		
3/ 2	Organics in groundwater	Organic pollutants	
4	Redox reactions		Chapter 11
6	NORTHEAST GSA		
9	Eh-pH diagrams	Redox in nature	
11	Eh-pH of groundwater		
13	Diffusion & dispersion		
March 16-20	SPRING BREAK		
23	Trace elements	Water plumes	Chapter 13
25	Trace elements in groundwater		
27	Isotope chemistry		Chapter 15
30	Stable isotopes	Trace Metals	
4/ 1	Stable isotopes in groundwater		
3	Radioactive and radiogenic isotopes		
6	SECOND HOURLY EXAM	Discussion	
8	Water-rock interaction		Chapter 7
10	Feldspar dissolution		

	13	Ion exchange	Shale filtration	Chapter 4
	15	River/ spring chemistry		Chapter 8
	17	Lake chemistry		
	21	Ocean chemistry	Salt divides	Chapter 10
	23	Ocean chemistry through time		
	24	Brine chemistry		Chapter 9
	27	Groundwater chemistry	Dating groundwater	
	29	Groundwater chemistry		
5/	1	GEOSCIENCE SEMINAR		
	4	Groundwater chemistry		

IUP I-Mail: Message from Sent Items Folder



From: "Michael A Poage" <mpoage@iup.edu>
Subject: Prerequisite change
Date: Mon, 21 Jul 2008 12:37:39 -0400
To: Anne.kondo@iup.edu
Cc: john.woolcock@iup.edu, hovan@iup.edu

Headers
Decode

Dear Dr. Kondo,

At the request of the Screening Committee of the University Wide Undergraduate Curriculum Committee, I am writing to inform you of a pending prerequisite change to GEOS 332 Geochemistry. The current prerequisites include CHEM 111-112. As part of the Geoscience Department's curriculum restructuring, we are proposing to change this prerequisite to CHEM 111 only.

If you have questions regarding this change, please do not hesitate to contact me.

Sincerely,

Michael Poage
Geoscience Department