Submitted by the College of	Agriculture	Date: November 5, 2009			
Department/Division offering cou	Plant and Soil Scien	nce			
Department Division offering coa					
*See the description at the end of this college to the Chair of the Senate Co appropriate Council for normal proce	form regarding what constitutes a minor uncil. If the Senate Council chair deems t ssing and an email notification will be set	Minor change. Minor changes are sent directly from the dean of the he change not to be minor, the form will be sent to the nt to the contact person.			
Current Distance Learning (DL) sta	tus: 🗸 N/A 🗌 Already app	proved for $DL^{\dagger}$ $\square$ Please Add $\square$ Please D			
If ADDING, check one of the meth	ods below that reflects how the majority	v of the course content will be delivered.			
Internet/Web-based	Interactive Video	Extended Campus			
<sup>†</sup> If already approved for DL, a new checking this box) that the prop	Distance Learning Form must be subm osed course changes will not affect DL	itted with this form <u>unless</u> the department affirms (by delivery.			
Charles Prove Contraction of Contract	PROPOSED CHANG	ES			
A DESTRUCTION	Please complete <u>all</u> "Current"	fields.			
Fill out the "Pro	pposed' field only for items being chang	ged. Enter N/A if not changing.			
Circle	the number for each item(s) being chan	nged. For example: 6.			
Current prefix & number: PLS	S 741/GLY 741 Propos	ed prefix & number: N/A			
Current Title	y Mineralogy				
Proposed Title <sup>†</sup> Env	vironmental Clay Mineralogy				
<sup>†</sup> If title is longer than 24 character	s, offer a sensible title of 24 characters	or less:			
Current number of credit hours:	Proposed nur	mber of credit hours: 3			
Currently, is this course repeatable	Currently, is this course repeatable? YES NO VI If YES, current maximum credit hours:				
Proposed to be repeatable?	YES NO 🗸 If Y	'ES, proposed maximum credit hours:			
Current grading system:	Letter (A, B, C, etc.)	Pass/Fail			
Proposed grading system:	Letter (A, B, C, etc.) $\Box$ H	Pass/Fail			
Courses must be described by at le	ast one of the categories below. Include	number of actual contact hours per week for each categor			
Current:					
		ON LABORATORY 3 LECTURE			
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# APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR and MINOR

11.	Supplementary teaching component: 🖌 N/A 🗌 Community-Based Experience 🔲 Service Learning 🗍 Both						
	Proposed supplementary teaching component: Community-Based Experience Service Learning Both						
2.	Cross-listing: N/A or GLY 741 Dhananjay Ravat						
	Current Prefix & Number printed name Current Cross-listing Department Chair signature						
	a. Proposed – REMOVE current cross-listing:						
	h Proposed 4DD more listing						
	D. Proposed – ADD cross-listing.         Prefix & Number         printed name         Proposed Cross-listing Department Chair         signature						
3.	Current prerequisites:						
	GLY 360 or consent of instructor						
	Proposed prerequisites:						
	GLY 360 or consent of instructor						
4.	Current Bulletin description:						
	A comprehensive study of the crystal structures of clay minerals commonly found in soils and sediments. Lecture and discussion, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741).						
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5.	discussion, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741). <i>Proposed Bulletin description:</i> A comprehensive study of the crystal structures of clay minerals commonly found in soils and sediments. Lecture and discussion, two hours; laboratory, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741). What has prompted this change?						
5.	discussion, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741). <i>Proposed Bulletin description:</i> A comprehensive study of the crystal structures of clay minerals commonly found in soils and sediments. Lecture and discussion, two hours; laboratory, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741).  What has prompted this change? The need to strengthen graduate student training by inclusion of a laboratory component.						
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5.	discussion, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741).  Proposed Bulletin description:  A comprehensive study of the crystal structures of clay minerals commonly found in soils and sediments. Lecture and discussion, two hours; laboratory, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741).  What has prompted this change?  The need to strengthen graduate student training by inclusion of a laboratory component.  If there are to be significant changes in the content or teaching objectives of this course, indicate changes: Hands-on laboratory sections will be added to include spectroscopic, microscopic, and thermal analyses of soil clays.						
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<b>5.</b> <b>6.</b>	discussion, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741). <i>Proposed Bulletin description:</i> A comprehensive study of the crystal structures of clay minerals commonly found in soils and sediments. Lecture and discussion, two hours; laboratory, three hours. Prereq: GLY 360 or consent of instructor (same as GLY 741).  What has prompted this change? The need to strengthen graduate student training by inclusion of a laboratory component.  If there are to be significant changes in the content or teaching objectives of this course, indicate changes: Hands-on laboratory sections will be added to include spectroscopic, microscopic, and thermal analyses of soil clays.  Please list any other department that <u>could</u> be affected by the proposed change: <u>Geological &amp; Environmental Sciences (GLY)</u>						

#### APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR and MINOR

#### 19. Is this course currently included in the University Studies Program?

Yes 🖌 No

_	_ Check box if	
20.	changed to	
_	400G or 500	

If <u>changed to</u> 400G- or 500-level, *you must include a syllabus showing differentiation* for undergraduate and graduate students by (i) requiring additional assignments by the graduate students; and/or (ii) the establishment of different grading criteria in the course for graduate students. (See SR 3.1.4)

21. Within the department, who should be contacted for further information on the proposed course change?

lame:	Chris Matocha	Phone:	257-9312 <sub>Email:</sub> cjmato2@uky.edu
2. S	Signatures to report approvals: eptember 15, 2009	Todd Pfeif	fer lodd Plu llu
	DATE of Approval by Department Faculty	printed name	Reported by Department Chair
]	DATE of Approval by College Faculty	printed name	Reported by College Dean signatur
	*DATE of Approval by Undergraduate Council	Bria	A -05'00'
*	DATE of Approval by Graduate Council	printed name	Reported by Graduate Council Chair signatur
(	*DATE of Approval by Health Care Colleges Council (HCCC)	printed name	Reported by Health Care Colleges Council Chair signature
	*DATE of Approval by Senate Council		Reported by Office of the Senate Council
	*DATE of Approval by the University Senate		Reported by the Office of the Senate Council
*If ap	plicable, as provided by the University S	enate Rules. ( <u>http://v</u>	www.uky.edu/USC/New/RulesandRegulationsMain.htm)
	Excerpt from University Senate Rules:	****	*****
	SR 3.3.0.G.2: Definition. A request n	may be considered a m	inor change if it meets one of the following criteria:
	<ul> <li>a. change in num</li> <li>b. editorial chan emphasis;</li> <li>c. a change in pr</li> </ul>	nber within the same h ge in the course title of rerequisite(s) which do	nundred series; r description which does not imply change in content or bes not imply change in content or emphasis, or which is

- made necessary by the elimination or significant alteration of the prerequisite(s);
- d. a cross-listing of a course under conditions set forth in SR 3.3.0.E;
- e. correction of typographical errors.

Rev 3/09

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	Proposed	sumbanauca			Community-]	Based Experience	Service Learning	Both
			y reaching com	ponent;	Community-1	Based Experience	Service Learning	Both /
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# Syllabus for Environmental Clay Mineralogy, PLS 741 Spring 2010, 3 credits Lecture:TR 11:00am-12:00pm Room A-6 Ag. Sci. Ctr-North (AGN) Lab:T 1:00-4:00pm Rooms N-131, N-103 (AGN)

### I. Instructors:

Dr. A.D. Karathanasis E-mail: <u>akaratha@uky.edu</u> Office: N-122K, Ag. North Office phone: 257-5925

Dr. C.J. Matocha E-mail: <u>cjmato2@uky.edu</u> Office: N-122R Ag. North Office Telephone: 257-9312

## II. Objectives:

- A. Introduce basic compositional and structural concepts of clay minerals
- **B.** Familiarize students with basic laboratory characterization techniques applied to clay mineralogical investigations.
- **C.** Elucidate the fundamental behavior of clay minerals in response to changing environmental conditions.

### III. Reading Material:

No textbook is required.

Primary References:

Minerals in Soil Environments. 1989. J.B. Dixon & S.B. Weed (eds). 2nd ed. Soil Sci. Soc. Am., Madison, WI.

<u>Methods of Soil Analysis</u>: <u>Part 5-Mineralogical Methods.</u> 2008. A. L. Ulery and L.R. Drees (eds.) SSSA Book Series, no. 5., Madison, WI.

IV. Prerequisites: GLY 360 or consent of instructor

#### **Environmental Clay Mineralogy Lecture and Lab Outline**

#### A. Lecture Series

- 1. Introduction (basic compositional and structural classification of minerals).
- 2. Structure and composition of clay minerals
  - a) Al, Fe, and Mg-hydroxides
  - b) 1:1 minerals
  - c) 2:1 minerals
  - d) 2:1:1 minerals
  - e) Allophanes and zeolites
  - f) Other typical clay-sized minerals (Mn-oxides, Ti-oxides, quartz, feldspars,

carbonates)

- 3. Methods for identification and quantification of clay minerals
- 4. Surface chemistry and behavior of clay minerals in environmental processes
- 5. Mineral weathering, thermodynamic stability, and equilibria

#### **B.** Lab Series

- 1. Sample preparation for mineralogical analysis
- 2. X-ray diffraction (XRD) analysis
- 3. Application of XRD for mineral identification & quantification
- 4. Thermal analysis
- 5. Application of thermal analysis for mineral identification & quantification
- 6. Total elemental analysis of minerals

7. Application of total elemental analysis for mineral structural composition determination

- 8. Scanning electron microscopy and energy dispersive x-ray analysis
- 9. Characterization of mineral surface charge and zeta potential properties
- 10. Fourier Transform infrared spectroscopy analysis

Faculty Member	Vote	Date	
marthur@uky.edu;	For	12-08-09	
barton@uky.edu;			
paul.bertsch@uky.edu;	For	12-09-09	
Coyne, Mark S;	For	12-08-09	
D'Angelo, Elisa;			
Ditsch, David C;	For	12-08-09	
Grove, John H;			
pkalisz@uky.edu;			
Karathanasis, A D;	For	12-08-09	
brad.lee@uky.edu;	For	12-09-09	
cjmato2@uky.edu;			
dave.mcnear@uky.edu;			
mueller@uky.edu;	For	12-10-09	
Mullen, Michael D;			
Murdock, Lloyd W;			
rpearce@uky.edu;			
Schwab, Gregory J;	For	12-08-09	
Sikora, Frank J;			
Thom, William O;			
Unrine, Jason;	For	12-15-09	
Wendroth, Ole O	For	12-08-09	

Soil Science Faculty PLS 741 Course Change - Fall 2009

# Syllabus for Environmental Clay Mineralogy, GLY/PLS 741 Spring 2010, 3 credits Lecture:TR 1:00pm-1:50pm Room A-6 Ag. North (AGN) Lab:R 2:00-4:30pm Rooms N-131, N-103 (AGN)

# I. Instructors:

Dr. A.D. Karathanasis E-mail: <u>akaratha@uky.edu</u> Office: N-122K, Ag. North Office phone: 257-5925

Dr. C.J. Matocha E-mail: <u>cjmato2@uky.edu</u> Office: N-122R Ag. North Office Telephone: 257-9312 MW, 10-12pm, or by appointment

# II. Objectives:

- A. Introduce basic compositional and structural concepts of clay minerals
- **B.** Familiarize students with basic laboratory characterization techniques applied to clay mineralogical investigations.
- **C.** Elucidate the fundamental behavior of clay minerals in response to changing environmental conditions.

## III. <u>Reading Material:</u>

No textbook is required.

Primary References:

- <u>Minerals in Soil Environments</u>. 1989. J.B. Dixon & S.B. Weed (eds). 2nd ed. Soil Sci. Soc. Am., Madison, WI.
- <u>Methods of Soil Analysis: Part 5-Mineralogical Methods.</u> 2008. A. L. Ulery and L.R. Drees (eds.) SSSA Book Series, no. 5., Madison, WI.
- <u>Soil Mineralogy with Environmental Applications</u>. 2002. J.B. Dixon & D.G. Schulze (eds.) SSSA Book Series, no. 7, Madison, WI.

IV. <u>Prerequisites:</u> GLY 360 or consent of instructor

### V. <u>Grading System:</u>

Evaluation type	Number	Weight(%)	Subtotal(%)
Exam	3	20	60
Reports	5	6	30
HW and quizzes	_	_	<u>10</u>
			100
Grading criteria			
<u>%</u>		Grade	
≥90		А	
80-89		В	
70-79		С	
≤59		Е	

#### VI. <u>Course Policies:</u>

1) Course attendance policy: Students who attend every session of this course will benefit from first-hand, direct learning opportunities. Excused absences are based on UK's standards (Section 5.2.4.2 of Student Rights and Responsibilities, available at <a href="http://www.uky.edu/StudentAffairs/Code/">http://www.uky.edu/StudentAffairs/Code/</a> ).

**2)** Academic integrity: Scholastic dishonesty is not tolerated. Forms of scholastic dishonesty include, but are not limited to: plagiarism (copying or using someone else's work as your own), utilization of unauthorized materials during academic evaluations, etc. University of Kentucky rules are strict on this, so we expect you to do your own, original work. For more information on academic integrity, see Part II of "The Code of Student Conduct" which can be viewed online at

<u>http://www.uky.edu/StudentAffairs/Code/part2.html</u> or can be obtained in the Dean of Students office.

**Environmental Clay Mineralogy Lecture and Lab Outline** 

#### A. Lecture Series

- 1. Introduction (basic compositional and structural classification of minerals).
- 2. Structure and composition of clay minerals
  - a) Al, Fe, and Mg-hydroxides
  - b) 1:1 minerals
  - c) 2:1 minerals
  - d) 2:1:1 minerals
  - e) Allophanes and zeolites
  - f) Other typical clay-sized minerals (Mn-oxides, Ti-oxides, quartz, feldspars, carbonates)
- 3. Methods for identification and quantification of clay minerals
- 4. Surface chemistry and behavior of clay minerals in environmental processes
- 5. Mineral weathering, thermodynamic stability, and equilibria

#### **B.** Lab Series

- 1. Sample preparation for mineralogical analysis
- 2. X-ray diffraction (XRD) analysis
- 3. Application of XRD for mineral identification & quantification
- 4. Thermal analysis
- 5. Application of thermal analysis for mineral identification & quantification
- 6. Total elemental analysis of minerals
- 7. Application of total elemental analysis for mineral structural composition determination
- 8. Scanning electron microscopy and energy dispersive x-ray analysis
- 9. Characterization of mineral surface charge and zeta potential properties
- 10. Fourier Transform infrared spectroscopy analysis

Tentative schedule

Lecture	Date	Topic	Lab	Lab Reports
1	1/14/2010	Introduction-Chris	No lab	-
2	1/19/2010	Introduction-Chris		
			Lab 1 Sample	
			Preparation-Dr.	
3	1/21/2010	Introduction-Chris	К	
		Al, Fe, Mg		
4	1/26/2010	hydroxides-Tasios		
		ID and quantification		
-	1/20/2010	methods (XRD)	Lab Z XRD	
5	2/2/2010	1:1 minorale Taciae	Tasios	
0	2/2/2010	1.1 minerais-rasios	Lab 3 XRD-	
7	2/4/2010	1:1 minerals-Tasios	Tasios	
8	2/9/2010	2.1 minerals-Tasios	105/05	
	2/0/2010	2.1 111101010 100100	Lab 4 XRD-	
9	2/11/2010	2:1 minerals-Tasios	Tasios	
10	2/16/2010	2:1:1 minerals-Tasios		
			Lab 5 XRD-	
11	2/18/2010	2:1:1 minerals-Tasios	Tasios	Report 1 due
12	2/23/2010	TA methodsTasios		
		Allophanes and	Lab 6 TA lab-	
13	2/25/2010	zeolites-Chris	Tasios	
	01010040	Allophanes and		
14	3/2/2010	zeolites-Chris		
15	2/4/2010	First Exam	Lap / TA lap-	Penert 2 due
10	3/4/2010	Other minerale_Chris	145105	Report 2 due
10	3/9/2010	Other mineralsOnns	Lah 8 Mineral	
		Surface Chemistry	Surface Charge	
17	3/11/2010	Chris	labChris	
	Spring Break	No class		
		Surface Chemistry		
18	3/23/2010	Chris		
			Lab 9 Zeta	
		Surface Chemistry-	potential of clay	
19	3/25/2010	Zeta potentialChris	mineralsChris	Report 3 due
		Total elemental		
20	2/20/2010	analysis methods		
20	3/30/2010	1 45105	Lab 10 Total	
		Mineral weathering	elemental	
21	4/1/2010	Tasios	analysisTasios	
		Mineral weathering		
22	4/6/2010	Tasios		
			Lab 11 Total	
		Mineral weathering	elemental	
23	4/8/2010	Tasios	analysisTasios	Report 4 due
24	4/13/2010	Second Exam		
			Lab 12 FTIR	
25	4/15/2010	FTIR methodsChris	labChris	
		Other Surface		
26	4/20/2040	Chemistry Methods		
20	4/20/2010	SEM/TEM methode-	Lab 13 SEM	
27	4/22/2010	Chris	labChris	Report 5 due
28	4/27/2010	XAS methodsChris	Sale Grine	
		Overview and		
29	4/29/2010	wrapup		Final report