UNIVERSITY OF FLORIDA – SPRING 2019

Environmental Biogeochemistry of Trace Metals

CWR6252 – Sections: 3C73, 3C74, 3C75 & 3C7

SWS6932 – Sections: 03AE, 08GC, 08GH & 34F6

Instructors		Lecture building & room	Lecture days & Periods
Dr. JC. Bonzongo EES, ESSIE/COE 308 Black Hall Tel: 392-7604 Email: bonzongo@ufl.edu	**Dr. Lena Q. Ma** SWS, IFAS 2157 McCarty Hall Tel: 392-9063; X-208 Email: lqma@ufl.edu	**Parts I & II of the course will be taught in CSE, Room E112 & Parts III & IV in MCCD, Room G001** ***(see Lecture Schedule on pages 2 & 3)***	**M, W, and F** **6th period** **(12.50 —1.40 pm)**

Course description and objectives (**3 cr**). This course focuses on fate and impacts of trace metals/metalloids as they cycle through geological and biological environmental compartments. The course emphasizes geological and chemical principles that drive the distribution, speciation, and bioavailability of trace metals as well as their interaction and dynamics in soils and aquatic systems. It is designed to provide students with a scientific basis to biogeochemical approaches and a foundation upon which they can develop the ability to analyze, predict, and solve environmental and engineering problems related to metal pollution.

Textbook and Software.

- **Textbook:** No textbook is required for this course. Reading materials will be provided by the instructors.
- **Software**: The geochemical equilibrium model MINEQL+ will be used in this course. The software will be provided by the instructors. Please note that all faculty, staff, and students of the University of Florida are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Prerequisites: Include one or more of the following: general chemistry, organic chemistry, biochemistry, soil and/or water chemistry, or permission of the instructors.

Student outcomes addressed in this course: Students who successfully complete this course should be able to: (1) identify, formulate, and solve problems related to water pollution in natural and engineered systems, (2) apply knowledge of mathematics, chemistry, and engineering; and (3) acquire knowledge on fate and environmental health impacts of pollutants in aquatic systems.

Class Format and Class Attendance for On-campus Students: The delivery of this course will be done through two different UF platforms: (1) EDGE through EES/College of Engineering, and (2) DE through SWS/IFAS. ***On-campus students are encouraged to attend all classes when applicable***. See Table on tentative lecture schedule below for details on course format.

TENTATIVE LECTURE SCHEDULE

DATES	LECTURE TOPICS	LECTURES #	ASSIGNMENTS
PART-I: BACKGROUND AND INTRODUCTION METAL GEOCHEMISTRY			
Week-1 **1/7** - 1/11	• Concept of Natural Order • Nuclear Chemistry • Origin of Chemical Elements	• Lecture 01 • Lecture 02	Watch the recorded lectures *(see course's canvas site)*
Week-2 **1/14** - 1/18	• The Earth's System • Distribution of metals in rocks forming the Earth's Crust • The rock Cycle	• Lecture 03 • Lecture 04 • Lecture 05	Watch the recorded lectures *(see course's canvas site).* HOMEWORK-1
Week-3 **1/21: Holiday** **1/23** & 1/25	• Metal transfer from rocks to different environmental compartments: Weathering Mechanisms	• Lecture 06 • Lecture 07	Watch the recorded lectures *(see course's canvas site).* HOMEWORK-2
PART-II: METALS IN THE HYDROSPHERE			
Week-4 **1/28** – 2/01	• Environmental classification of metals • Metals in the Hydrosphere: Geochemical Equilibrium Model: MINEQL+ as case study	• Lecture 08 • Lecture 09 • Lecture 10	Watch the recorded lectures *(see course's canvas site).* HOMEWORK-3
Week-5 **2/04** – 2/08	• Metal speciation methods • Analytical methods used in metal speciation • Redox chemistry and fate of metals in aquatic systems	• Lecture 11 & 12 • Lecture 13	Watch the recorded lectures *(see course's canvas site).* HOMEWORK-4
Week-6 **2/11** - 2/15	• Interaction of metals with living organisms • Cell biochemistry • Organometallic • Metal Toxicity	• Lecture 14 • Lecture 15 • Lecture 16	Watch the recorded lectures *(see course's canvas site).* HOMEWORK-5
Week-7 **2/18** – 2/22	• Biogeochemistry of trace metals: Environmental Engineering considerations.	• Lectures 17, 18, 19	**Live lectures only** HOMEWORK-6
PART-III: METALS IN SOIL AND PLANT SYSTEMS			
Week-8 **02/24 – 03/01**	• Introduction to soil processes and trace metals	• Lectures 20, 21, & 22	**Live Lectures only** **Topics for term papers assigned this week.**
Week-9 3/04 - 3/08	***SPRING BREAK***		

Week-10 3/11 – 3/15	• Trace metals in the rhizosphere and concentrations of trace metals in soils and plants.	• Lectures 23, 24, & 25	Assignment (TBA)
Week-11 3/18 – 3/22	• Selected trace metals in soils and plants: Analysis and levels. • Plant responses to trace metals.	• Lectures 26, 27, & 28	Assignment (TBA)
Week-12 3/25 – 3/29	• Mobility, speciation and availability of trace metals in soils	• Lectures 29, 30, & 31	Assignment (TBA)
PART-IV: BIOGEOCHEMISTRY OF SELECTED METALS			
W**eek**-13 4/01 – 4/05	Term paper presentations by students on the biogeochemistry of selected metals	• Lectures by students	After completing the term papers, each student will be given an opportunity to give an oral presentation and answer questions. Guidelines for both term papers and oral presentations will be provided by the instructors.
Week-14 4/08 – 4/12	Term paper presentations by students on the biogeochemistry of selected metals	• Lectures by students	
Week-15 4/15 – 4/19	Term paper presentations by students on the biogeochemistry of selected metals	• Lectures by students	
Week-16 Classes only on 4/22 & 4/24	Term paper presentations by students on the biogeochemistry of selected metals	• Lectures by students	

Canvas: We will use CANVAS for posting both audio and non-audio materials associated to this course. Posted information will consist of (i) lectures' power point slides, (ii) lectures' videos, (iii) homework assignments and corresponding keys, (iv) reading papers and handouts, and any other materials relevant to the course. Students needing assistance with the computer and technical requirements for using E-learning, should seek this assistance from the UF HelpDesk http://helpdesk.ufl.edu/ 352-392-4357, helpdesk@ufl.edu).

Grading Scale and Assignments

Percent	Grade	Grade Points
90 - 100	**A**	**4.00**
87 - 89	**A-**	**3.67**
83 - 86	**B+**	**3.33**
80 - 82	**B**	**3.00**
76 - 79	*B-*	*2.67*
73 - 75	*C+*	*2.33*
70 - 72	*C*	*2.00*
66 - 69	*C-*	*1.67*
63 - 65	*D+*	*1.33*
60 - 62	*D*	*1.00*
56 – 59	*D-*	*0.67*
<56	*E*	*0.00*

Grades will be determined based on performance on homework, term papers, and oral presentations. The weight of the above assignments towards the final grade is as follows.

- Homework……..……65%
- Term papers…….…….....20%
- Oral presentations……..15%

Graduate students should complete the class with a grade of B or higher. Any grade less than B is considered failure. For more information on grades and UF grading policies, please visit: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Cell Phones. Cell phones **must be turned off** or silenced during class. Use of cell phones for calls or messaging during class is prohibited.

University Honesty Policy. UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TA in this class.

Course Evaluation. Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at the end of the semester. Evaluations are typically open during the last two or three weeks of the semester. Students will be given specific times when they will become available. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.