

## **NRES 765 Biogeochemical cycles Fall 2020**

### **General information**

*Time and Location-* MW in SFB 104 from 1430 to 1540

*Instructor-* Mae Sexauer Gustin, Professor, NRES Dept Office location- FA 126, email [mgustin@cabnr.unr.edu](mailto:mgustin@cabnr.unr.edu), phone-784-4203, Office hours-by appointment.

### **Course description:**

Investigation of factors and processes controlling, and the anthropogenic impacts on, the biogeochemical cycles of elements within and between the hydrosphere, lithosphere, atmosphere, and biosphere.

### **Course objectives:**

This course will introduce and investigate processes and factors controlling the biogeochemical cycles of elements

Topics to be covered include:

- α- The origin of the Earth and elements as we know it and co-evolution of life.
- β- Methods used to measure and model chemical fluxes and to decipher biogeochemical cycles past and present.
- γ- Physicochemical and biotic processes and reactions controlling the distribution, speciation, and fluxes of elements within and between the four major spheres.
- δ- The significance of element speciation in controlling mobility and impacts on biological systems.
- ε- Anthropogenic influences and alterations of Earth processes and biogeochemical cycles.
- ζ- The development of biogeochemical cycles for elements including carbon, nitrogen, phosphorus, sulfur, potentially toxic trace metals (Hg, Cd, As), and for environmental contaminants such as radionuclides and persistent organic pollutants.

### **Readings:**

1-This book is required and has not been ordered

**The Disappearing Spoon (and other true tales of madness, love, and the history of the world from the periodic table of the elements** 2010 by Sam Kean, Back Bay Books, Little Brown and Company, New York.

2- This book was used in the past and may be a good resource- **Biogeochemistry: An analysis of global change (3<sup>rd</sup> edition)** 2013 by W.H. Schlesinger and Emily S. Bernhardt, Academic Press, Elsevier Publishing Company, Printed in China. This is available as an e-book.

<https://www.sciencedirect.com/book/9780123858740/biogeochemistry>

3- These are on electronic reserve as e books.

**Treatise of Geochemistry V4 The Atmosphere** Ralph F. Keeling editor (2014)

**Treatise of Geochemistry V 8 Biogeochemistry** WH Schlesinger editor (2014)

**Treatise of Geochemistry V9 Environmental Geochemistry** BS Lollar editor (2014)

<https://innopac.library.unr.edu/search~S1?/Xtreatise+on+geochemistry&searchscope=1&SORT=D/Xtreatise+on+geochemistry&searchscope=1&SORT=D&SUBKEY=treatise+on+geochemistry/1%2C3%2C3%2CB/frameset&FF=Xtreatise+on+geochemistry&searchscope=1&SORT=D&1%2C1%2C>

4- In addition you will need to read select papers from journals available from the UNR system. These will be listed under each topic on the webpage. You may access these through the UNR web page and the following link to the library and journals. <https://library.unr.edu/>

**Grading:**

Exams 45% Three exams will be given (@ 15% each). The format will be short answer and essay. Material for tests will come from lectures and readings. Exams do serve a purpose!

**Purpose- These will help students assimilate the information given as well as focus on organizing information and placing details within a broader context.**

Discussion assignments 45%. There will be 5 of these over the semester. This will involve doing assigned and chosen readings, assessing data presented, determining major findings, making brief presentations, and writing up specific information. Each discussion will be led by a group of graduate students. Group size will be dependent on the number of students taking the class. The presentation and leading the group discussion will be 15% of your grade. The rest of the grade (6% each assignment) will take into consideration the following: 1-each student's preparedness for the discussion, and 2- written assignments for each topic, one that is based on the paper(s) being discussed (typed, 1.5 spaced), and the second based on the reading done in Kean (typed, 1.5 spaced). *Kean chapters will be briefly discussed during the discussion days.* Both written assignments will require the students to do a little additional research.

**Purpose- Exposure to scientific literature and history, critical review, and learning about class topics.**

Participation (10%) It is expected that students come to every class and participate in discussion of materials in readings and presented in class. This means that assignments pertinent to class should be read prior to class and the students should come prepared to discuss course materials. This grade will also be calculated taking into account the number of classes missed. **Purpose- Develop confidence in participating in discussion.**

Final grades will be assigned with the following: A>90, B+=87.5 to 90, B=87.5 to 82.5, B-=80 to 82.5, C+=77.5 to 80, etc).

All students are expected to maintain high standard of intellectual honesty. Anyone involved in academic misconduct (i.e. plagiarism, cheating) will receive no credit for that assignment/test. Repeat offenses will result in a failing grade for the class.

**Statement on Academic Dishonesty:** The University Academic Standards Policy defines academic dishonesty and mandates specific sanctions for violations. See the University Academic Standards policy: [UAM 6,502](#).

Late assignments will not be accepted and make up tests will not be given unless the student has a very good excuse for having a late assignment or missing a test that is given to the instructor prior to the exam.

Tentative schedule (may change as we move along)- Readings will be posted as we move along.

Date	Component	Topic
Aug 24	Introduction	Biogeochemical cycles for studying Earth system science-Gaia Theory
Aug 26	Introduction	Definitions and scales
Aug 31	Introduction	Definitions and scales
Sept 2	Introduction	Definitions and scales
Sept 7		NO CLASS-Labor Day
Sept 9		<b>Discussion: Paradigm shifts/Human impact on the Earth/Kean Part I</b>
Sept 14	The framework	The origin and early evolution of the Earth
Sept 16	The framework	The origin and early evolution of the Earth
<b>Sept 21</b>	Tools	Measuring fluxes
Sept 23	Tools	Measuring fluxes
Sept 28	Tools	Using isotopes
<b>Sept 30</b>	Tools	Using isotopes
Oct 5	Tools	Using models
Oct 7		<b>Discussion -Application of tools/Kean Part II</b>
<b>Oct 12</b>		Test 1
Oct 14	Properties key reservoirs	The hydrosphere
Oct 19	Properties key reservoirs	The oceans
Oct 21	Properties key reservoirs	The lithosphere
Oct 26	Properties key reservoirs	The atmosphere
Oct 28	Properties key reservoirs	The atmosphere
Nov 2		<b>Discussion- Feedbacks between spheres/Kean Part III</b>
Nov 4	Specific cycles	The carbon cycle
Nov 9	Specific cycles	Biogeochemical Cycle of Nitrogen
Nov 11		<b>NO CLASS-Veterans Day</b>
Nov 16	Specific cycles	<b>Discussion -Humans and the C cycle</b>
Nov 18		Test 2
Nov 23	Specific cycles	Biogeochemical Cycles of Sulfur and Phosphorus
Nov 25	Specific cycles	Mercury
Nov 30	Specific cycles	Trace Metals
Dec 2	Specific cycles	Persistent organic pollutants/Radionuclides
Dec 7	Specific cycles	<b>Discussion- Humans and trace contaminants</b>

Dec 9	Dead Day	
Dec	Final	Kean Part V/ Test 3

**Student learning outcomes:**

Upon successful completion of NRES 765 students will be able to:  
 Discuss local, regional, and global biogeochemical cycles of many elements and the processes governing the movement of these elements between the lithosphere, hydrosphere, atmosphere, and biosphere.  
 Critique, appraise, and assess the scientific literature.  
 Organize, analyze, and debate issues regarding presentation of scientific information, and place scientific details within a broader context.

## University Policies

### Statement on COVID-19 Policies

**Training**

Students must complete and follow all guidelines as stated in the *Student COVID-19 Training* modules, or any other trainings or directives provided by the University.

**Face Coverings**

In response to COVID-19, and in alignment with State of Nevada Governor Executive Orders, Roadmap to Recovery for Nevada plans, Nevada System of Higher Education directives, the University of Nevada President directives, and local, state, and national health official guidelines face coverings are required at all times while on campus, except when alone in a private office. This includes the classroom, laboratory, studio, creative space, or any type of in-person instructional activity, and public spaces.

A “face covering” is defined as a “covering that fully covers a person’s nose and mouth, including without limitation, cloth face mask, surgical mask, towels, scarves, and bandanas” (State of Nevada Emergency Directive 024).

Students that cannot wear a face covering due to a medical condition or disability, or who are unable to remove a mask without assistance may seek an accommodation through the Disability Resource Center.

**Social Distancing**

Face coverings are not a substitute for social distancing. Students shall observe current social distancing guidelines where possible in accordance with the Phase we are in while in the classroom, laboratory, studio, creative space (hereafter referred to as instructional space) setting and in public spaces. Students should avoid congregating around instructional space entrances before or after class sessions. If the instructional space has designated entrance and exit doors students are required to use them. Students should exit the instructional space

immediately after the end of instruction to help ensure social distancing and allow for the persons attending the next scheduled class session to enter.

### **Disinfecting Your Learning Space**

Disinfecting supplies are provided for you to disinfect your learning space. You may also use your own disinfecting supplies.

### **COVID-19, COVID-19 Like Symptoms, and Contact with Someone Testing Positive for COVID-19**

Students must conduct daily health checks in accordance with [CDC guidelines](#). Students testing positive for COVID 19, exhibiting COVID 19 symptoms or who have been in direct contact with someone testing positive for COVID 19 will not be allowed to attend in-person instructional activities and must leave the venue immediately. Students should contact the [Student Health Center](#) or their health care provider to receive care and who can provide the latest direction on quarantine and self-isolation. Contact your instructor immediately to make instructional and learning arrangements.

### **Tracking In-Class attendance**

In person attendance will be fluid and difficult to track for classes taught through hyflex or multimodal instructional delivery. If a student in your class tests positive for COVID 19, an awareness of which students are present and in which seat they are sitting will be very important for contact tracing. Therefore, we suggest that instructors use their cell phones to photograph or video record classroom participants at the beginning of each class period. This will provide a record of in class attendance and student seating positioning. Instructors choosing this option, will be required to inform students during the first day of class and in their syllabus that in class participants will be photographed or videoed each period only for use for contact tracing purposes in the case one of their classmates test positive for COVID 19.

### **Laboratory, Studio, and Creative Space Settings**

You will be provided specific instructions and procedures by your instructor for art studios, recording studios, digital media labs, testing centers, observation labs, podcasting studios, dance studios, clinical centers, research labs, physical science labs, etc. as necessary.

### **Failure to Comply with Policy (including as outlined in this Syllabus) or Directives of a University Employee**

In accordance with section 6,502 of the University Administrative Manual, a student may receive academic and disciplinary sanctions for failure to comply with policy, including this syllabus, for failure to comply with the directions of a University Official, for disruptive behavior in the classroom, or any other prohibited action. "Disruptive behavior" is defined in part as behavior, including but not limited to failure to follow course, laboratory or safety rules, or endangering the health of others. A student may be dropped from class at any time for misconduct or disruptive behavior in the classroom upon recommendation of the instructor and with approval of the college dean. A student may also receive disciplinary sanctions through the Office of

Student Conduct for misconduct or disruptive behavior, including endangering the health of others, in the classroom. The student shall not receive a refund for course fees or tuition.

## Statement on Academic Dishonesty

"The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: [UAM 6,502](#)."

## Statement of Disability Services

*Use either the traditional or online statement, in addition to the last sentence regarding third party materials.*

### ***For Traditional and Seated Classrooms:***

"Any student with a disability needing academic adjustments or accommodations is requested to speak with me or the [Disability Resource Center](#) (Pennington Achievement Center Suite 230) as soon as possible to arrange for appropriate accommodations."

### ***For Online Courses:***

"If you are a student who would normally seek accommodations in a traditional classroom, please contact me as soon as possible. You may also contact the Disability Resource Center for services for online courses by emailing [drc@unr.edu](mailto:drc@unr.edu) or calling 775-784-6000. Academic accommodations for online courses may be different than those for seated classrooms; it is important that you contact us as soon as possible to discuss services. The University of Nevada, Reno supports equal access for students with disabilities. For more information, visit the [Disability Resource Center](#)."

**This course may leverage 3<sup>rd</sup> party web/multimedia content, if you experience any issues accessing this content, please notify your instructor.**

## Statement on Audio and Video Recording

### **Student-created Recordings**

"Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded."

### **Instructor-created Recordings**

Class sessions may be audio-visually recorded for students in the class to review and for enrolled students who are unable to attend live to view. Students who participate with their camera on or who use a profile image are consenting to have their video or image recorded. If you do not consent to have your profile or video image recorded, keep your camera off and do not use a profile image. Students who un-mute during class and participate orally are consenting to have their voices recorded. If you do not consent to have your voice recorded during class, keep your mute button activated and only communicate by using the "chat" feature, which allows you to type questions and comments live.

## Statement on Maintaining a Safe Learning and Work Environment

The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit the [Equal Opportunity and Title IX](#) page.

*In addition to the required information listed above, it is strongly recommended that the syllabus include:*

- Methods for communicating with students outside the classroom regarding matters such as class cancellations, meeting times, or room changes
- More detail about what constitutes academic dishonesty, with a concrete list or examples of "dos and don'ts" in the context of the class
- **Statement for Academic Success Services:** "Your student fees cover usage of the [Math Center](#) (775) 784-4433, [Tutoring Center](#) (775) 784-6801, and [University Writing Center](#) (775) 784-6030. These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student."