

# GEOS 101 – GLOBAL ENVIRONMENTAL SCIENCE

## Spring Semester, 2013

### COURSE INFORMATION

**Instructor:** Dr. Samuel D. Matson

**Contact Information:** [sammatson@boisestate.edu](mailto:sammatson@boisestate.edu), (208) 426-3645

**Website:** <http://earth.boisestate.edu/sammatson>

**Office Hours:** Tue. 1:00 pm – 3:00 pm and by appt., 1162 Environmental Research Bldg

**Course Website:** <http://blackboard.boisestate.edu>

**Course Text:** Christopherson, R.W., 2013, *Elemental Geosystems* (7<sup>th</sup> ed.), W.H. Freeman, ISBN: 1429269545

**Course Dates:** 22 January – 9 May 2013

**Lecture Time and Location:** TuTh, 10:30–11:45 am, 110 Engineering Building

### **Lab Instructors:**

Xavier Gagne ([xaviergagne@u.boisestate.edu](mailto:xaviergagne@u.boisestate.edu))

Ryan McCutcheon ([ryanmccutcheon@u.boisestate.edu](mailto:ryanmccutcheon@u.boisestate.edu))

Will Parham ([willparham@u.boisestate.edu](mailto:willparham@u.boisestate.edu))

Lab Schedule	Monday	Wednesday	Thursday
08:15–10:15		<b>B</b> (wp)	<b>D</b> (xg)
10:30–12:30	<b>A</b> (wp)	<b>C</b> (rm)	
13:30–15:30			<b>E</b> (xg)

### COURSE DESCRIPTION

Geology is the scientific study of the Earth system at various scales of time and space. Environmental Science is an applied subdiscipline of geology, with a focus on the relationship between humans and the Earth. Essentially, it explores how we can use geologic knowledge to address human concerns about their surroundings. These concerns can range from natural disasters (such as earthquakes, flooding, and landslides), to the supply of fossil fuels, to the pollution of air, water, and soils. In this course, students will use the Scientific Method and an Earth Systems approach to explore the interaction between humans and their environment. This course will examine Earth's atmospheric, oceanic, and biologic systems and cycles – which are driven primarily by energy from the Sun – as well as Earth's geologic systems and cycles (e.g., Plate Tectonics and the Rock Cycle), which are driven primarily by heat energy from within the Earth. Specific topics this course will address include plate tectonics, Earth materials, natural hazards (e.g., volcanoes, earthquakes, landslides, severe weather), cycling of energy and elements, natural resources, environmental sustainability, and climate change.

### LEARNING OUTCOMES

Boise State's Foundational Studies Program provides undergraduates with a broad-based education that spans the entire university experience. *GEOS 101: Global Environmental Science* satisfies four credits of the Foundational Studies Program's Disciplinary Lens – Natural, Physical, and Applied Science (DL-N) requirement. It supports the following University Learning Outcome, along with a variety of other course-specific goals:

8. Apply knowledge and the methods characteristic of scientific inquiry to think critically about and solve theoretical and practical problems about physical structures and processes.

*GEOS 101: Global Environmental Science* is designed help students understand the major components of the Earth System (atmosphere, hydrosphere, lithosphere, biosphere), and the cycles through which they interact, through the perspective of an Earth System scientist. This course helps to achieve the goals of the Foundational Studies Program by focusing on the following course learning outcomes. After successful completion of this course, you will be able to:

- 1) develop and articulate a question based on relevant geologic observations, 2) describe parallel, testable hypotheses that explain your observations, 3) design a simple experiment to test each hypothesis, and 4) evaluate the results of the experiment to decide which hypotheses are supported by the data.
- clearly differentiate between observation and interpretation of geologic data, and summarize and relate observations in order to support an interpretation.
- clearly and accurately apply scientific terms and principles to construct organized and concise written, oral, and graphical communication about important ideas such as Earth's energy budget, atmospheric composition and circulation, the hydrologic cycle and water resources, plate tectonics and the rock cycle, landform development, and past and current climate change.
- 1) describe the primary ways in which humans are affected by each of the major components of the Earth System, 2) explain how scientific understanding about these components and their interaction has a direct impact on societal wellbeing, and 3) summarize scientific data illustrating ways in which human activities can in turn affect the Earth System.

**COURSE ORGANIZATION AND GRADING CRITERIA**

Your final grade will be based on points that you have earned on exams, reading quizzes, homework and in-class activities, laboratory activities, lecture and lab exams, and a final lab presentation. The weight of each of these assessments in your final grade is as follows:

Assessment Category	Percent of Grade
Reading Quizzes (11)	10%
Exam 1	5%
Exam 2	10%
Final Exam	15%
Homework and In-class Activities (?)	20%
Labs (10)	25%
Post-Labs (10)	5%
Lab Final Exam	5%
Lab Presentation	5%

At the end of the semester, I will evaluate the total percentage you have earned on the assessments above and will determine your final letter grade as follows:

A	92 – 100%	B	82 – 87%	C	72 – 77%	D	62 – 67%
A–	90 – 91%	B–	80 – 81%	C–	70 – 71%	D–	60 – 61%
B+	88 – 89%	C+	78 – 79%	D+	68 – 69%	F	<60%

Your grade for this course is *non-competitive*, and will be determined by how you perform on course assessments – not how you perform relative to your peers. **There will be no extra-credit opportunities, so please do not ask.**

***Textbook Assignments and Reading Quizzes (RQ)***

You will be expected to read the assigned chapters from the textbook on your own prior to each lecture. This course does not focus explicitly on the textbook, but keeping up with the reading will help you become familiar with vocabulary and concepts and will greatly enhance what you take away from each lecture and lab exercise. There will be 12 reading quizzes throughout the semester, delivered online via Blackboard. These quizzes will be based on the textbook reading assignments, and their purpose is to help you prepare for lecture by encouraging you to complete the assigned readings and giving you feedback on your understanding of concepts before coming to lecture. The reading quizzes will be due at the beginning of lecture on Tuesday for weeks in which there is not an exam, and they will be available for one week prior to that time. **Each quiz is an individual effort**; you are welcome (and encouraged) to use your textbook, but NOT your fellow classmates. Quizzes are not cumulative and will cover material since the last quiz. You can take each reading quiz up to 2 times, and I will record your highest score. **No make-ups are allowed on reading quizzes**, but I will drop your lowest reading quiz score when calculating your final grade. Please interpret this policy wisely.

***Exams***

There will be three lecture exams in this class – 2 midterms and 1 final. All three exams will be delivered online via Blackboard at the Testing Center on the main campus in Boise (418 Education Building). You will need to sign up for a time slot with the Testing Center prior to the exam (a link is provided on the course website), and you will need to bring a photo ID to the Testing Center at that arranged time to take the exam. **You are strongly encouraged to sign up for exam slots early in the semester**, since the Testing Center schedule fills very quickly. **It is extremely unlikely that you will be able to make up a missed exam**, so scheduling your exam for the last time slot on the last day of the exam availability period is probably a bad idea. Scheduling your exam early in the week increases the chances that you will be able re-schedule in the event that you miss your exam due to unforeseen and/or emergency circumstances.

Each exam will be *roughly* 40% cumulative material since the beginning of the semester, and *roughly* 60% new material since the last exam. The exams will use a combination of multiple choice, word/definition matching, and picture and graph identification to assess your recall and understanding of material from lectures and lab, as well as your ability to apply geologic concepts and to synthesize and evaluate geologic data.

### ***Homework and In-class Activities***

Throughout the semester, there will be several activities and assessments in lecture that are designed to 1) illustrate and reinforce concepts introduced in lecture, 2) promote student interaction (and alertness!), and 3) to provide immediate evaluation of student understanding of important concepts (for both the instructor and students!). These activities will comprise 20% of your final course grade, and include (but are not limited to) short in-class quizzes using student response technology (“clickers”), brief in-class assignments, essays or sketches, and/or take-home homework assignments. Though some quizzes may contain questions that will be graded as right/wrong, the majority of your grade for homework and in-class activities will be based on participation and effort. **No make-ups are allowed for missed in-class activities**, but I will drop your lowest 2 scores when calculating your final grade. Interpret this policy wisely. If you must miss a lecture, you are responsible for getting the notes from a classmate and ensuring you understand the material you missed.

### ***Laboratory Exercises***

The laboratory exercises are hands-on, in-class activities designed to illustrate and reinforce (and sometimes introduce!) concepts we discuss in lecture. The laboratory exercises will comprise 25% of your final course grade, and each lab exercise will consist of two components:

- 1) A short pre-lab quiz designed to make you more efficient with your time in lab by encouraging you to read the lab handout ahead of time. **Pre-labs will be due at the beginning of each lab period**, and will comprise 10% of the total grade for each lab exercise.
- 2) Lab worksheets, consisting of a series of questions, graphs, tables and/or other work that you will complete during the lab period. **Completed lab worksheets will be due at the end of each lab period**, and will comprise 90% of the total grade for each lab exercise.

If you must miss your scheduled lab, then you are strongly encouraged to contact the TA of another lab section to see if there is room for you to attend that lab. (Keep in mind that we are limited in terms of lab space and supplies, so you are NOT guaranteed a spot in a lab section for which you are not enrolled.) **No make-ups are allowed for missed labs**, but I will drop your lowest lab score when calculating your final grade. Interpret this policy wisely. If you must miss a lab it is important that you master the skills and concepts in order to perform well on the lab exam.

### ***Post-Lab (PL) Quizzes***

For each lab exercise, there will be a short post-lab quiz delivered via Blackboard; these quizzes will comprise 5% of your final course grade. The post-labs are designed to 1) give you immediate feedback about your understanding of important concepts before you leave lab, 2) encourage dialogue between you and your lab instructor about those concepts, and 3) help you prepare for the lab final exam. **Post-labs will be due by 11:59 pm on Friday the week of the corresponding lab**, but you are strongly encouraged to complete them during the lab period or immediately after. You are welcome to consult with your lab partners as you are completing the post-labs, but keep in mind that you will NOT be able to consult with your classmates during the lab final exam – so completing them on your own would probably be better practice for that exam. **No make-ups are allowed for missed post-labs**, but I will drop your lowest lab score when calculating your final grade. Please interpret this policy wisely.

### ***Laboratory Exams***

There will be one cumulative final exam in the laboratory portion of this class, to be held during your lab period the week of 29 April – 2 May. **The lab exam is an individual effort** and will comprise 5% of your final course grade. The lab exam is designed to test your understanding of important lab concepts, and your ability to apply those concepts to synthesize and evaluate geologic data.

### ***Lab Final Presentation***

Each lab section will be divided into groups of 2–3 students, and each group will be responsible for investigating one of the major energy sources available to society and presenting their findings to fellow GEOS 101 students via a 10-minute video presentation in lab during week 16 (6–9 May) of the semester. The lab presentation will comprise 5% of your final course grade. Presentation topics, introductory questions, and assessment criteria are available in your lab manual.

- 1) **Academic Dishonesty:** Academic integrity is essential to a positive teaching and learning environment, and scholastic dishonesty is considered unacceptable in any form in this course. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own, can result in disciplinary action. As described in Article 4, Section 1 of Boise State University's Student Code of Conduct:  
*A violation may include cheating, plagiarism, or other forms of academic dishonesty. All assignments submitted by a student must represent her/his own ideas, concepts, and current understanding or must cite the original source. Academic dishonesty includes assisting a student to cheat, plagiarize, or commit any act of academic dishonesty. Attempts to violate academic integrity do not have to be successful to be considered academic dishonesty. Academic dishonesty includes turning in substantial portions of the same academic work to more than one course without the prior permission of the faculty members.*  
  
In this course, academic dishonesty includes (but is not limited to) using a classmate's clicker to submit answers for him/her, allowing a classmate to submit clicker responses on your behalf, consulting another student's exam, quiz, or laboratory materials from a previous semester, and/or making your exam, quiz, or lab materials available to another student after the conclusion of this semester. **Any student responsible for academic dishonesty in GEOS 100 can be assigned a penalty up to and including and "F" for the course.** If you have any questions regarding the expectations for a specific assignment or exam, ask.
- 2) **Attendance:** Class attendance is essential. In the vast majority of circumstances, late work is not accepted and class assignments and lab activities cannot be made up. Much of the class is based on activities and discussions, which require full attention and participation. Please be prompt and ready to begin at the start times for your lecture and lab sections.
- 3) **Accommodations:** If you have any physical or learning needs that might impact your learning and evaluation in this course, please discuss these needs with your instructor **at the beginning of the term**. The University has a multitude of resources so don't hesitate to let your instructor help you. *To request academic accommodations for a disability, contact the Disability Resource Center, Admin 114, (208) 426-1583. Students are required to provide documentation of their disability and meet with a Disability Specialist prior to receiving accommodations. Information about a disability or health condition will be regarded as confidential.*
- 4) **Communication:** If you have something important to tell your instructor (i.e. you'll be late, absent, etc.), send an email reminder. Telling your instructor after class and hoping he/she will remember is not a good option. You must notify your instructor(s) well in advance of any travel plans for university-sponsored events (athletics or other activities) that will interfere with the scheduled course activities.
- 5) **Electronic devices:** Please show respect for your instructor and fellow students by turning off all phones, personal music players, etc., before coming to class. If your phone rings during class **your instructor will answer it for you**. This is no joke, but it will be funny. No devices that allow communication of any kind may be used during examinations (tests, quizzes, final exams, etc.) in this course. This includes, but is not limited to, cell phones, pagers, messaging devices, PDAs, computers with wireless network connections, and calculators with IR communications capabilities. In general, laptop use will not be allowed during lecture. If you strongly prefer to take notes electronically then you must be willing to sit at the front of the class and be prepared to demonstrate acceptable use to your instructor.
- 6) **Course Workload:** You should expect to spend a total of 12 hours per week working to earn your 4 credits in this class. This includes lecture and lab, which account for 5 of those 12 hours. The remainder should be spent reading your textbook, studying your notes, and/or coming to office hours. Reviewing your notes over a cup of coffee for just 30 minutes after each lecture will be tremendously helpful as a review, and for identifying concepts you do not understand or gaps in your notes. We will cover many topics, most of which will be new and unfamiliar to most of you. I will do my best to make the course content as clear and accessible as possible; you should do your part by reading your textbook and reviewing your notes day to day.

**COURSE SCHEDULE:**

Wk	Date	Lecture Topic(s)	Lab	Text	Due
1	22 Jan	Introduction; Ice Age Theory	<b>NO LAB</b>	Ch. 1, 2	KS 1
	24 Jan	Earth's Place in Time and Space			
2	29 Jan	Earth's Place in Time and Space	1. Topographic Maps	Ch. 2, 3	RQ 1; Lab 1; PL 1
	31 Jan	Earth's Energy Budget			
3	5 Feb	Earth's Energy Budget	2. Dendrochronology	Ch. 2, 3	RQ 2; Lab 2; PL 2
	7 Feb	Composition and Structure of the Atmosphere			
4	12 Feb	<b>NO CLASS</b> (Instructor available for review)	3. The Sun and Climate	Ch. 3, 4	KS 2; <b>EXAM 1</b> ; Lab 3; PL 3
	14 Feb	Circulation in the Atmosphere and Oceans			
5	19 Feb	Circulation in the Atmosphere and Oceans	(Work on Presentations)	Ch. 4, 12	RQ 3
	21 Feb	Oceans and Coasts			
6	26 Feb	The Hydrologic Cycle; Water Resources	4. Carbon in the Atmosphere	Ch. 5, 6, 13	RQ 4; Lab 4; PL 4
	28 Feb	Groundwater; Glaciers			
7	5 Mar	Rivers and Flooding	5. Water Contamination and Treatment	Ch. 11	RQ 5; Lab 5; PL 5
	7 Mar	Rivers and Flooding			
8	12 Mar	Plate Tectonics	6. To Buy Or Not To Buy?	Ch. 8, 9	RQ 6; Lab 6; PL 6
	14 Mar	Plate Tectonics; Earthquakes			
9	19 Mar	<b>NO CLASS</b> (Instructor available for review)	7. Earthquake Hazards	Ch. 8, 9	KS 3; <b>EXAM 2</b> ; Lab 7; PL 7 Presentation Draft
	21 Mar	Mineral Resources			
10	25–29 Mar	<b>NO CLASS (Spring Break)</b>	<b>NO LAB</b>		
11	2 Apr	The Rock Cycle	8. Mineral and Rock Classification	Ch. 8, 9	RQ 7; Lab 8; PL 8
	4 Apr	Volcanoes			
12	9 Apr	Weathering and Mass Wasting	9. Volcanic Hazards	Ch. 10	RQ 8; Lab 9; PL 9
	11 Apr	Geomorphology			
13	16 Apr	Soils, Ecosystems, and Biomes	10. Soils	Ch. 14, 15, 16	RQ 9; Lab 10; PL 10
	18 Apr	Soils, Ecosystems, and Biomes			
14	23 Apr	Biogeochemical Cycles	11. FIELD TRIP	Ch. 15	RQ 10; Lab 11; PL 11
	25 Apr	Biogeochemical Cycles			
15	30 Apr	Paleoclimate	<b>Lab Final Exam</b>	Ch. 13	RQ 11; <b>Lab Exam</b>
	2 May	Paleoclimate			
16	7 May	Modern Climate Change	<b>Presentations</b>	Ch. 7, 17	RQ 12; <b>Presentation</b> ; KS 4
	9 May	Modern Climate Change			

**FINAL EXAM:** Available at Blackboard Testing Center 13–16 May 2013

Some other important dates:

- 28 January: Last day to add course without a permission number; Drop fee begins
- 4 February: Last day to drop class without a “W” on your transcript
- 4 March: Last day to withdraw from the course

RQ = Reading Quiz

PL = Post-Lab

KS = Knowledge Survey (optional)

**STATEMENT OF TEACHING PHILOSOPHY**

SAMUEL D. MATSON

*As an educator, my primary objectives are threefold. First, I seek to convey to my students the value of a lifelong intellectual curiosity about the world around them. I believe that an understanding of science as inquiry-based is fundamental to quality education. **I want my students to understand the fundamental importance of observation and of having questions, and to understand that science is a unique and powerful approach to answering those questions.** I enjoy sharing my passion for discovery with my students by incorporating my own interdisciplinary research interests into my teaching, and my experience as a student and researcher has taught me that interdisciplinary approaches to education are invaluable for creating new worldviews. Second, **I wish to give my students an opportunity to see the world – and their place in it – in an entirely different way.** I have come to see Geoscience as a particularly good vehicle for achieving this goal, since through the study of geology we enjoy a reality that is spatially and temporally beyond our everyday experience. Sharing this alternate worldview with my students is something I enjoy immensely and in turn, I hope to learn from the life experiences each of them brings to the classroom. Finally, **I wish to share with my students the importance of critical thinking and problem-solving as skills that extend beyond a college science course.** A fundamental goal I have for my teaching is to more directly encourage my students to move beyond the stage of analysis and interpretation, and on to action. That is, I want to help my students realize and implement concrete ways that they can apply their newfound knowledge to make positive changes both locally and globally.*

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**STATEMENT OF SHARED VALUES**

Boise State University upholds the following values as the foundation for a civil and nurturing environment. Campus community members are expected to adhere to these common values.

1. Academic Excellence
2. Caring
3. Citizenship
4. Fairness
5. Respect
6. Responsibility
7. Trustworthiness

PLEASE SIGN THE STATEMENT BELOW AND RETURN IT TO YOUR INSTRUCTOR BY THE SECOND WEEK OF CLASS.

**I have read, understand, and will comply with the rules described above in this course syllabus.**

Your printed name: \_\_\_\_\_

Your signature and today's date: \_\_\_\_\_

**PLEASE NOTE: You will not receive any further grades in this course until you bring a signed copy of the agreement above to your instructor.**