**ENVS 23000 Earth System Science**

**MWF 9:00-9:50AM CNS 202**

**Lab M 1:00-3:50PM CNS 212**

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Office hours: Tues 11-12; Wed 10-11 or by appointment

***Sakai*** *will be used during this course for assignments and grades*

Required Readings:

* *Elemental Geosystems* by R.W. Christopherson and G.H. Birkeland. 8th edition (2016), Pearson– *bring to every class*
* Additional supplemental readings will be distributed throughout the semester.

Required Materials brought to each class and lab

* Pencils
* Scientific calculator (or app on your phone)

**Course Summary**

Our Earth is a dynamic planet that is governed by a complex web of biological, chemical, and physical processes that interact within and between the major spheres: the atmosphere, hydrosphere, biosphere, and lithosphere. We can also add the *anthroposphere* to reflect the human impact on the planet. This course provides a multidisciplinary focus on the *connections, interactions and feedbacks*between the system components. It serves as an introduction to earth science with a particular emphasis on how these processes influence and are influenced by human activity. The course will be taught with an emphasis on generating and analyzing quantitative data in order to answer questions about earth processes. Since this course is a requirement for IC Environmental Science majors, the curriculum is oriented for that group. I expect that you will have some background and interest in the topic and will be prepared to work hard.

**Course Goals**

This is essentially a multidisciplinary science course that strives to connect the multiple strands of earth processes. By the end of the semester, you should be able to:

* Understand and describe key **components, interactions, and concepts** that characterize the earth system
* Understand the relevant physical, chemical, and biological processes that are important in the earth system;
* Have an essential understanding of systems, including positive and negative feedbacks;
* Complete quantitative problems including basic modeling of climate change; and
* Have basic skills of gathering, organizing, and analyzing environmental data.

**Lab**

Lab time will be a mix of classroom and outdoor exercises. Part of several labs will be dedicated to going to local places to gather data. During these activities and any field trips, you will need to wear close-toed shoes (no flip flops!) and bring appropriate clothing. We will be going outside regardless of weather conditions unless there are obvious dangerous conditions (lightning).

**Seneca Field Trip**

The October 17 lab will be a research cruise on Seneca Lake using the Hobart and William Smith Colleges’ boat *Scandling*. On that day, we will need to leave at 11AM and will arrive home by 4:15 PM. Please let me know as soon as possible about any conflicts.

**Grading**

Grades in the course will be based on in-class activities, homework exercises, and exams as follows:

* Reading quizzes (lowest grade will be dropped) – 20%
* Mid-term exam – 20%
* Final exam – 25%
* Lab exercises – 30%
* Participation – 5%

Below are my expectations for a given grade for assignments and other work:

**A = Excellent =** all your answers to the questions are accurate and correct. You demonstrate considerable thought to your answers. All calculations are correct and you show your work and units. There is evidence of analysis of ideas on your part - not simply repeating what you observed. The writing is complete and free of errors.

**B = Good =** most of your answers to the questions are accurate and correct. Almost all calculations are correct and you show your work and units, but there may be some small mistakes. You fulfilled the basics of the assignment but you could have given a little more analysis. The writing generally is complete and free of errors.

**C = Average =** some of your answers to the questions are accurate and correct but others are incorrect. Some calculations are correct, others are not; you do not always show your work and units. You fulfilled some of the assignment but here is little analysis. The writing is okay but may be confusing and has some errors.

**D = Below Average =** few of your answers to the questions are accurate and/or correct. Your answers are short and show little to no analysis. The writing has errors. For whatever reason, you work does not reflect what you are capable of.

**Grading Scale**

4.0 = A = 95 – 100 %

3.7 = A- = 90 – 94 %

3.3 = B+ = 87 – 89 %

3.0 = B = 83 – 86 %

2.7 = B- = 80 – 82 %

2.3 = C+ = 77 – 79 %

2.0 = C = 73 – 76 %

1.7 = C- = 70 – 72 %

1.3 = D+ = 67 – 69 %

1.0 = D = 63 – 66 %

0.7 = D- = 60 – 62 %

0.0 = Fail = 0 – 59 %

**Class Policies**

Class policies are intended to provide an atmosphere favorable to learning. Adherence to these policies will help you keep current with class material and ensure excellent performance in the class.

* **Readings:** Readings assigned on the Schedule of Topics (see below) must be completed prior to the class session for which they are assigned. *Where noted, there will be an in-class quiz that must be completed at the beginning of class.*
* **Quizzes:** There will be at least eight short, multiple choice (five questions) quiz given at the beginning of class based on the assigned reading for that day. You are allowed hand-written notes from the reading – *no printed material is allowed!* The lowest quiz grade will be dropped at the end of the semester.
* **Attendance:** You are expected to attend all class sessions, participate in discussion and group activities, take notes, and ask questions when material is not clear. If you miss a class, it is your responsibility to get notes from a classmate. If you are absent due to health reasons, please bring documentation from the health center. If you have a family emergency, please communicate with me as soon as possible. If you will miss class due to a religious holiday or an athletic event, you must let me know within a reasonable amount of time ahead of the event. If you have more than two unexcused absences, your participation grade will be zero.
* **Office Hours:** You are encouraged to visit during office hours if you have questions on course content, homework or exams that you would like to discuss outside of the classroom.
* **Laptop computers:** You may bring your laptop to class, but it must remain closed during lecture and class discussion. You are welcome to use it if you are doing group and need to do research during lab.
* **Texting:** Textingis not allowed during class time - it is disrespectful to me and fellow students.
* **Unapproved** **late work** is accepted and graded (if at all) at my discretion.
* I value a diverse and inclusive classroom. Please see me in private to discuss any **personal concerns**, such as anxieties in the classroom, a first language other than English, or any aggressions, macro- or micro. I will listen to you.  I will then do whatever I can to change the classroom environment so that you feel safe for the rest of the semester. Please also consult the Office of Academic Support Services (607-274-1005, TDD 607-274-7319, [acssd@ithaca.edu](mailto:acssd@ithaca.edu)). In accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, reasonable accommodations will be provided to qualified students with documented disabilities. Students seeking accommodations must register with Student Accessibility Services and provide appropriate documentation before any accommodations can be provided.  Please note that accommodations are not retroactive so timely contact with Student Accessibility Services is encouraged.
* Any observed, suspected, or alleged **acts of** **academic dishonesty** will be referred directly to the appropriate authority. It is your responsibility to understand what constitutes academic dishonesty and also its consequences. For clarification or further information, please consult the Ithaca College Policy Manual (<http://www.ithaca.edu/attorney/policies/vol7/Volume_7-70104.htm>).

**Schedule of Topics (subject to change)**

|  |  |  |
| --- | --- | --- |
| **Week** | **Topic** | **Reading (due that day)** |
| **1** |  |  |
| W 8/24 | Introduction and Syllabus |  |
| F 8/26 | The Spheres and Interactions | [Earth from Space Video](http://www.pbs.org/wgbh/nova/earth/earth-from-space.html) – submit concepts and questions on Sakai |
| Lab | No Lab |  |
| **2** |  |  |
| M 8/29 | Earth Systems | Ch. 1 |
| W 8/31 | Earth-Sun Energy Relationships | Ch. 2 p. 34-48 |
| F 9/2 | The Atmosphere | Ch. 2 p. 48-65 |
| Lab | Earth-Sun Energy |  |
| **3** |  |  |
| M 9/5 | *Labor Day – No Class* |  |
| W 9/7 | Mechanisms of the Greenhouse Effect | Ch. 3 p. 70-86 |
| F 9/9 | Global Temperature Distribution | Ch. 3 remainder |
| Lab | *No lab* |  |
| **4** |  |  |
| M 9/12 | Atmospheric Circulation | Ch. 4 all pages |
| W 9/14 | Moisture and Precipitation Patterns | Ch. 5 p. 142-165 |
| F 9/16 | El Nino |  |
| Lab | Water Sampling and Basic Testing |  |
| **5** |  |  |
| M 9/19 | Hydrosphere | Ch. 6 p. 184-199 |
| W 9/21 | Surface Water | Ch. 6 remainder |
| F 9/23 | Groundwater |  |
| Lab | Irrigation and Agriculture |  |
| **6** |  |  |
| M 9/24 | Rivers and Streams | Ch. 12 p. 372-385 |
| W 9/28 | Regional Watersheds |  |
| F 9/30 | Water Chemistry | Assigned |
| Lab | Six Mile Creek |  |
| **7** |  |  |
| M 10/3 | Regional Climates | Ch. 7 |
| W 10/5 | Regional Climates II |  |
| F 10/7 | ***Mid-term Exam*** |  |
| Lab | TBA |  |
| **8** |  |  |
| M 10/10 | No class (but there is lab) |  |
| W 10/12 | Lakes |  |
| F 10/14 | *No Class - Fall Break* |  |
| Lab | Water Alkalinity |  |
| **9** |  |  |
| M 10/17 | Seneca Lake Cruise | Leave at 11AM |
| W 10/19 | Seneca Lake debrief |  |
| F 10/21 | Water, Weathering, and Climate | Ch. 11 p. 346-360 |
| Lab | Seneca Lake Cruise |  |
| **10** |  |  |
| 10/24 | Intro to the Lithosphere | Ch. 9 |
| 10/26 | Lithosphere Chemistry |  |
| F 10/28 | Lithosphere Physics |  |
| Lab | Rocks and Minerals |  |
| **11** |  |  |
| M 10/31 | Soils | Ch. 15 |
| W 11/2 | Nutrient Cycles |  |
| F 11/4 | Nutrient Cycles II |  |
| Lab | Soils (ICNL) |  |
| **12** |  |  |
| M 11/7 | Faulting and Mountains | Ch. 10 p. 310-328 |
| W 11/9 | Volcanism | Ch. 10 p. 335-343 |
| F 11/11 | Volcanism and Climate |  |
| Lab | Mountains |  |
| **13** |  |  |
| M 11/14 | Glaciation | Ch. 14 |
| W 11/16 | Glacial Sediments in Ithaca | Assigned |
| F 11/18 | Natural Climate Change | Ch. 8 p. 244-257 |
| Lab | Glaciers |  |
| 11/19-27 | *Thanksgiving Break* |  |
| **14** |  |  |
| M 11/28 | Paleoclimate Data |  |
| W 11/30 | Global Climate Change Observations | Ch. 8 remainder |
| F 12/2 | Global Climate Change Mechanisms |  |
| Lab | Paleoclimate and Marine Sediments |  |
| **15** |  |  |
| M 12/5 | Climate Models |  |
| W 12/7 | Sea Level and Seawater pH | Assigned |
| F 12/9 | Solutions – Geoengineering? | Assigned |
| Lab | Climate Modeling |  |
| F 12/16 | *Final Exam 4:30PM-7:00PM* |  |