**METR 4533 / METR 5533 / GEOL 4533 / GEOL 5533**
**Earth's Past Climate (Meet in SEC 1446)**
**Fall 2013**

**Instructors:**

Prof. Susan Postawko (spostawk@ou.edu)
Meteorology
414 SEC or 5329 NWC; 325-1142
**Office Hours:** M/W 9:30-10:30 in SEC or by appt

Prof. Lynn Soreghan (lsoreg@ou.edu)
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**Office Hours:** Tu 3-4, W 10-11:30 or by appt

**Optional Text:** Ruddiman, W.F., 2001, Earth's Climate: Past and Future, *1st edition*: W.H. Freeman and Co, NY, 465 p.

**Prerequisite:** Introductory geology and meteorology or equivalent (or permission of instructor); senior undergraduate or graduate standing. Intended for students in both the geosciences and science education.

**Course Philosophy and Objectives:** Climate is interdisciplinary. Our goal is to provide you with a fundamental understanding of how Earth's climate system works, how climate has changed through geologic time, how to decipher climate archives from the geologic record, and practice in communication.

**Readings:** Required readings are journal articles, although we have also listed corresponding chapters in the textbook if you decide to purchase it. *You are responsible for material covered in all required readings.* Journal readings will be uploaded as pdfs on D2L. Reading primary literature is an important component of advanced education because it requires you to absorb, synthesize and analyze research papers. An online exercise will accompany each non-text reading assignment, due 24 hours prior to the relevant lecture. Further details will be discussed in class.

**Term Project:** For your term project, you should focus on, and research *extensively*, a paleoclimatic topic selected by you and approved by us. Use existing literature. Project requirements for those enrolled in the graduate levels differ *significantly* from those enrolled in the undergraduate levels; undergraduates may work in teams of two, whereas graduates are expected to work independently. This is a semester-long project with components due throughout the semester; see syllabus for due dates. Our goal is to help you learn to write. For additional help (outside of class), please remember OU's writing center; for more information visit www.ou.edu/writingcenter. Know the definition of plagiarism, and don't plagiarize. More instructions will follow soon.

**A Note on Research:** Your research on course projects should be extensive, given the level of this course. Go well beyond the web—i.e., to the professional literature (real books and journals). ALL sources, including web sources, must be cited—using uncited material is a form of plagiarism. Good starting points for literature searches are Georef, Web of Science, Geoscience World, and Google Scholar.

**Exams and Exercises:** There will be two exams; do not miss either (there will be no make-up exams). Exercises will be linked to lecture topics. More details will be provided later. All exercises must be uploaded to the D2L dropbox by the due date. Students who plan to observe a religious holiday that falls on an exam or due date should notify the professor as soon as possible to make appropriate arrangements for rescheduling of class work.

**Field Trip:** A field trip is planned to discuss climate proxies from field data. More details later.

**Grading:** Readings (20%), Homework (15%), In-class Exercises (15%), Exams (30%), Term Project (20%).

**KNOW THE GEOLOGIC TIMESCALE!!!**

*Any student in this course who has a disability that may prevent full demonstration of abilities should contact us personally as soon as possible to discuss accommodations necessary to ensure full participation and facilitate your educational opportunities. Also, it is the policy of the University to excuse*

*the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays.*

**Tentative Schedule**

| Week | Date | Lecture (w/opt'l Ruddiman readings) | Activity |
|---|---|---|---|
| *PART I: Introduction to Core Geologic and Climatic Concepts* | | | |
| Week 1 | Tu 20 Aug | Logistics, Philosophy, Research Methods [Both] | Reading assignments throughout semester |
| | Th 22 | Why Study Past Climate? (Chapter 1) [Lynn] | |
| Week 2 | Tu 27 Aug | Plate Tectonics, Rock Cycle (p. 101-112) [Lynn] | Radio-isotopic Dating Web HW |
| | Th 29 | The Earth as a System; Geologic Time and Dating (p. 59-64 for dating; Chapter 4) [Lynn] | |
| Week 3 | Tu 3 Sep | Sed Rocks Review, Lithologic Climate Proxies I (Chapter 3) [Lynn] | Sed Rocks/Proxies HW |
| | Th 5 | Lithologic Climate Proxies II [Lynn] | Leaf Analysis HW |
| Week 4 | Tu 10 | In-Class Practicum: Lithologic Climate Proxies [Lynn] | |
| | Th 12 | Isotope Practicum | Isotope Exercise HW |
| Week 5 | Tu 17 | Isotopic Climate Proxies (Chapter 11 – parts) [Lynn] | |
| | Th 19 | Intro to Climate System I (Chapter 2) [Susan] | Carbon Cycle HW |
| Week 6 | Tu 24 | Climate System Dynamics / Global Warming (Chapters 2, 18, 19) [Susan] | |
| *PART II: Major Controls on the Climate System* | | | |
| | Th 26 | Evolution of Atmosphere, Faint Young Sun Paradox (Chapter 4) [Susan] | |
| | *Sat 28* | *Fieldtrip [details TBA]* | |
| Week 7 | Tu 1 Oct | Orbital Practicum | Orbital HW |
| | Th 3 | Orbital Controls on Climate (Chapters 8, 10, 11) [Susan] | |
| Week 8 | Tu 8 | Plate Tectonics and Climate I (Chapters 4, 5) [Susan] | |
| | 10 | Plate Tectonics and Climate II [Susan] | Exam I |
| *PART III: Case Studies of Past Climates* | | | |
| Week 9 | **Tu 15** | **EXAM I** | |
| | Th 17 | The Snowball Earth (Proterozoic) I (p. 89) [Susan] | • Wiki Project Title DUE 22 Oct (10% of total Project grade) |
| Week 10 | Tu 22 | The Snowball Earth II | |
| | Th 24 | Back into the Icehouse (Cenozoic) 147-171) [Susan] | |
| Week 11 | Tu 29 | The Hothouse Earth (Paleocene-Eocene) [Susan] | |
| | Th 31 Oct | Pangaean Climate (Late Paleozoic) (p. 110-116] [Susan] | • Wiki Project Annotated Biblio DUE 31 Oct (15% of total Project grade) |
| Week 12 | Tu 5 Nov | The Cretaceous Greenhouse (Mesozoic) (p. 129-146) [Lynn] | |
| | Th 7 | The Quaternary Icehouse & Last Glacial Max (p. 274-329) [Lynn] | |
| Week 13 | Tu 12 | Millennial-Scale Climate Change (p. 330-351, 383-404) [Susan] | • Wiki Project Draft DUE --bring hardcopy to class-- 14 Nov (25% of total Project grade) |
| | Th 14 | Peer Review of Term Paper Drafts [Lynn & Susan] | |
| Week 14 | **Tu 19** | **EXAM II** | Exam II |
| | Th 21 | THANKSGIVING—no class | |
| Week 15 | Tu 26 | Project Presentations | • Wiki Project Presentations (10% of |

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|---|---|---|---|
| | Th 28 | Project Presentations | total Project grade). |
| Week 16 | Tu 3 Dec | Project Presentations | • Wiki final project DUE Dec 3. (40% of total grade). |
| | Th 5 | Project Presentations | |