



## Course Syllabus GEOL 113: The Earth's Record of Climate Spring Semester, 2010



Instructor	Dr. Kevin Theissen
Lab Instructor	Erik Smith
Office	OSS 116
Office Hours	Tuesday 1-2 p.m., Thursday 9 – 10 a.m. or by appointment
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Lecture	MWF 10:55 am-12:00 pm, <u>Room: OWS 150 (3M Lecture Hall)</u>
Lab Sections	Theissen: M and W 3-5pm; Smith: T and Thurs 10-12 and 1:30-3:30 Labs will meet in room OSS 124 or OSS 120

### COURSE DESCRIPTION:

In this course we will explore the Earth's climate system and the climatic changes that have occurred during the history of our planet. You will gain a hands-on introduction to the collection, analysis, and interpretation of climate data in laboratory sessions and course exercises designed with an emphasis on scientific inquiry and problem solving.

### PREREQUISITES:

None. This course fulfills the core requirement of an introductory geology course for potential Geology majors or minors. Students who have taken another introductory geology course may take this course as well. After satisfactory completion of this course you will be eligible to take upper level courses in geology.

### REQUIRED MATERIALS:

1. *Earth's Climate Past and Future* by William F. Ruddiman, 2008. W.H. Freeman and Co., New York, 388 p.
  2. *Dire Predictions: Understanding Global Warming* by Michael E. Mann and Lee R. Kump, 2009. DK, New York, 208 p.
  3. A Turning Point ResponseCard ("clicker") is also required for this course.
- All are Available at the UST bookstore.*

### Course web page

You need a St. Thomas email account. The course page (Blackboard) can be accessed using 'My UST' link on the UST homepage. This will prompt you to a page that asks for your UST username and password.

### COURSE OBJECTIVES:

At the end of this course, you should be able to:

1. Collect and access climate and past climate data from sources such as the internet, analyze these data sets, make interpretations, and make comparisons between different data sets.
2. Use different types of geological evidence (including sediment and rock types, fossils, and geochemical data) to make an interpretation of the geological and climate-related history of a given region.
3. Evaluate climate-related arguments and information in scientific articles and the mainstream media.

In order to meet these objectives lab exercises, and in-class activities are designed to help you develop your skills in the following areas:

- Using Microsoft Excel and other software to work with data.
- Using the internet as a resource for scientific information.
- Working in groups to solve problems.
- Improving quantitative and spatial skills.

- Review of science articles from science journals and the mainstream media.

#### GRADING SCALE and BREAKDOWN:

A	93 - 100%	B	83 - 86%	C	73 - 76%	D	63 - 66%
A-	90 - 92%	B-	80 - 82%	C-	70 - 72%	D-	60 - 62%
B+	87 - 89%	C+	77 - 79%	D+	67 - 69%	F	< 60%

Assessment Category	Points	Percent of Grade
Exams (3)	350	35%
Quizzes, in class exercises, participation	200	20%
Lab Assignments (10)	250	25%
Mineral and Rock quiz	50	5%
Lab Synthesis Project	100	10%
Emissions Role Play	50	5%
	1000	100%

**\*\*\*Please note:** The first two items constitute the lecture portion of the course and the last four constitute the lab portion. In order to receive a passing grade in this course you will need to achieve passing scores in both portions.

#### COURSE ORGANIZATION:

##### Readings:

You will be expected to complete assigned reading on your own prior to each lecture. Keeping up with the reading will help you become familiar with vocabulary and concepts, greatly enhancing what you take away from each lecture and laboratory exercise.

##### Knowledge Survey

In your first lab session and then again before each exam, you will complete a knowledge survey that is available on the course website in Blackboard. The knowledge survey is a series of questions and instructions that resembles an exam. However, instead of directly answering the questions on the survey, you are asked to reflect and give your level of confidence (on a 3 point scale) that you could answer them. This learning tool has specific uses for both you and your instructors. It will allow us to gauge your understanding of important concepts prior to, during, and at the end of the course. This will provide a measure of your learning in the course. The knowledge survey will also make a nice study guide for you as you prepare for quizzes and exams. You will always be able to refer to the questions on the survey. We will explain the knowledge survey more fully in class.

##### Exams: (2 midterms @ 100 points each; 1 final @ 150 pts; **350 points total**)

Each exam is an individual, in-class effort, without the assistance of books, notes, or other students. There will be three exams in this class. The exams will use a combination of multiple choice, true/false, fill in the blank, diagram labeling, and sketch/short answer questions. Exams will cover lectures, textbook reading assignments, and lab activities. The final exam will be somewhat longer than the two midterms and will be cumulative.

##### Quizzes (3 quizzes at 25 points each = **75 points**); **In-class assignments and Participation (125 points)**

You will complete three quizzes in class to firm up important concepts and to make sure you are keeping up with the reading assignments. Quizzes are scheduled and will take place in the first 10-15 minutes of the class period in which they are given. We will frequently complete short in-class assignments to help you master the material and prepare for what you might expect on exams. Additionally, we will use the student response system in this course. During each class session I will ask you to respond to questions related to lecture. You will receive

feedback after each class session on your responses. As long as you are fully participating in responding to these questions you will receive credit.

**Lab exercises (10 assignments at 25 points each = 250 points)**

Mandatory two-hour lab sessions will be held each week of the semester. The lab activities are hands-on, in-class exercises designed to illustrate and reinforce concepts introduced in lecture. Your instructor will test your understanding of these concepts and provide you with immediate feedback during the lab.

**Rock and Mineral Quiz (50 points)**

In the seventh week of the course (Week of March 15) you will take a quiz in the first half of the lab session to test your knowledge of rocks and minerals examined during the previous two lab sessions.

**Lab Synthesis Project (100 points)**

This project will give you the opportunity to apply the skills and concepts that you have worked on in laboratory exercises. You will work with a partner to interpret the climate history of a region using geological tools that you have learned about in the course.

**Emission Role Play Exercise (50 points)**

During the final two lab sessions of the course you and your classmates will be cast into different roles and then challenged to research, debate, and vote on proposed legislation to reduce greenhouse gases in the atmosphere. Your grading will be based on your effort and the quality of the material you present during the exercise.

**COURSE POLICIES:**

- 1) **Attendance:** Class attendance is essential. Late work is not accepted, and class assignments and lab activities cannot be made up without prior consent of the instructors. The class is based on activities and discussions, which require full attention and participation.
- 2) **Lectures:** We will use Powerpoint as a lecturing tool throughout this course. All Powerpoint slides will be available on the course Blackboard site. **Please Note: Lecture slides are not a substitute for attending class and many important concepts will be only partially represented on slides. Also, lecture slides will be made available after class for that particular lecture. Students have often asked if we could make them available before class meets. The reason we don't provide these materials in advance is that we often change things---even right up to the last minute before class!**
- 3) **Academic Integrity:** please review the Academic Integrity Policy in the *UST Student Policy Book*. Cheating, fabrication, plagiarism, and aiding others in these violations are all forms of academic dishonesty. At minimum the penalty for a violation will be automatic failure of the assignment along with a letter notifying the dean of the offense. In order to avoid plagiarism, always use quotation marks when directly quoting someone else's work, attempt to use your own words (paraphrase) wherever possible, and always properly cite sources of information.
- 4) **Accommodations:** If you have a learning disability or other disability, contact the Enhancement Program (651-962-6315) and discuss your needs with the instructor **at the beginning of the term**. Every effort will be made to ensure that this course is a valuable learning experience for all participating students.
- 5) **Communication:** If you have something important to tell us (i.e. you'll be late, absent, etc.) send an email reminder. Telling your instructor after class and hoping we will remember is not a good option.
- 6) **Cell phones:** Show respect for the instructor and other students in the classroom, by turning off your phone during class time.

Tentative course schedule. This schedule is subject to change.

<i>Date</i>	<i>Lecture Topics</i>	<i>Lab Exercise</i>	<i>Reading</i> EC =Earth's Climate Past and Future DP = Dire Predictions
Feb 1, 3, 5	The Earth's climate system: forcings, responses, and feedbacks	Working with Climate Data in Excel *Knowledge Survey	EC: Chap. 1 DP: Introduction (pp 10- 15)
Feb 8,10,12	Moving heat around the planet: Atmosphere and Ocean Circulation	Does a Heat island exist in the Twin Cities?	Reading posted in Blackboard: (pp 2 -27) Heat island article (Blackboard)
Feb 15,17,19	Climate archives and age- dating the climate record <b>Quiz 1</b> <b>Film: <u>Mystery of the</u></b> <b><u>Megavolcano</u></b>	Stump the chumps: Relative and absolute age-dating	EC: Chap. 2 (pp. 17-31)
Feb 22,24,26	CO <sub>2</sub> and long-term climate change The Solid Earth: the Earth's interior and Plate Tectonics	Plate Boundaries *Knowledge Survey	EC: Chap 3 (pp. 43-56) and Chap 4 (pp. 60-66)
Mar 1,3,5	Plate tectonics and climate Greenhouse world <b>Mid-term Exam I, Mar. 3</b>	Minerals and igneous rocks	EC: Chap. 5 (pp. 81-92)
Mar 8, 10, 12	Catastrophic climate events: KT events and Snowball Earth	Sedimentary rocks and sedimentary structures	EC: Chap. 5 (92-95) Snowball Earth articles (Blackboard )
Mar 15,17,19	Icehouse and Oxygen isotopes The influence of changes in the Earth's orbit on climate  <b><u>Film: Cracking the Ice Age</u></b>	<b>Mineral and Rock quiz</b> and "Web mining" for data: Geochemical records of past climate change	EC: Chap. 6 (pp. 97-102) Chap. 7 (pp. 119-129) Chap. 9 (pp. 155-158)
Mar 22,24,26	The influence of changes in the Earth's orbit on climate <b>Quiz 2</b>	Northern Africa's paleolakes	EC: Chap. 8 (pp. 137- 146)
<b>SPRING BREAK --- March 29 – April 5</b>			
Apr 7, 9	The Last Glacial Maximum and Deglaciation <b><u>Film: Mystery of the</u></b> <b><u>Megafood</u></b>	Streams and glaciers: Minnehaha Falls trip *Knowledge Survey	EC: Chap. 12 (pp. 209-218) Chapter 13 (pp. 229- 240) Ice age module website
Apr 12, 14, 16	The Holocene world and historical climate events <b>Mid-term Exam 2, Apr. 12</b>	Web-mining 2: Holocene rapid climate change	EC: Chap. 16
Apr 19, 21, 23	Fossil fuels and the climate of the twentieth century	Lab synthesis project	IPCC Report (blackboard) DP: Part 1

Apr 26, 28, 30	Climate models The evidence for global climate change, climate contrarians and their arguments <b>Quiz 3</b>	Lab synthesis project	EC: Chap. 2 (pp. 31-36) DP: Part 1
May 3, 5, 7	Future climate trends, climate change in Minnesota	Emissions role-play preparation	IPCC report (blackboard) DP: Parts 2 and 3
May 10, 12, 14	Climate change policy and solutions	Emissions role-play exercise *Knowledge Survey	IPCC Report (blackboard) DP: Part s 4 and 5
FINAL EXAM WEEK			

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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 bring a signed copy of this slip to class