

**GLY 3074**  
**The Oceans and Global Climate Change**

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Office Hours: Tues 4:00 - 5:00 and Wed. 4:00 - 5:00, or by appointment

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Office Hours: (Wed. 1:00-2:00; Fri. 2:00-3:00)

**Lectures:** M,W,F, Period 4, 10:40-11:30, Rm 202 Williamson Hall

**Objectives:** The oceans store huge amounts of heat, moisture and carbon dioxide. As such, they profoundly influence climate and modulate natural and anthropogenic climate change. The goal of this course is for you to understand the role the oceans play in determining climate and regulating global climate change. We will start with an introduction to the climate system, then cover atmospheric and ocean circulation, the relationship between the oceans and the global carbon system, and finally discuss the long-term record of global climate preserved in the oceans and the current record of short term global change.

**By the end of the course you should understand** the basics of how the atmosphere and ocean circulate, the processes that drive climate change, the reservoirs and fluxes of carbon on earth, how to evaluate the evidence for modern climate change and predictions of future climate change, and how modern climate change compares to the long-term history of global climate change.

**Required Materials:**

Kump, Kasting and Crane, 3<sup>rd</sup> (or 2<sup>nd</sup>) edition, 2010, The Earth System, Pearson.

There is no perfect textbook for this course. The Kump, Kasting and Crane book covers a lot of the important material, but not all of it, and there are a number of chapters you will not be assigned. I've placed a number of books on reserve to try to cover topics that are not covered in detail in the textbook.

<b>Grading</b>	Assignments- incl. GW opinion*/ Stabilization Triangle	10%
	3 Exams (15% each) (Jan. 29, Feb. 24 and Mar. 30)	45%
	2 Lab exercises (5% each)	10%
	Position paper (due Mar. 21)*	10%
	Writing assignment (due Apr. 11)*	10%
	Presentation and abstract*	10%
	Presentation evaluations	5%

\* Denotes short writing assignments (~1 page each) to be handed in as **both** a hard copy and electronically.

*Assignments handed in late will only receive 50% of their original value.*

**Assignments:**

There will be a number of short take home and in-class assignments throughout the semester. These are designed to let you think about some of the concepts independently or to give you hands-on experience manipulating some of the data

**Position paper:** everyone will write a detailed response to a letter to the editor about climate change. We will then have a group discussion to share ideas about

whether it is important to convey information about climate change to the public and how to best accomplish that goal.

**Written Assignments:**

There are four writing assignments designated with \* above and listed below:

- 1) One short (~<1 page) assignment explaining your current views on the greenhouse effect and global warming.
- 2) A position paper written in response to a letter to the editor questioning climate change.
- 3) A final writing assignment near the end of the semester that is essentially a final essay question.
- 4) A one page abstract of your class presentation.

**Exams:** There are 3 one hour exams that will be administered during regular class times. Each exam will cover the material from the previous third of the course. Exams will consist of a mixture of short answer, fill-in-the-blank, and essay questions.

**Lab exercises:** Two days during the semester have been set aside for lab exercises. One exercise covers surface ocean circulation, the other covers deep ocean circulation. Both will require some computer work outside of class.

**Presentations:** Each student will give a short (10 min) presentation to the class on a topic related to oceans and global climate change. The idea is to give you an opportunity to delve into some topic in more detail, put together a Powerpoint presentation, write up a 1 page abstract, and present your findings to the class.

**Evaluations:** A portion of your course grade will be based on your contribution to evaluating class presentations.

**Webpage:** There is an e-learning (canvas) website for the course that you should be able to access. Contact me if you have any trouble. The site includes copies of the PowerPoint presentations from lectures, announcements about assignments and activities, study guides for exams, and grade information.

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**Schedule- Spring 2016**

Week	Date	Topic	Assignments Due	Reading
1	Jan. 6	Introduction		
	Jan. 8	Climate		Ch.1: 1-3 (1-3)
2	Jan. 11	Climate System		Ch. 2: 21-26, skim 26-33 (1-3, 18-23, skim 23-31)
	Jan. 13	Earth's Energy Balance	Systems	Ch. 3 (Ch. 3)
	Jan. 15	Earth's Energy Balance	GW Opinion	
3	Jan. 18	MLK Day- no class		

	Jan. 20	Forcing	Black Body Problem	Ch.1: 3-19 (3-15)
	Jan. 22	Atmospheric Circ		Ch. 4 (Ch. 4)
4	Jan. 25	Atmospheric Circ	Atm Circ Problem	
	Jan. 27	Atmospheric Circ and presentation topics		
	Jan. 29	EXAM 1		
5	Feb. 1	Surface Circ Lab	Pre lab	Ch.5: 84-95(Ch. 5)
	Feb. 3	Surface Ocean Circ	Presentation topic	
	Feb. 5	Surface Ocean Circ	Surface lab	
6	Feb. 8	Surface/Deep Circ	Follow up	
	Feb. 10	Deep Ocean Circ		Ch. 5: 96-106
	Feb. 12	Deep Ocean Circ	References for topic	
7	Feb. 15	Deep Ocean Circ Lab		
	Feb. 17	ENSO		Ch. 5: 92-96 (Ch.15: 306-312)
	Feb. 19	ENSO/Oceanic Productivity	Deep water lab	Ch.8: 154-159 (153-158)
8	Feb. 22	Oceanic Productivity		
	Feb. 24	EXAM 2		
	Feb. 26	Global Carbon Cycle	Presentation Sign up	Ch. 8 (Ch. 8)

9	F27-M5	Spring Break!!		
10	Mar. 7	Global Carbon Cycle		Ch.7: 130-146 (126-145) plate tectonics rev
	Mar. 9	Carbon Cycle	CO2 uptake	
	Mar. 11	Global Change		Ch. 15 (Ch. 15 and 16)
11	Mar. 14	Global Change		Ch. 16 (Ch. 6)
	Mar. 16	Global Change	Carbon calculator	Global Change
	Mar. 18	Global Change		Global Change
12	Mar. 21	Discussion on Global Warming	Position paper	Ch.12: 240-253 (236-249)
	Mar. 23	Records of Climate		Ch. 14 (Ch. 14)
	Mar. 25	Paleoclimate		
13	Mar. 28	Paleoclimate		
	Mar. 30	EXAM 3		
	Apr. 1	Presentations		
14	Apr. 4	Stabilization Triangle	You need to be in class both days	
	Apr. 6	Stabilization Triangle	Group presentation and write-up	
	Apr. 8	Presentations		
15	Apr. 11	Presentations	Final paper	
	Apr. 13	Presentations		
	Apr. 15	Presentations		
16	Apr. 18	Presentations		
	Apr. 20	Presentations		
	Apr 28	Scheduled time for final	12:30-2:30	

There is no final for this course during finals week, I have listed that time in case we need more time to get through all of the presentations. We can talk about this and finalize plans early in the semester.

Readings from Kump, Kasting and Crane, 3<sup>rd</sup> edition (2<sup>nd</sup> edition in parentheses)