

# OCN 310, ATMO 310: Global Environmental Change

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Marine Science Building 100  
Sample Syllabus

## Instructors:

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## Course Description

Global Environmental Change has become one of the most pressing issues of our time. The increase in human population, estimated to have reached seven and a half billion in 2017, and the consumption of natural resources to feed, house, clothe, and provide energy for this growing world population have placed enormous stress on the natural systems that support us. How did humanity arrive at this crisis? How are we feeding nearly eight billion humans? Have we exceeded the carrying capacity of our planet? The answers to these questions are inevitably linked to our use of energy to power our civilization, and particularly to its source. We will explore both the practical and the ethical considerations of the use of energy and other resources, both renewable and non-renewable, and their implications for sustainability.

Global Environmental Change involves both the physiochemical and biological nature of change and the effects and consequences of natural and human-induced change for ecosystems, humans, and human infrastructure. Earth's ecosphere or exogenic system—the Earth surface system of land, water, biota, air, ice, and sediments—has always been in a dynamic state of change from a variety of causes. We will explore the natural causes of environmental change over geologic time to provide a context for the human-induced change we are presently experiencing. We will consider the geochemical cycles of C, O, N, and P, which are key to sustainability and climate change. We will investigate the present consequences of change, along with a variety of feedback mechanisms, both chemical and physical, which operate on a wide range of time scales in determining the course of Earth's physiochemical environment.

## Focus on Contemporary Ethical Issues (E-Focus Designation)

This course has a Contemporary Ethical Issues (E) Focus designation. Contemporary ethical issues are fully integrated into the main course material and will constitute at least 30% of the content. At least 8 hours of class time will be spent discussing ethical issues. Through the use of lectures, discussions, and assignments, students will develop basic competency in recognizing and analyzing ethical issues;

responsibly deliberating on ethical issues; and making ethically determined judgments.

### Evaluation

The course will consist of lectures, six homework assignments, three discussion sessions, two midterms and a final exam, and an optional 5-min. student presentation. Homework assignments must be submitted in class on the due date to receive full credit. Assignments turned in one class session after the due date will receive an automatic 20% reduction. No assignments overdue by more than one class session will be accepted unless prior arrangements have been made. The three class discussion sessions will be conducted during class time (see schedule). The class will be separated into smaller groups and each group will discuss assigned readings and the related ethical issues. Students may be asked to write a one- to two-page summary of the readings to be used as a basis for group discussion. This write-up, along with participation in the group sessions, will count toward the final grade. Grades will be assigned approximately as

- 60% for three exams (20% each)
- 20% for six homework assignments
- 20% for class attendance and participation in discussions
- 5% extra credit for those who make a 5-min. oral presentation to the class, chosen from a list of topics and dates shown on the Schedule.

### Adherence to Student Conduct Code

Students are reminded to adhere to the rules set forth in the [Student Conduct Code](#), and not engage in cheating, plagiarism, or other forms of academic dishonesty. Those found to violate the rules will receive a failing grade and be reported to the Office of Judicial Affairs.

### Required Materials for the Course

- Textbook: *Fixing Climate: What Past Climate Changes Reveal about the Current Threat—and How to Counter It* by Wallace S. Broecker and Robert Kunzig (2008). Hill and Wang, a Division of Farrar, Straus, and Giroux. ISBN-13: 978-0-8090-4502-0. (There will at least one question from this book on each exam.)
- Supplemental readings will be provided, including those relevant to the Ethics Focus Designation.
- iClicker for in-class participation credit. PLEASE REFER TO iCLICKER REGISTRATION INSTRUCTIONS FOR MORE DETAILS.

### Student Learning Outcomes

Upon completion of OCN 310 a student should be able to:

- Identify and summarize human impacts on the global environment.
- Use simple calculations to understand and illustrate the dynamics of global carbon, nitrogen, and oxygen cycles.
- Evaluate and use scientific data to explain sources of environmental variability and climate change over a wide range of time scales.

- Critically evaluate and discuss current media coverage of climate change.
- Evaluate the ethical issues pertaining to global change.

### **Student Learning: Title IX, Sexual Discrimination or Harassment**

*The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:*

***As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator.*** Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

*If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, contact the Title IX office directly (Hawai'i Hall 124, 2500 Campus Road (808) 956-2299) or use the **confidential resources available here:***

<http://www.manoa.hawaii.edu/titleix/resources.html#confidential>

*If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator [\(808\) 956-2299](tel:8089562299) [t9uhm@hawaii.edu](mailto:t9uhm@hawaii.edu)*

## Class schedule (subject to change)

Class	Date	Topic	Lecturer
1	Aug 26 (M)	Organization and introduction	CLS
2	Aug 28 (W)	Human population and energy	CLS
3	Aug 30 (F)	Energy, food and climate change	CLS
--	Sep 02 (M)	<b>HOLIDAY</b>	
4	Sep 04 (W)	Fossil fuel chemistry and energy terms	CLS
5	Sep 06 (F)	ERoEI, oil and gas formation	CLS
6	Sep 09 (M)	The greenhouse effect	CLS
7	Sep 11 (W)	CO <sub>2</sub> and other greenhouse gases	CLS
8	Sep 13 (F)	<i>Discussion 1</i>	both
9	Sep 16 (M)	The carbon cycle	CLS
10	Sep 18 (W)	The CHNOPS elements: essential for life	CLS
11	Sep 20 (F)	Introduction to the biosphere	CLS
12	Sep 23 (M)	Forests, soils, acid rain, ocean acidification	CLS
13	Sep 25 (W)	Impacts to ecosystems: coral reefs (Great Barrier Reef)	JTP
14	Sep 27 (F)	Impacts to ecosystems: fisheries	JTP
15	Sep 30 (M)	<b>EXAM 1</b>	
16	Oct 02 (W)	Early Earth and climate	JTP
17	Oct 04 (F)	Earth system dynamics: solar radiation and energy balance	JTP
18	Oct 07 (M)	Variations in solar forcing and orbital dynamics	JTP
19	Oct 09 (W)	Stratospheric ozone	JTP
20	Oct 11 (F)	Atmospheric circulation	JTP
21	Oct 14 (M)	Oceanic circulation	JTP
22	Oct 16 (W)	Natural climate variability (ENSO)	JTP
23	Oct 18 (F)	Lower frequency oscillations	JTP
24	Oct 21 (M)	<i>Discussion 2</i>	
25	Oct 23 (W)	Climate in the Phanerozoic	JTP
26	Oct 25 (F)	Plate tectonics and sea level	JTP
27	Oct 28 (M)	Milankovitch cycles	JTP
28	Oct 30 (W)	Ice cores	JTP
29	Nov 01 (F)	Pleistocene and Holocene	JTP
30	Nov 04 (M)	<b>EXAM 2</b>	
31	Nov 06 (W)	The global warming "controversy"	CLS
32	Nov 08 (F)	IPCC	CLS
--	Nov 11 (M)	<b>HOLIDAY</b>	
33	Nov 13 (W)	Numerical modeling	JTP
34	Nov 15 (F)	IPCC and climate models	JTP
35	Nov 18 (M)	Climate sensitivity, forcings, and feedbacks	JTP
36	Nov 20 (W)	Representative Concentration Pathways	CLS
37	Nov 22 (F)	Climate change: possible non-linearities	CLS
38	Nov 25 (M)	<i>Discussion 3</i>	
39	Nov 27 (W)	Climate change: sea level rise	CLS
--	Nov 29 (F)	<b>Non-Instructional Day</b>	
40	Dec 02 (M)	Peak oil	CLS
41	Dec 04 (W)	Oil, tar sands, and coal	CLS
42	Dec 06 (F)	Coal and nuclear energy	CLS
43	Dec 09 (M)	Renewable energy	CLS
44	Dec 11 (W)	Energy in Hawaii	CLS
	Dec ?? (M)	<b>FINAL EXAM 9:45-11:45</b>	