MET 5105, CLIMATE PROCESSES AND IMPACTS (U01/14010)

FLORIDA INTERNATIONAL UNIVERSITY

Spring 2018

Instructor: Dr. Hugh Willoughby, Office: AHC-5, 363. Phone: 305-348-0243. Email: hugh.willoughby@fiu.edu.

Time and location: MWF, 2:00-2:50AM, AHC5-357

Office Hours: MW 10:00-11:00 AM, TU2:00-3:00 PM, or by appointment.

Prerequisites: Graduate standing.

Text: Bloom, Arnold, J., 2010: ***Global Climate Change*.** Sinauer Assoc. Inc., Sunderland, MA, USA, 398 pp., IBSN 978-0-87893-027-2 (pbk.) Supplementary class notes. You can reach an on-line version of this syllabus at:

http://faculty.fiu.edu/~willough/met_3103_5105/0_Syllabus_G.pdf

And a file with links to the course notes at:

http://faculty.fiu.edu/~willough /met__3103_5105/0_LINKS.html

Course description:

MET 5105 is a broadly interdisciplinary examination of climate change for graduate-level non-Atmospheric-Sciences majors. Although by design it is not highly quantitative, it does address the essential chemistry and physics of Earth Systems Science as applied to climate change.

Course Goals and Objectives:

MET 5105 is intended to build upon the interdisciplinary strengths of the Department of Earth and Environment. Climate change may become the greatest challenge that humanity has faced. In addition to your learning the factual content, I hope and expect that you will develop sharper skills in critical thinking, quantitative reasoning, and rigorous analysis. These are the tools that will enable us, as a species, to survive this challenge and to prosper. Broadly defined topics include:

- History of the Earth's (and to some extent other terrestrial planets') climates
- Causes of climate change with emphasis of external and internal forcing and feedbacks
- Numerical climate simulation, including the philosophy and limitations of the modeling enterprise
- Biology of increased atmospheric CO_2
- Climate-change mitigation strategies in transportation, power generation, and elsewhere
- Economics of climate change
- Human response to climate change

Course organization and philosophy: I hope and expect that you are self-selected for motivation and interest in the atmosphere. The lectures are important. Please, **no cell phones, texting, web surfing, or off-line conversations during class.** This is a reasonably demanding course, but the class is small enough for substantial interaction and individual attention. Make a genuine effort, and you should do well.

The basis of MET 5105 is Bloom's outstanding text. I chose it because it is interdisciplinary. Some of the topics are outside my expertise, but I'm a quick study. My intention is to add material in the notes that goes beyond the text in first four chapters. Among the key objectives of MET 5994 is critical thinking. Why do specific pieces of evidence convince us, or not? I expect that we will discuss issues where honorable men and women may differ in their conclusions.

I see atmospheric science as a descriptive natural science that often speaks the language of physics and mathematics to describe phenomena that can have huge human and economic impacts and ad beauty and meaning to our lives. We will use some basic mathematical ideas here, but we will be selective and focus on essential concepts. Attending the lectures, doing the reading, participating in discussion, and taking careful notes will be keys to success.

One-Page Essays	40%
Midterm Exam	25%
Final Exam	30%
Participation	5%
Total	100%

Writing will be an essential part of this course. We will write two "Churchillian" single-page essays and a term paper on climate change issues. The term paper will be a significant part of your effort and grade. You should select your topic carefully. We will schedule a graduate recitation section to meet outside of regular class and discuss advanced topics and to provide the more nuanced understanding needed to write an outstanding paper. Grading will be determined by the quality of your writing and the strength of your arguments. I will use Turnitin to ensure originality. A focused effort and understanding of the material should be enough to do well.

Grading Scale	
100-90	A
89-80	B
79-70	C
69-60	D
below 60	F

There will be a midterm exam and a final. Format of the exams will be multiple choice, short (1-2 paragraph) essay, draw and label a sketch. Essays and exams will contribute to grades as indicated in the table above on the left, and I plan to use a standard 90-80… scale, as shown to the right, for assigning letter grades.

A word about intellectual dishonesty, which I define as claiming someone else's work or ideas as your own. I won't tolerate it, and it is a certain way to have a bad outcome in MET 4993. Everyone is trustworthy unless proven otherwise. You are to have no hats, hoodies, dark glasses or cell phones available during exams.

Objectives and Learning Outcomes; Students will:

- Understand the causes of climate change, their mechanisms and timescales, including the roles of positive and negative feedbacks.
- Understand the impacts of climate change on human and natural systems
- Understand the efficacy, costs, and benefits of mitigation measures
- Learn to think critically about climate change and to express their ideas clearly and concisely.

MET 5105 TOPICS AND ASSIGNMENTS

Week	Date	Topic	Reading
1	8-12 JAN	Introduction, Essay #1	Ch. 1
2.1	15 JAN	**MLK Day, No Class**	
2.2-3.2	17-24 JAN	History of Earth's Climate	Ch. 2
3.3-4	29 JAN-2FEB	Causes of Climate	Ch. 3
5	5-9FEB	Climate Models, Begin Term Paper	Ch. 4
6-7.1	12-19FEB	Biological Impacts of More CO_2	Ch. 5
7.2-7.3	21-23FEB	**Midterm Review & Exam**	Ch. 1-6
8	26FEB-2MAR	Biosphere Impacts,	Ch. 6
9	5-9MAR	Mitigation Strategies for Transport	Ch. 7
	13-16MAR	**Spring Break, No Class**	
10	19-23 MAR	Mitigation Strategies for Electric Generation	Ch. 8
11	26-30 MAR	Mitigation in Other Sectors, Essay #2G Term paper due.	Ch. 9
12.1-12.2	2-4 APR	Economics of Climate Change	Ch. 10
12.3-13.2	6-11 APR	Law & Human Response, . Essay #3G	Chs. 11 &12
13.3	13 APR	Summary & Review	Cumulative
	16-20 APR	**HEW at AMS Hurricane Conference. No Class**	
	TBA	Final Exam	Cumulative

Written Assignments

	Topic	Due
Essay 1G	Global warming is: a) real and b) caused by humans: Yes or no; why or why not?	Week 2
Term Paper	Select a key climate-change topic for an approximately 10-page critical analysis. Due Week 11	Week 9
Essay 2G	Global Minister of the Environment	Week 12
Essay 3G	Offer convincing counter arguments to those in Essay 1G	Week 13