Cover Sheet: Request 11162

IUF2100 Climate Change Science and Solutions

Info

Process	Course|New/Close/Modify|Ugrad|Gen Ed
Status	Pending
Submitter	Zimmerman,Andrew R azimmer@ufl.edu
Created	9/29/2016 1:26:58 PM
Updated	10/10/2016 1:24:49 PM
Description of request	Add N (International) designation to the currently-approved general education designations for this course.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CLAS - Geological Sciences 011610000	Foster, David A		9/29/2016
Added CCSS_FA16_syllabus_IUF2100_gen ed N.doc					9/29/2016
College	Approved	CLAS - College of Liberal Arts and Sciences	Pharies, David A		10/10/2016
No document changes					
General Education Committee	Pending	PV - General Education Committee (GEC)			10/10/2016
No document changes					
Office of the Registrar					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|Gen_Ed|New-Close-Modify for request 11162

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Form version: 1

Responses

Course Prefix and Number IUF2100
Course Title Climate Change Science and Solutions
Delivery Method Hybrid
Request Type Change GE/WR designation (selecting this option will open additional form fields below)
Effective Term Earliest Available
Effective Year Earliest Available
Credit Hours 3
Prerequisitesnone
Current GE Classification(s)P
Current Writing Requirement Classification None
One-semester Approval?No
Requested GE ClassificationN
Requested Writing Requirement Classification None

SYLLABUS: CLIMATE CHANGE SCIENCE AND SOLUTIONS
Fall 2016 IUF2100/IDH3931

Lead Instructor: Dr Andrew Zimmerman, Department of Geological Sciences
Office: 364 Williamson Hall Ph# 392-0070 email: azimmer@ufl.edu Office meeting: by appointment

Wednesday 7-8 period (1:55-3:50 am), IUF2100 Sec 197A & IDH3931 sec2B53, Meeting: Weimer 1084
Section Instructor (Grad. TA): Carrie Schuman, carrie.schuman@ufl.edu , Interdisciplinary Ecology, Office: 136B Williamson Hall. Office meeting: by appointment

Thursday 3rd-4th period (9:35-11:30 am), IUF2100 Sec 1988, Meeting: Matherly 14
Section Instructor (Grad. TA): Carla Alonso-Contes, caalonso@ufl.edu, Soil and Water Science Department, Office: 3191 McCarty A. Office meeting: by appointment

COURSE DESCRIPTION

This course invites students to deepen their understanding of the practice of science by examining the complex issue of climate change. Working collaboratively and using the scientific method, we will explore the multi-disciplinary evidence behind climate change and its effects and develop potential novel adaptation and mitigation solutions and to communicate this work effectively.

Prerequisites: none **Credits:** 3 **Course Fee:** none **Gen. Ed. Fulfillment:** P

Course Objectives

This physical science general education course will cover concepts of climate change and science in our modern and global society. It is the aim of this course that by the end, students will be able to:

- Understand the basic facts and uncertainties regarding climate change and the role of humans in causing it.
- Understand how climate change affects natural and human systems and how its effects vary among nations and with socioeconomic factors and cultures worldwide.
- Apply the process of critical thinking and scientific inquiry in discovering, understanding, and addressing the challenges of climate change.
- Develop and evaluate hypothesis-driven solutions to address climate change through critical thinking and teamwork.
- Effectively communicate multi-disciplinary scientific challenges and strategies for addressing them.

Course Structure

The course will require both on-line and in-class participation. Each week, students will cover online content on their own time (about 2 hours total) that will include:

1) Completion of a 'Spark' Discussion (See due date in 'Weekly CCSS Due Dates' at end of syllabus)
2) Readings and on-line lectures
3) A quiz on the on-line materials (See due date in 'Weekly CCSS Due Dates' at end of syllabus)

Each week, in class, students will:

1) Take a team readiness assurance-test (t-RAT) and review on-line material
2) Complete an In-Class Activity that reinforces the 'Fundamental Science Topic' & 'Framework Topic'. This is usually a group activity that will be turned in (via Canvas, one per group) by the end of the class meeting day.

In addition, students will work on a semester-long group project, both in and outside of class, which will, via hypothesis testing and quantitative analysis, develop a novel approach to addressing one a climate change-related problem. Students are required to bring a laptop or other web-enabled device (though use of a smart phone is not advised). Students are also required to participate in a midterm exam one evening of the semester.

COURSE WEBSITE and COMMUNICATION

Course Website

The course will run via **Canvas** (UF https://ufl.instructure.com/). The course site will be used to post relevant announcements, reading, lecture materials, links, assignments and quizzes, etc. You are responsible for checking this site for updates, announcements and to verify that your grades are recorded correctly. No grade will be changed more than one week following the due date for the assignment. It is recommended that students adjust Canvas settings so that Announcements are sent to phone or email. All communication with instructors should use the mail tool within this site.

Questions in regards to grades etc (e.g. medical emergency, legal, documented disability accommodation, etc.) should be sent to the TA who will forward these to the faculty instructor as necessary.

Required Textbook

Dire Predictions: Understanding Global Warming, by Mann and Kump, 2015, Pearson, 2nd edition ($16 new on Amazon, Kindle or at the UF bookstore for about $39). In addition, there will be numerous selected readings posted or linked through the course website weekly.

ASSESSMENTS AND GRADING

Final Grade Calculation

15%	Homework (individual):		
	3%	12 'Spark' Discussions (2 lowest dropped)	[0.3% = 3 pts each, 30 tot.]
	12%	12 Quizzes (2 lowest dropped)	[1.2% = 12 pts each, 120 tot.]
10%	In-class Quiz (group t-RAT), 12 quizzes, 2 lowest dropped		[1% = 10 pts each, 100 tot.]
25%	In-class Activities (group) 12 assignments, 2 lowest dropped		[2.5% = 25 pts each, 250 tot.]
5%	In-class Attendance (+homework, individual)		[50 pts. total]
30%	Final Project (group)		
		Initial Proposal (group assessment)	[3% = 30 pts]
		Hypothesis/Source (group assessment)	[3% = 30 pts]
		Quant. Method (group assessment)	[5% = 50 pts]
		Final Presentation (group assessment)	[8% = 80 pts]
		Final Paper (group assessment)	[8% = 80 pts]
		Effort (individual/team assessment)	[3% = 30 pts]
15%	Mid-term Exam* (Curved to a median of 85%, No Final Exam)		[15% = 150 pts]

Final Grade Scale

A = ≥93%, A- = 90-92.99, B+ = 87-89.99, B = 83-86.99, B- = 80-82.99, C+ = 77-79.99, C = 73-76.99, C- = 70-72.99, D+ = 67-69.99, D = 63-66.99, D- = 60-62.99, E < 60

***Note:** The midterm exam scores will be curved to a median of 85% using a linear method described here: http://www.ats.amherst.edu/software/excel/excel-grading/excel-grades/#CurvingGrades

***Note:** A minimum grade of C is required for general education credit.

Discussions

Students have 2-3 days from the end of class (See due date in 'Weekly CCSS Due Dates' at end of syllabus) to complete the on-line 'Spark' Discussion. Each student must make one substantive original comment and one

substantive response to the comment of another student. That is, students must read what has been said before and add something more than a few words of agreement or disagreement. No credit will be given for late submissions.

Quizzes and Exams

Each week students must complete a time-limited (30 min.) quiz on Canvas by midnight of the day before class consisting of 12 multiple choice questions (open book) on all lecture and reading materials presented on-line that week. These quizzes cannot be made up or taken late if missed except in the case of an excused absence. (At 11:59 pm, the quiz will lock students out and unanswered questions will be marked wrong. So start by 11:30 p.m.)

At the start of class each meeting day, students will take a team-Readiness Assurance Test (tRAT) consisting of 3 - 8 multiple-choice questions based on the on-line material of that week. Some of these questions may have appeared in the Canvas Quiz of that week. Team answers will be recorded on scratch-off cards that will be provided (if the team does not uncover a correct answer, they continue to discuss the question and sequentially select other choices, but receiving progressively lower scores: 1/2 for 2 scratchs, ¼ for 3 scratchs). All team members present will receive the same score. These quizzes cannot be made up or taken late if missed except for because of an excused absence. Individuals (for quiz questions) or teams (for t-RAT questions) can submit a written appeal to their instructor for questions they feel may have a valid alternate answer.

The Midterm Exam will be given on campus in the evening of Monday Oct. 3 (7:20-9:10 pm), closed book. Students must bring a laptop to take the exam which will consist of about 50 multiple choice questions (some taken from quizzes, some new). Everything associated with the class up to the point of the exam (Weeks 1-6), including on-line material and in-class discussion/exercises, is fair game on the mid-term exam. If there is an issue with attending the exam at this time, it should be discussed with the TA at least one week prior to the date.

In-Class Activities

At each class meeting, there will be a team assignment (answer to questions, spreadsheet calculation, etc.) to be completed and turned in, usually via Canvas (Assignment Tab) by the evening of the day of class (11:59 pm). Exceptions may be granted by special arrangement with the TA. These assignments will not be accepted after 1 week following the class. Full credit will be awarded as follows:

- 4 points – Assignment was submitted by the due date (2 points if submitted within 1 day of due date)
- 7 points – Demonstrates complete competence in the terminology, concepts, methodologies and theories used within the subject area.
- 7 points – Critical Thinking: Carefully, logically, and fully analyzes information from multiple perspectives and develops reasoned solutions to problems within the subject area.
- 7 points – Communication: Clearly and effectively communicates knowledge, ideas, and reasoning in forms appropriate to the subject area.

Attendance

Worth 5% of your grade, attendance will be managed by the Canvas system. Also, 30% of the score for a day will be deducted for lateness. Let your TA know about any excused absence/lateness and the Canvas score can be corrected. No corrections will be made more than 1 week after the absence/lateness event.

Semester Project

Students, in groups of 3-4, will be asked to work as a team to create and quantitatively evaluate either a strategy to mitigate or adapt to climate change. The strategies will range widely, e.g., from a solar-powered bicycle to a change in international law. But we encourage student groups to consider a local or regional problem and solution. Each group will also quantitatively evaluate the cost and/or potential impacts that would result from the adoption of their strategy. Each group will start with a hypothesis, then work to test the hypothesis and quantitatively evaluate the efficacy of the strategy by weighing the calculated costs against the potential benefits that would result from the adoption of their strategy (climate, human health, economic, etc.) or by comparing the

action to a different course of action. During the course of the semester, both lectures and sub-assignments will build students' skills and the knowledge base needed for this kind of problem solving. At the end, both an oral and a written presentation will be due. More details can be found on the course website.

Extra Credit/Field Trip

We will visit the Solar Park just south of campus (Solar Decathlon House, Solar array, Bioenergy Lab) on the afternoon of Friday Oct. 7 (likely). Those attending the field trip will receive 2.5% extra credit added to final grade tally. HOWEVER, if you commit to going but do not show up, I will deduct 0.5% from your final grade. Transportation will be provided.

The only other extra credit opportunity will be a survey about your views of science and climate change. If you complete BOTH an initial and final survey, you will receive a 1% addition to your final grade. You will receive announcements about this via e-mail (first and last week of the course).

COURSE AND UNIVERSITY POLICIES

Absence/Late Assignments

Students are expected to complete all requirements (quizzes, exams, presentation) on the specified dates and will not be granted an alternate date unless they have an acceptable reason for their absence (e.g., due to medical emergency, observance of religious holidays, military obligation, etc.) and pre-arranged consent of the instructor. These requests must be timely and accompanied by all necessary written documentation. This policy is accordance with UF's attendance policies, which can be reviewed further at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx. Quizzes and assignments completed late will suffer a loss of points spelled out in each section above (generally half off). No assignment can be turned in more than 1 week after its due date without instructor consent. Discussions cannot be completed late.

Grade Appeals

Students or student groups who feel that their quiz, discussion, in-class activity or semester project was graded unfairly or incorrectly should make an appointment with their TA to discuss the issue. If students are still dissatisfied with the resulting explanation or action, they should then make an appointment with the lead instructor to discuss the issue.

Classroom policy

Students are required to bring to each class meeting a laptop or similar device for use in taking notes, summarizing in-class activities, and accessing the Internet. However, use of mobile devices and computers during class for purposes other than viewing readings or conducting sanctioned research/communications is not allowed. Students who receive or make calls or text messages or engage in other disruptive behavior during class will be asked to leave will not be allowed to turn in the assignment due on that day.

Academic Honesty Policy

Students must conform to UF's academic honesty policy regarding plagiarism and other forms of cheating. This means that on all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The university specifically prohibits cheating, plagiarism, misrepresentation, bribery, conspiracy, and fabrication. For more information about the definition of these terms and other aspects of the Honesty Guidelines, see http://www.dso.ufl.edu/sccr/process/student---conduct---honor---code/. All students found to have cheated, plagiarized, or otherwise violated the Honor Code in any assignment for this course will be prosecuted to the full extent of the university honor policy, including judicial action and the sanctions listed in paragraph XI of the Student Conduct Code. For serious violations, you will fail this course.

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Such violations are also against University policies so disciplinary action may be taken.

Accommodations for Students with Disabilities
Please do not hesitate to ask for accommodation for a documented disability. Students requesting classroom accommodation must first register with the Dean of Students Office (http://www.dso.ufl.edu/drp/). The Dean of Students Office will provide documentation to the student, who must then provide this documentation to the Instructor when requesting accommodation. Please ask the instructor if you would like any assistance in this process. Please provide this information to your TA within the first two weeks of the semester.

Instructor Evaluation
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open.

Drop/Add/Withdrawal
A student can drop/add during the drop add period with no penalty. After drop/add, a student who drops will receive a W until the date listed in the academic calendar. After that date, the student may be assigned an "E" (fail). Note: it is the responsibility of the STUDENT to withdraw from a course, not the instructor. Failure to participate/complete the class is NOT a drop.

Additional Resources
Students facing difficulties completing the course or who are in need of counseling or urgent help may contact the Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc/Default.aspx, 392-1575; or the University Police Department: 392-1111 or 9-1-1 for emergencies.
Other Resources available on-campus for students include:

a. Student Mental Health, Student Health Care Center, 392-1171, personal counseling;
b. Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual counseling;
c. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

FOR WED CLASS: Weekly CCSS Due Dates* **Sec 197A & IDH3931 sec2B53**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Finish module **Quiz due 11:59 pm**	**Class 1:55 pm** **ICA due 11:59 pm**		**Spark Discussion due 11:59 pm**	

FOR THURS CLASS: Weekly CCSS Due Dates* **IUF2100 Sec 1988**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Spark due 11:59 pm			Finish module **Quiz due 11:59 pm**	**Class 9:35 am** **ICA due 11:59 pm**		

Fall 2016 COURSE SCHEDULE

Week Of:	Week #		Fundamental Science Topic	Framework Topic	Other Activities	Reading in 2nd Ed. *Dire Predictions* pgs.
21-Aug	1	Introduction to climate and CC	Disciplines of climate change	Interdisciplinary Science		
28-Aug	2		Climate Drivers	Scientific Method		6-29
4-Sep	3		Climate History	How Science is Done		30-51
11-Sep	4		Evidence for Anthro. CC	Uncertainty/Consensus		30-51
18-Sep	5		CC and the Weather	Research and Big Data	Intro. Semester Project (2nd hr)	52-67 & 112-115 & 132-135
25-Sep	6		CC Projections	Models	Sem. Project Initial Proposals	68-117
2-Oct	7	Problems and Solutions	Ecological Impacts of CC	Team Science	Midterm Exam – Oct. 3 (7:20 pm)	124-131 & 188-189
9-Oct	8		Population/Consumption	Ethics /Sustainability	Field trip – Oct 7	136-149 & 206-207
16-Oct	9		Agriculture/ Land Use	Communicating Science	Sem. Project Hypothesis/Sources	150-163 & 184-187
23-Oct	10		Energy	From Lab to the Real		164-177
30-Oct	11		Built Environment	Effecting Change	Sem. Project Quant. Method Presentation	178-199
6-Nov	12	CC Policy	Environmental Policy	Science in Action		200-213
13-Nov	13		Sea Level Rise	Science in the Public Realm		36-37 & 110-111 & 122-123 & 158-159
20-Nov	x		- No Class – Thanksgiving Week -			
27-Nov	14		- Semester Project Presentations During Class -			
4-Dec	15		- Semester Project Paper & Individual Assessment Due Dec 9 -			

COURSE READINGS – Bibliography - Sorted by Type

Selected Examples of assigned readings (in addition to almost all of the 212 page textbook):

Peer Reviewed Research

Fudge, D., 2014. Fifty years of J. R. Platt's strong inference. The Journal of Experimental Biology, 217: 1202-1204 doi:10.1242/jeb.104976.

Monnin et al., 2010. Atmospheric CO2 Concentrations over the Last Glacial Termination. Science. 291: 112-114. DOI: 10.1126/science.291.5501.112.

Hites, R.A. How To Give a Scientific Talk, Present a Poster, and Write a Research Paper or Proposal, Environ. Sci. Technol. 2014, 48, 9960−9964. dx.doi.org/10.1021/es503552t.

Teigen, K.H., 2014. When very likely is not so likely. NATURE CLIMATE CHANGE , v.4

Doran and Zimmerman, 2009. Examining the Scientific Consensus on Climate Change, Eos, VOLUME 90 NUMBER 3. DOI: 10.1029/2009EO030002.

Curry, JA and PJ Webster, 2013. Climate change: no consensus on consensus. CAB Reviews, v8.

Kitchn., R., Big Data, new epistemologies and paradigm shifts. Big Data & Society 2014 1. DOI: 10.1177/2053951714528481.

Retchless, D., Frey, N., Wang, C., Hung, L., Yarnal, B. 2014. Climate extremes in the United States: recent research by physical geographers. *Physical Geography*, 35:1, 3-21.

Davidson, E.A. et al., 2012. The Amazon basin in transition. Nature 481, 321-328. doi:10.1038/nature10717.

Costanza et al., 1997. The value of the world's ecosystem services and natural capital. *Nature* 387:253-260.

Gardiner, S. M. & Hartzell-Nichols, L., 2012. Ethics and Global Climate Change. Nature Education Knowledge 3(10):5.

Kelly, T. (2001). Chapter 4 "The Perfect Brainstorm" in The art of innovation: Lessons in creativity from IDEO, America's leading design firm. New York: Doubleday.

Rockstrom et al., 2009. A safe operating space for humanity. Nature 461: 472-475

Mejean et al., 2015. Equity, burden sharing and development pathways: reframing international climate negotiations. Int Environ Agreements, 15:387–402

Bertaud, A. and Richardson, H.W. (2004), "Transit and density: Atlanta, the United States and Western Europe", in Bae, C. and Richardson, H.W. (Eds), Urban Sprawl in Western Europe and the United States, Ashgate, Aldershot, pp. 293-310.

The Popular Press

The Real Scientific Consensus on Climate Change http://www.foxbusiness.com/business-leaders/2014/06/05/real-scientific-consensus-on-climate-change/

The Seven Warning Signs of Bogus Science http://www.quackwatch.com/01QuackeryRelatedTopics/signs.html

NOVA science-Now video on Tropical Ice Cores Measure Climate, http://www.pbslearningmedia.org/asset/clim10_vid_icecores/

Climate change is an uncertain science by John Howard. *The Telegraph*. 09 Nov 2013.

Broome, J., 2008. The Ethics of Climate Change. *Scientific American* , **298**, 96-102.

Government Agencies

Climate Change 2007: Working Group I: The Physical Science Basis, Chapter 1: Historical Overview of CC, http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch1.html

IPPCC Fifth Assessment Report (AR5) Home page. http://www.ipcc.ch/index.htm

Climate Change 2013, The Physical Science Basis, Summary for Policymakers, A report of Working Group I of the IPCC (selected portions; p 4-25, 36-41 and 114-115). http://www.ipcc.ch/report/ar5/wg1/

IPCC Special Report s, CHpater 5, Emissions Scenarios (SRES). http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=0

IPCC Special Report: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) Chapter 3: Changes in Climate Extremes and their Impacts on the Natural Physical Environment http://ipcc-wg2.gov/SREX/images/uploads/SREX-Chap3_FINAL.pdf

NASA Earth Observatory Website on Paleoclimatology
http://earthobservatory.nasa.gov/Features/Paleoclimatology_SedimentCores/

Specific sections: Executive Summary p. 111-114, Section 3.2 Requirements and Methods for Analyzing Changes in Extremes 3.2.1 Observed Changes p. 122 – 125 (skip box), Box 3-2 p. 132 ~ 6 pages of reading

NOAA/NCDC report on billion dollar weather and climate events from 1980-2003
http://www1.ncdc.noaa.gov/pub/data/techrpts/tr200301/tr2003-01.pdf

Southeast Climate Consortium's agroclimate website climate fact sheets: Fundamentals of Climate variability and Change
http://agroclimate.org/fact-sheets-climate.php

NOAA National Climatic Data Center: http://www.ncdc.noaa.gov/cag/time-series/us

Ecosystem Services Fact Sheet, Ecological Society of America
http://www.esa.org/ecoservices/comm/body.comm.fact.ecos.html

Academic Resources

On Science: http://undsci.berkeley.edu/article/0_0_0/us101contents_01

Zimmerman, A.R., 2014. How science is *really* done.

SENSE ABOUT SCIENCE, MAKING SENSE OF UNCERTAINTY, 2013.
http://www.senseaboutscience.org/resources.php/127/making-sense-of-uncertainty

Naomi Oreskes on the Merchants of Doubt, https://www.youtube.com/watch?v=wX3y6BQd4LI

Holgate, S.A., 2014. How to Collaborate. *Science*. 10.1126/science.caredit.a1200082

Non-Governmental Agencies

Climate Drivers http://co2now.org/Know-the-Changing-Climate/Climate-System/ipcc-explains-earths-climate-system.html

Selections from Climate Change Reconsidered II – Physical Science. Published for the Nongovernmental International Panel on Climate Change (NIPCC). Heartland Institute. 2013.

Can we live inside the doughnut? Why the world needs planetary and social boundaries: http://blogs.oxfam.org/en/blog/12-02-13-can-we-live-inside-doughnut-why-world-needs-planetary-and-social-boundaries

Southeast Climate Consortium's agroclimate website climate fact sheets. http://agroclimate.org/fact-sheets-climate.php

Brown and Taylor, 2015. Ethics and climate change : a study of national commitments. IUCN World Commission on Environmental Law (WCEL). Monographic Series no. 86.

Global Warming's Six Americas in September 2012. Report by Yale Project on Climate Change Communication and the George Mason University Center for Climate Change Communication.

GENERAL EDUCATION

This course fulfills a Physical Science (P) General Education requirement

General Education Objectives (Physical Sciences)
Physical science courses provide instruction in the basic concepts, theories and terms of the scientific method in the context of the physical sciences. Courses focus on major scientific developments and their impacts on society, science and the environment, and the relevant processes that govern physical systems. Students will formulate empirically-testable hypotheses derived from the study of physical processes, apply logical reasoning skills through scientific criticism and argument, and apply techniques of discovery and critical thinking to evaluate outcomes of experiments.

Accomplishment of General Education Objectives (Physical Sciences)
The general education Physical Sciences objectives will be accomplished through the examination of the issue of climate change; climate science, climate change impacts, and approaches to finding solutions to the 'wicked problem' of climate change. Each week, students will study on-line material (prerecorded lectures and readings) on a 'hard science' climate change (Fundamental) topic and a 'doing science' or 'science and society (Framework) topic'. Then, in class meetings each week, the two topics will be brought together and reinforced by doing critical thinking and application exercises and discussions. In addition, a semester project will require students to formulate empirically-testable hypotheses and test them using logical reasoning skills and argument and examine impacts on society more broadly among nations and across socioeconomic groups and cultures worldwide.

General Education Student Learning Outcomes (Physical Sciences)
The general education student learning outcomes describe the knowledge, skills and attitudes that students are expected to acquire while completing a general education course at the University of Florida. The SLOs fall into three areas: content, communication and critical thinking.

- Content: Students identify, describe, and explain the basic concepts, theories and terminology of natural science and the scientific method within the subject area. Identify, describe, and explain the major scientific developments within the subject area and the impacts on society and the environment. Identify, describe, and explain relevant processes that govern biological and physical systems within the subject area.
- Critical Thinking: Students formulate empirically-testable hypotheses derived from the study of physical processes or living things within the subject area. Apply logical reasoning skills effectively through scientific criticism and argument within the subject area. Apply techniques of discovery and critical thinking effectively to solve experiments and to evaluate outcomes
- Communication: Students communicate scientific findings clearly and effectively using oral, written and/or graphic forms. Write effectively in several forms, such as research papers and laboratory reports.

General Education Student Learning Outcomes Assessment (Physical Sciences)

- Content: Mastery of discipline-specific science-related content (terminology, concepts, theories etc.) will be assessed through weekly on-line quizzes that will be taken by students after viewing weekly on-line materials (12% of final grade), another quiz taken in their groups in class (10% of final grade) as well as in the mid-term exam (15% of final grade). In addition, 'content' is assessed and represents about 25% of the grade received on weekly in-class activities and all elements of the semester project (or about 15% of final grade, see rubrics attached below).
- Critical Thinking: Each week, students will complete group exercises in groups which require them to synthesize and interpret scientific data, and lead them to support or reject existing scientific hypotheses or ones that they have proposed. Hypothesis testing is most explicitly addressed in week 2 of the course in which students formulate their own scientific hypotheses regarding drivers of climate and experiments to test those hypotheses, and in week 4, in which students will critically evaluate data proposed to support established

hypotheses. For the semester project, students propose and test a hypothesis of their own, regarding a climate change mitigation or adaptation strategy and then evaluate its broader implications from multiple perspectives. 'Critical Thinking' is assessed and represents about 25% of the grade received on weekly in-class activities and all elements of the semester project (or about 15% of final grade, see rubrics attached below).

- Communication: In weekly class meetings, students will be required to participate in open-ended thoughtful discussions regarding the climate change topics and policy implications, the process of scientific discovery, ethics, and applications. Students will communicate their ideas to their peers while working in groups to communicate to generate creative solutions of a scientific nature and also present these final projects orally to the larger group and then as a written paper. 'Communication' is assessed and represents about 25% of the grade received on weekly in-class activities and all elements of the semester project (or about 15% of final grade, see rubrics attached below).

<u>This course fulfills an International (N) General Education requirement</u>

General Education Objectives (International)

International courses provide instruction in the values, attitudes and norms that constitute the contemporary cultures of countries outside the United States. These courses lead students to understand how geographic location and socioeconomic factors affect these cultures and the lives of citizens in other countries. Through analysis and evaluation of the students' own cultural norms and values in relation to those held by the citizens of other countries, they will develop a cross-cultural understanding of the rest of the contemporary world.

Accomplishment of General Education Objectives (International)

The general education International objectives will be accomplished through the examination of the issue of climate change; climate science, climate change impacts across the globe, and evaluating approaches to finding solutions to the 'wicked problem' of climate change. Each week, students will study on-line material (prerecorded lectures and readings) on a 'hard science' climate change (Fundamental) topic and a 'doing science' or 'science and society (Framework) topic'. Then, in class meetings each week, the two topics will be brought together and reinforced by doing critical thinking and application exercises and discussions. In addition, a semester project will require students to formulate empirically-testable hypotheses and test them using logical reasoning skills and argument and examine impacts on society more broadly among nations and across socioeconomic groups and cultures worldwide.

General Education Student Learning Outcomes (International)

The general education student learning outcomes describe the knowledge, skills and attitudes that students are expected to acquire while completing a general education course at the University of Florida. The SLOs fall into three areas: content, communication and critical thinking.

- Content: Students identify, describe, and explain the values, attitudes and norms that shape the cultural differences of peoples who live in countries other than the United States. Identify, describe, and explain the roles of geographic location and socioeconomic factors on the lives of citizens in other countries.
- Critical Thinking: Students analyze and evaluate their own cultural norms and values in relation to those held by citizens in other countries.
- Communication: The international designation is always in conjunction with another category. Communication outcomes are listed in those subject areas.

General Education Student Learning Outcomes Assessment (International)

- Content: Mastery of international conditions and values-related content (terminology, concepts, theories etc.) will be assessed through weekly in-class activities and all elements of the semester project (about 25% of these grades or about 15% of final grade, see rubrics attached below).
- Critical Thinking: Each week, students will complete group exercises in groups which, after synthesizing and interpreting scientific data, will have them evaluate its broader implications from multiple perspectives and

how they may arise from the students' own cultural norms and values and compare these to those held by the citizens of other countries. 'Critical Thinking' is assessed and represents about 25% of the grade received on weekly in-class activities and all elements of the semester project (about 25% of these grades or about 15% of final grade, see rubrics attached below).

- Communication: In weekly class meetings, students will be required to participate in open-ended thoughtful discussions regarding the climate change topics and policy implications, the process of scientific discovery, ethics, and applications. They must be able to express how these implications arise from their own cultural norms and values in relation to those held by citizens in other countries. 'Communication' is assessed and represents about 25% of the grade received on weekly in-class activities and all elements of the semester project (about 25% of these grades or about 15% of final grade, see rubrics attached below).

GRADING RUBRICS

For each activity, students are provided with specific instructions for completing the activity and a grading rubric, all within Canvas. The grading rubrics are designed to evaluate the student's mastery of specific content and their ability to produce bodies of work within the guidelines specified in the instructions.

Rubric for Grading of Weekly In-class Activity

Criteria/Score	Outstanding:	Satisfactory:		Unsatisfactory:
SUBMISSION	In-class activity was submitted by the due date. (4 pts)	In-class activity was submitted within 1 day of the due date (2.0 pts)		ICA was submitted between 1 and 7 days after the due date (0 pts).
CONTENT	Demonstrates complete competence in the terminology, concepts, methodologies and theories used within the subject area. Identifies conditions and values that shape lives of citizens in other countries. 7 pts.	Demonstrates some competence in the terminology, concepts, methodologies and theories used within the subject area. Some identification of conditions and values that shape lives of citizens in other countries. 5 pts.	Demonstrates poor competence in the terminology, concepts, methodologies and theories used within the subject area. Poor identification of conditions and values that shape lives of citizens in other countries. 3.0 pts	No demonstration of competence in the terminology, concepts, methodologies and theories used within the subject area. No identification of conditions and values that shape lives of citizens in other countries. 0.0 pts
CRITICAL THINKING	Carefully, logically, and fully analyzes information from multiple perspectives and develops reasoned solutions to problems within the subject area. Evaluates conditions and values that shape lives of citizens in other countries. 7.0 pts	To some extent, analyzes information from multiple perspectives and develops reasoned solutions to problems within the subject area. Some evaluation of conditions and values that shape lives of citizens in other countries. 5.0 pts	Mostly description or summary, without consideration or support of evidence. Generally unfocused and no connections made between ideas. Poor evaluation of conditions and values that shape lives of citizens in other countries. 3.0 pts	Displays no evidence of engagement with the topic. No evaluation of conditions and values that shape lives of citizens in other countries. 0.0 pts
COMMUNICATION	Clearly and effectively communicates knowledge, ideas, and reasoning in forms appropriate to the subject area. 7.0 pts	Somewhat clearly and effectively communicates knowledge, ideas, and reasoning in forms appropriate to the subject area. 5.0 pts	Fails to clearly and effectively communicate knowledge, ideas, and reasoning in forms appropriate to the subject area. 3.0 pts	The assignment is unfocused and/or displays little or no degree of completion. 0.0 pts
Total: 25 pts				

Rubric for Grading of Quantitative Method Presentation (Semester Project)

ELEMENT COMPLETION (20 points total)

___/1 pt Title Slide (one slide): title and group members
___/1 pt Introduction (one slide) – present problem
___/2 pt Detailed proposal outline (one slide)
___/2 pt Well-worded hypothesis and subhypotheses as to the efficacy of the project (one slide)
___/2 pt A method for quantitatively assessing the effectiveness/impact of each hypothesis
___/2 pt Equations presented are clear and use an equation editor
___/2 pt All benefits factored into equations (e.g. if C emissions were reduced, this was monetized)
___/2 pt Citations were made on each slide where fact was used
___/2 pt Bibliography (one slide) including alphabetic listing of all references cited (and no more).
___/2 pt Includes figures on almost every slide to make visually appealing
___/1 pt Text not too small, slides not packed with text
___/1 pt Presentation of material shared equally by group members

Criteria/Score	Outstanding:	Satisfactory:	Unsatisfactory:
CONTENT **Score __ / 10 pts**	Demonstrates complete competence in the terminology, concepts, methodologies and theories used within the discipline. Evaluates conditions and values that shape lives of citizens in other countries. (10-9 pts).	Demonstrates some competence in the terminology, concepts, methodologies and theories used within the discipline. Some identification of conditions and values that shape lives of citizens in other countries. (8.9-7 pts).	Demonstrates poor competence in the terminology, concepts, methodologies and theories used within the discipline. Poor identification of conditions and values that shape lives of citizens in other countries. (<7 pts).
CRITICAL THINKING **Score __ / 10 pts**	Thorough consideration of issues from multiple perspectives, logically analyzes evidence from credible, relevant sources, and develops reasoned conclusions. Evaluates conditions and values that shape lives of citizens in other countries. (10-9 pts).	Considers issues from multiple perspectives, logically analyzes evidence from credible, relevant sources, and develops reasoned conclusions. Some evaluation of conditions and values that shape lives of citizens in other countries. (8.9-7 pts).	Does not considers issues from multiple perspectives or logically analyze evidence from credible, relevant sources, and develop reasoned conclusions. Poor evaluation of conditions and values that shape lives of citizens in other countries. (<7 pts).
COMMUNICATION **Score __ / 10 pts**	Communicates knowledge, ideas, and reasoning clearly and effectively, very polished and practiced (10-9 pts).	Communicates knowledge, ideas, and reasoning, somewhat polished and practiced (8.9-7).	Does not communicates ideas, and reasoning effectively, not polished or practiced (<7 pts).
Total: __ / 50			

Rubric for Grading of Final Project PRESENTATION (Semester Project)

ELEMENT COMPLETION (20 points total)
___/2 pt Title Slide, Introduction, Detailed proposal
___/2 pt Well-worded hypothesis and subhypotheses as to the efficacy of the project
___/2 pt Hypothesis testing method clearly explained. Equations presented are clear and use an equation editor, all numbers have units
___/2 pt All benefits factored into equations (e.g. if C emissions were reduced, this was monetized)
___/2 pt All data used to solve equations clearly explained and sources given
___/2 pt Quantitative error analysis conducted (not just qualitative list of uncertainties)
___/2 pt Conclusions drawn linked directly to quantitative analysis (hypothesis testing) done
___/2 pt Larger significance discussed (importance beyond the scope of the project proposed)
___/2 pt Citations made on each slide where fact was used. Bibliography alphabetic and lists all references cited.
___/2 pt Figures on almost every slide. Text not too small. Presentation shared equally by group members.

Criteria/Score	Outstanding:	Satisfactory:	Unsatisfactory:
CONTENT **__ /20 pts**	Demonstrates complete competence in the terminology, concepts, methodologies and theories used within the discipline. Evaluates conditions and values that shape lives of citizens in other countries. (20-18 pts).	Demonstrates some competence in the terminology, concepts, methodologies and theories used within the discipline. Some identification of conditions and values that shape lives of citizens in other countries. (17.9-14 pts).	Demonstrates poor competence in the terminology, concepts, methodologies and theories used within the discipline. Poor identification of conditions and values that shape lives of citizens in other countries. (<14 pts).
CRITICAL THINKING **__ /20 pts**	Thorough consideration of issues from multiple perspectives, logically analyzes evidence from credible, relevant sources, and develops reasoned conclusions. Evaluates conditions and values that shape lives of citizens in other countries. (20-18 pts).	Considers issues from multiple perspectives, logically analyzes evidence from credible, relevant sources, and develops reasoned conclusions. Some evaluation of conditions and values that shape lives of citizens in other countries. (17.9-14 pts).	Does not considers issues from multiple perspectives or logically analyze evidence from credible, relevant sources, and develop reasoned conclusions. Poor evaluation of conditions and values that shape lives of citizens in other countries. (<14 pts).
COMMUNICATION **__ /20 pts**	Communicates knowledge, ideas, and reasoning clearly and effectively, very polished and practiced (20-18 pts).	Communicates knowledge, ideas, and reasoning, somewhat polished, with some polish & practice (17.9-14 pts).	Does not communicate ideas and reasoning effectively, not polished or practiced (<14 pts).
Total: ____ /80 Points			

Rubric for Grading of Final Project PAPER (Semester Project)

ELEMENT COMPLETION (20 points total)

___/2 pt Title Page supplied. Whole paper formatted as required.
___/2 pt Abstract provides a good summary of whole paper .
___/2 pt Background and detailed proposal well explained.
___/2 pt Hypotheses and testing method clearly explained. Equations presented are clear and use an equation editor. All data used to solve equations clearly explained and sources given.
___/2 pt All benefits factored into equations (e.g. if C emissions were reduced, this was monetized).
___/2 pt Quantitative error analysis conducted (not just qualitative list of uncertainties).
___/2 pt Conclusions drawn linked directly to quantitative analysis (hypothesis testing) done.
___/2 pt Larger significance discussed (importance beyond the scope of the project proposed).
___/2 pt Bibliography alphabetic and lists all references cited (and no more). Citations made correctly.
___/2 pt Improvements made in response to the critiques made after oral presentation.

Criteria/Score	Outstanding:	Satisfactory:	Unsatisfactory:
CONTENT **__ /20 pts**	Demonstrates complete competence in the terminology, concepts, methodologies and theories used within the discipline. Evaluates conditions and values that shape lives of citizens in other countries. (20-18 pts).	Demonstrates some competence in the terminology, concepts, methodologies and theories used within the discipline. Some identification of conditions and values that shape lives of citizens in other countries. (17.9-14 pts).	Demonstrates poor competence in the terminology, concepts, methodologies and theories used within the discipline. Poor identification of conditions and values that shape lives of citizens in other countries. (<14 pts).
CRITICAL THINKING **__ /20 pts**	Thorough consideration of issues from multiple perspectives, logically analyzes evidence from credible, relevant sources, and develops reasoned conclusions. Evaluates conditions and values that shape lives of citizens in other countries. (20-18 pts).	Considers issues from multiple perspectives, logically analyzes evidence from credible, relevant sources, and develops reasoned conclusions. Some evaluation of conditions and values that shape lives of citizens in other countries. (17.9-14 pts).	Does not considers issues from multiple perspectives or logically analyze evidence from credible, relevant sources, and develop reasoned conclusions. Poor evaluation of conditions and values that shape lives of citizens in other countries. (<14 pts).
COMMUNICATION **__ /20 pts**	Communicates knowledge, ideas, and reasoning with very clear and organized prose (20-18 pts).	Communicates knowledge, ideas, and reasoning, with somewhat clear & organized prose (17.9-14 pts).	Does not communicate ideas and reasoning effectively. Prose not clear or organized (<14 pts).
Total: ____ /80 Points			

WEEKLY SCHEDULE OF IN-CLASS ACTIVITIES

NOTE: This document outlines the overall and week-by-week Topics, Summary of Activities, and Learning Objectives covered during the double-period meeting time each week.International components of each are highlighted with shading and an asterisk symbol.

Overall Course Objectives

This physical science general education course will cover concepts of climate change and science in our modern and global society. It is the aim of this course that by the end, students will be able to:

- Understand the basic facts and uncertainties regarding global climate change, the role of humans in causing it.
- *- Understand how climate global change affects natural and human systems and its effects vary among nations and with socioeconomic factors and cultures worldwide.
- Apply the process of scientific inquiry in discovering, understanding, and addressing the challenges of climate change.
- Develop and evaluate hypothesis-driven solutions to address climate change through critical thinking and teamwork.
- Effectively communicate multi-disciplinary scientific challenges and strategies for addressing them.

Week #1

1) Fundamental Science Topic: Perceptions of Climate Change, Disciplines of Climate Change
Framework Topic(s): Interdisciplinary Science, Science communication
Skill: Course search

2) Summary:

This class introduces the idea of collaboration and interdisciplinary science. Students reflect on their perceptions (preconceptions) of climate change and then complete an engineering/design activity called the marshmallow challenge. Student groups create a climate science major curriculum.

3) Learning Objectives: *When students complete this lesson they will be able to:*

-describe course objectives and student responsibilities
-reflect on preconceived ideas of climate change
*-differentiate among the diverse ways in which climate change must be studied including from many disciplines and multi-cultural multinational perspectives.
-describe aspects of collaboration for creative problem solving and its relationship with climate change and science in general.

4) Activity/Assessment

*In-Class Activity: Discussion of climate change interdisciplinary nature includes multinational aspects and the undergraduate major curriculum created by the students likely includes courses with international content

Week #2

1) Fundamental Science Topic: Climate Drivers**,** Climate System (Cycling, Feedback, and Thresholds)
Framework Topic(s): The Scientific Method
Skill: Formulate Hypotheses

2) Summary:

Students learn the basics of the climate system and increase their understanding of the scientific process through the online lectures and readings. Discussion and group activities are used to reinforce the online materials and promote complex understandings of the nature of science. Students think about basic hypothesis about climate change and possible approaches to testing them.

3) Learning Objectives: *When students complete this lesson they will be able to:*

- summarize the primary external drivers of Earth's global climate
- analyze global climate as a complex system
- *- explain the scientific method and give examples of misconceptions about science
- give examples of climate system material exchanges, feedbacks, and tipping points
- apply the scientific method to the question of climate change by generating hypotheses and devising 'experiments' to test them

4) Activity/Assessment

*In-Class Activity: Students ask questions and construct hypotheses about climate change and its effects. They are encouraged to think globally and multi-nationally and cross-culturally.

*Science misconceptions discussion: Emphasizes that science is now funded by multinational governments and carried out by teams of multinational scientists

Week #3

1) Fundamental Science Topic: Climate History
Framework Topic: How Science is Done
Skill: Excel use, Hypothesis Testing

2) Summary:

This week, after reviewing climate history, students complete an exercise with real ice core data. After creating and examining several graphs, they are asked to form arguments for or against anthropogenic warming.

3) Learning Objectives: *When you complete this lesson students will be able to:*

- explain the different sources of climate records and the applicable timescale and resolution (uncertainties) associated with each
- recount the broad outlines of how climate has varied over Earth history (and the process controlling it)
- *-realize that climate data collection and sharing is an international activity
- use Excel to examine data (create columns, simple calculations, make graphs)
- understand and draw inferences from graphs of real paleoclimate data
- use paleoclimate data to test some climate change hypotheses
- understand that science is not done in a vacuum but is influenced by many 'real world' factors including funding, publishing, and personal biases

4) Activity/Assessment

*On-line Discussion: Students are asked to think about the value of governmental funding of large multinational scientific efforts to extract paleoclimate records form ice and sediment cores

*In-Class activity: in part, examines the 'Early Anthropocene Hypothesis' which involves understanding and discussion of early European and Asian agriculture and settlement history.

Week #4

1) Fundamental Science Topic: Evidence for Climate Change
Framework Topic: Uncertainty/Consensus
Skill: Sources/ Critical Thinking

2) Summary:

This week, after reviewing major lines of evidence supporting CC from lecture (and from last week's assignment), as well as some of the major uncertainties, students will do an exercise in which they come up with arguments and counter-arguments to the anthropogenic global warming hypothesis.

3) Learning Objectives: *When they complete this lesson, students will be able to:*

- recount the major lines of evidence supporting the theory of anthropogenic global warming (AGW)
- discuss various uncertainties associated with the theory of AGW and their nature
- understand the workings and role of the IPCC
- discuss the role of uncertainty and consensus in shaping scientific debates generally, and AGW specifically.
- discuss a range of counter-arguments to AGW and find and present lines of evidence that would validate or invalidate these counter-arguments
- distinguish between types of sources of information and make proper scientific citation

4) Activity/Assessment

Students critically think about the AGW argument; finding evidence supporting it, counter-arguments, discuss the method used in source and how it supports the counter-argument. Also, students discuss the biases or assumptions and include proper citation for each source.

Week #5

1) Fundamental Science Topic: Climate Change and the Weather
Framework Topic: Research and Big Data
Skill: Test hypotheses using data

2) Summary:

Students will complete an in-class activity in which they will propose and test hypotheses using weather data in excel. Difficulties with Big Data will be realized. Then, students will learn about the semester project and be assigned to groups according to their strengths.

3) Learning Objectives: *When you complete this lesson students will be able to:*

-compare and contrast weather and climate
-differentiate between changes to long-term average in climate data and changes to extremes
-describe what it means for conditions/events to be extreme
-realize the meaning of 'big data' and the challenges it presents
- evaluate key strengths individuals may bring to group collaborations
-carry out effective group 'brainstorming'

4) Activity/Assessment

*In-Class Activity: Students examine weather data (climate trends) in Florida cities and compare this kind of data with that of averages for different regions of the Earth and global data depictions.

Week #6

1) Fundamental Science Topic: Future Effects of Climate Change
Framework Topic: Models
Skill: Hypothesis testing/Model interpretation

2) Summary: Students think about and use climate models to make and test hypotheses

3) Learning Objectives: *When students complete this lesson they will be able to:*

- outline the purpose and types of models used in science generally and climate science specifically
- evaluate the relative degree that difference forcing impact the climate system and global temperatures
*- understand how regional/global models are used and can inform national and international climate policy decisions

4) Activity/Assessment

*In-Class Activity: Students use output of climate model run scenarios to make arguments that will inform international policy makers

Week #7

1) Fundamental Science Topic: Ecological Impacts of Climate Change
Framework Topic: Team Science
Skill: Team Work/Hypothesis Writing

2) Summary:

A group activity provides students with a team science experience. After reading section of a paper on the Amazon, they meet in groups of disciplinary experts. Then experts are separated into interdisciplinary groups that develop then present a research proposal.

3) Learning Objectives: *When you complete this lesson students will be able to:*

- define ecosystems and how ecosystems are linked to climate
- name key impacts of climate change on ecosystems
- understand the role of humans as components of Earth's ecosystems
- *- appreciate socioeconomic conditions in various regions of the world place differeing pressures and demands on ecological systems
- experience the value of team effort and synthesis of different scientific disciplinary perspectives, in many scientific endeavors

4) Activity/Assessment

*In-Class Activity: Students consider the *interactions* between climate change, humans and the ecological health of the Amazon Rainforest. Students will also consider/discuss the roles of international teams of research scientists working in Brazil, national policies of Brazil, and lifestyles and cultures of humans living in the region.*

Week #8

1) Fundamental Science Topic: Human Population/ Consumption
Framework Topic: Ethics & Sustainability
Skill: Calculations/Units

2) Summary:

Students will learn about how population growth and climate change are linked and how mitigation and adaptation strategies must be made with ethical considerations.

3) Learning Objectives: *When students complete this lesson they will be able to:*

- *-Describe how resource use combined with population growth varies in different regions of the Earth, along with its effects.
- -*Evaluate different strategies for how individual countries and their population contribute to CO2 emission reduction goals.
- *-Realize the implications of our personal lifestyle choices and consumption patterns on the resources that are available to others in different regions of the Earth
- *-Realize the linkages between ethics and climate change

4) Activity/Assessment

*In-Class Discussion: After calculating their carbon footprint (and that of average Americans), students think about and discuss why it differs from that of residents of other countries and cultures.

*In-Class Activity - By apportioning future emission scenarios over the 21st century among the world's different countries, students come up with a plan to reduce C emissions so that the critical temperature is not reached before 2100. The plan needs to be based on the data, consider various socioeconomic and cultural factors and an ethical framework that can be justified.

*In-Class Discussion: We conclude with a discussion of international climate change treaties: Kyoto Protocol and Paris Agreement

Week #9

1) Fundamental Science Topic: Agriculture and Land Use

Framework Topic: Communicating about climate change to the public

Skill: Working with Google Docs, Communication

2) Summary: Consider how we currently feed the world (or don't), what changes to our food system will occur due to CC, and what we can do about it, including, how, through proper communication techniques, we can actually make the necessary changes happen.

3) Learning Objectives: *When students complete this lesson they will be able to:*

*-Consider competition for land & other natural resources among urban, agricultural and natural systems within the context of increasing population densities and climate change.

*-Appreciate how agricultural and foodways practices vary across nations and cultures

-Understand climate-related risks associated with agriculture and ways in which farmers can prepare for and adapt to these changes

-Appreciate the diverse communication strategies required to build adaptive capacity among different audiences.

4) Activity/Assessment

*In-Class Activity – Student groups are each assigned a major world commodity crop for which they collect data and then, comparatively, evaluate the role they now play in different regions and cultures, and might play in the future, in supporting humanity.

*In-Class Activity: Students will work in groups to develop solutions to simultaneously protect our natural systems, feed growing world populations, and build healthy communities. Student will be encouraged to develop 'food and land' solutions for other regions and cultures. These are presented to the class.

Week #10

1) Fundamental Science Topic: Energy

Framework Topic(s): From Lab to the Real

Skill: Communication, Sources

2) Summary: Students think about and investigate a range of specific measures that reduce CO2 emissions and see that they, without too much pain, add up to quite a ways toward the needed reduction (to prevent reaching the critical temp.).

3) Learning Objectives: *When students complete this lesson they will be able to:*

*-Understand characteristics of different forms of energy (renewable energy and nonrenewable) and their relative contribution in powering the U.S. versus other nation's economy.

-Evaluate the efficacy and feasibility of different actions that could be done to reduce energy consumption (CO_2 emissions)

4) Activity/Assessment

*On-line Discussion: Students consider/compare U.S. and China energy and climate policy.

*In-Class Discussion: The focus of this week's activity is on the U.S. energy system but we end with a discussion of its implications for the recent agreement between U.S. and China on lowering emissions and compare the U.S. and Chinese energy and climate system and policies.

Week #11

1) Fundamental Science Topic: Built Environment

Framework Topic: Effecting Change

Skill: Oral presentation, Evaluation and Project Planning, Creative Design

2) Summary:

Students present their project outlines, give and receive feedback.

Activity may be 1) project evaluation and planning, or 2) Built Environment Design Activity

3) Learning Objectives: *When students complete this lesson they will be able to:*

-Detail the impact of the built environment on climate change
-Describe how modifications to the built environment can reduce climate change
-Demonstrate that individual choices impact carbon emissions and climate
- Prepare a sound oral/visual presentation.
- Accept criticism and suggestions for project improvement.
- Create a plan for project completion

4) Activity/Assessment

* Activity: Students design something for the built environment of Gainesville or any place in the world that will help it adapt to or mitigate CC

Week #12

1) Fundamental Science Topic: Environmental Policy: Climate Change

Framework Topic: Science in action

Skill: Finding/evaluating Sources/Calculation

2) Summary:

After a review, students look at and compare different environmental policies.

3) Learning Objectives: *When students complete this lesson they will be able to:*

*-Compare legal frameworks for international, national, state, and local climate change policy.
-Discuss different categories of CC policy options
- Differentiate between market incentive and regulation.
- Evaluate the strength of different sources of data and build skepticism for all that they read in the press

4) Activity/Assessment

*In-Class Activity: Students investigate the details of, present, then compare and contrast in a final discussion, different governmental environmental policies from around that world that have had the greatest effects on mitigating climate change. These include examples from European Union, China, U.N. developing countries, etc.

Week #13

1) Fundamental Science Topic: Sea Level Rise

Framework Topic: Science in the Public Realm

Skill: Debate

2) Summary:

Students are divided into stakeholder groups, prepare suggestions for sea level rise policy from the stakeholder perspective, and then role play in a public forum concerning sea level rise policy in Volusia County. This serves as a capstone experience that connects the students' scientific learning to the formation of public policy.

3) Learning Objectives: *When students complete this lesson they will be able to:*

-Explain the mechanisms that cause both global and relative sea level variation.
-Outline the history and causes of sea level variation in the past and predictions for the future.
*-Detail the potential impacts of sea level rise and possible societal response strategies in various regions of the U.S. and the world.
*-Evaluate the role of science in society, particularly in policy development.
*-Describe how public policy on wicked problems such as climate change or sea level rise might best be made and implemented in various regions of the U.S. and the world.

4) Activity/Assessment

*In-Class Activity – In this activity, students play the role of different stakeholder groups in making recommendations on sea level rise adaptation policy/regulations to be adopted by a Florida county. While focusing on Florida, this activity leads students to understand how geographic location and socioeconomic factors affect the lives and views of citizens. Students are asked at end to imagine how their policy recommendations might differ were they to be citizens of a different country.

Semester Project

Students groups will work as a team to propose, hypothesis and quantitatively evaluate the potential effects of either:

a) a strategy to mitigate climate change, or
b) a strategy to adapt to the predicted effects of climate change.

The strategies will range widely, e.g., from an invention such as a solar-powered bicycle to a change in local ordinance or international law. Each group will start with a hypothesis, then work to test the hypothesis and quantitatively evaluate the efficacy of the strategy by weighing the calculated costs against the potential benefits that would result from the adoption of their strategy (climate, human health, economic, etc.) or by comparing the action to a different course of action.

*Students are not required, but are encouraged to identify and address problems that relate to their own local community, be it state of Florida, Gainesville, or on the UF campus or even in one's dormitory. However, at the end of the assignment (in both presentation and paper), students are required to evaluate the efficacy of the project were it to be carried out in other regions of the U.S. and the world.

Project elements include:

Final Project 30% of Final Grade

3% Initial Proposal (group assessment)
3% Hypothesis/Source (group assessment)
5% Quantitative Method Presentation (group assessment)
8% Final Presentation (group assessment)
8% Final Paper (group assessment)
3% Individual Effort (self-/team assessment)

WEEKLY SCHEDULE OF ON-LINE ACTIVITIES AND READINGS

Week 1

Objectives. Students will:
-break the ice and get their creative juices flowing
- understand the course objectives, student responsibilities and all items in the syllabus
- know something of the background of course instructors and contributors
- reflect on the many preconceived ideas of climate change
- differentiate among the diverse ways in which we understand and study climate change and its different sub-disciplines.

To Do List

1. Review all material in the Course Information section and Syllabus in 'Start Here' Section.
2. Take the Syllabus Quiz
3. View the Instructor Introduction Bios (below).
4. Upload your photo (face or upper body only so you are clearly identifiable) to Canvas via settings tab. (Click 'Settings' on the top right, or see this link for detailed instructions. You may also want to change your notification settings for email, or add phone notifications.)
5. Bring internet-enabled device to class (every day).

Week 2

Objectives. Students will be able to:
- summarize the primary external drivers of Earths global climate
- characterize the properties of a complex 'systems' and analyze global climate as such
- give examples of climate system material exchanges, feedbacks and tipping points
- explain the scientific method and give examples of misconceptions about science
- give characteristics of scientific versus non-scientific assertions
- apply the scientific method to the question of climate change by generating hypotheses and devising 'experiments' to test them

To Do List
1. Week 2 Intro Video

2. Spark Topics Discussion

3. Textbook Reading in 'Dire Predictions' pages 6-29

4. Lecture on Climate Drivers (Links to an external site.)

5. Reading on the Scientific Process: Understanding Science Website. Peruse all but focus on:

- http://undsci.berkeley.edu/article/0_0_0/howscienceworks_01 (Links to an external site.)and
- http://undsci.berkeley.edu/teaching/misconceptions.php#b1 (Links to an external site.). I also suggest:
- http://undsci.berkeley.edu/faqs.php (Links to an external site.)

6. Lecture on The Climate System (Links to an external site.)

7. Reading on Climate Drivers and the Scientific Method: IPCC AR4_Chap1 _Historical Overview of CC_5pg

8. Quiz

9. Complete extra credit CC survey (1% grade boost if you complete both a pre and post-course survey - link will be provided to you in an e-mail you will receive this week)

Supplemental Materials
1. Video of 'How science works using ocean sediment coring as an example' (Links to an external site.)
2. Fifty years of J. R. Platt's strong inference
3. What does real scientific work look like? Stuart Firestein: The pursuit of ignorance (Links to an external site.)
4. Website showing Milankovitch Cycles (Links to an external site.)
5. Last Week Tonight with John Oliver: Scientific Studies (Links to an external site.) (HBO)

Week 3

Objectives. Students will be able to:
- explain the different sources of climate records and the applicable timescale and resolution (uncertainties) associated with each
- recount the broad outlines of how climate has varied over Earth history (and the process controlling it)
- use Excel to similar spreadsheet program to examine data
- understand and draw inferences from graphs of real paleoclimate data
- use paleoclimate data to test some climate change hypotheses
-understand that science is not done in a vacuum but is influenced by many 'real world' factors including funding, publishing, and personal biases

To Do List
1. Week 3 Intro Video

2. Spark Discussion on Paleoclimatology

3. Reading in Dire Predictions, pages 30-51

4. Lecture on Climate History (Links to an external site.)

5. Look through NASA Earth Observatory Website on Paleoclimatology
Focus on sections called: A Record from the Deep (Links to an external site.), The Ice Core Record (Links to an external site.), Explaining the Evidence (Links to an external site.), The Oxygen Balance (Links to an external site.)

6. Reading on Doing Science: How Science is Really Done

7. Prepare for our in-class activity by reading: Introduction to Vostok Ice Core Data Exercise

8. Week 3 Quiz

9. We will be looking at icecore-derived climate data on an Excel spreadsheet in class this week so be sure to bring in your Excel-equipped devise. (Tablets may not work). If you don't have Excel, UF students can download and install Microsoft Office 365 ProPlus (which contains Excel) AT NO COST here (Links to an external site.).

Supplemental Materials
- Examples of real scientific journal papers on climate change. One from the journal Science (Monin et al., 2001, and one from a more typical journal (Stuiver 1995)

- Science Nation video showing ice core collection in Antarctica (Links to an external site.)

- NOVA scienceNow video on Tropical Ice Cores Measure Climate (Links to an external site.)

Week 4

Objectives. Students will be able to:
- recount the major lines of evidence supporting the theory of anthropogenic global warming (AGW)
- discuss various uncertainties associated with AGW theory
- understand the workings and role of the IPCC
- discuss the role of uncertainty and consensus in shaping scientific debates generally and AGW specifically
- propose a range of counter-arguments to AGW and find and present lines of evidence that would validate or invalidate these counter-arguments
- distinguish between types of sources of information and make proper scientific citations

To Do List
1. Introduction to Week 4View in a new window Click to view (video)

2. Spark Discussion on AGW Doubts

3. Reading in Dire Predictions, pages 30-51 (same as last week)

4. Lecture on CC Evidence (Links to an external site.) (22 min)

5. Lecture on CC Uncertainties (Links to an external site.) (24 min)

6. Take a look at the IPCC website (Links to an external site.), particularly the pages describing the Organization (Links to an external site.), History (Links to an external site.), Working Groups (Links to an external site.). This section of the course is focusing on The Physical Science Basis of CC. Have a look at the subjects covered by this working group report (Links to an external site.).

7. Familiarize yourself with the AR5 The Physical Science Basis Report. Of course you are welcome to read any section, but for this week, I want you to focus on:

- Summary for Policymakers (p 4-25). Focus on figures, tables, and highlighted text.
- Technical Summary (p 36-41 and 114-115). Focus on figures, tables, and highlighted text.
- Check out the Glossary (p 185) and Frequently Asked Questions (p 119-182)
(During your reading, make note of any section you would like to ask questions about in class)

8. What is Critical Thinking?

9. Evaluating Science Information Sources, information on Primary versus secondary Sources, and a Reference on how to make proper Scientific Citations

9. Week 4 Quiz

Supplemental Materials
-Climate Change Evidence and Causes_US_NAS_RS
-NASA: Climate change: How do we know? (Links to an external site.) In particular, try out the Climate Time Machine (Links to an external site.)

Some perspective on 'Uncertainty'
- When likely is not so likely
- Climate change is an uncertain science - By John Howard
- Making sense of uncertainty
-IPCC Uncertainty guidance note
Naomi Oreskes on the Merchants of Doubt (10:15) (Links to an external site.)

Some perspective on 'Consensus'
- Last Week Tonight with John Oliver: Climate Change Debate (Links to an external site.) (HBO) (caution! some vulgar language)
-The Real Scientific Consensus on Climate Change, Fox Business
- Doran et al., 2009. Examining the Scientific Consensus on Climate Change
- No Consensus on consensus

Some anti-AGW sources
- Heartland Institute (Links to an external site.)
- Climate Change Reconsidered II: Physical Science
and Climate Change Reconsidered II: Physical Science Interim Report
- Global Climate Scam (Links to an external site.)

Week 5

Objectives. Students will be able to:
- compare and contrast weather and climate
- describe what it means for data to be extreme
- realize the meaning of 'big data' and the challenges it presents
- evaluate key strengths individuals may bring to a group collaboration
- carry out effective brainstorming

To Do List
1. Week 5 Intro Video

2. Spark Discussion

3. Textbook Reading pages 52-67 + 112-115 + 132-135

4. Reading: Southeast Climate Consortium's agroclimate website climate fact sheets: Fundamentals of Climate variability and Change (Links to an external site.) - read the .pdf files from the following links:
a) Rainfall Intensity, b) Precipitation Trends, c) Temperature Trends

5. Reading: Kitchin (2014) Big Data, new epistemologies and paradigm shifts. Big Data & Society. Read pages 1-3, stop at Fourth paradigm in science.

6. Lecture on 'Weather and Climate' (Links to an external site.)

7. Lecture on Big Data (Links to an external site.)

8. Quiz 5

9. Look over the Semester Project Module where you will find the Semester Project Student Handout. We will discuss this together in class this week.

10. We will use Excel in class this week so be sure to bring in your Excel_equipped devise. (Tablets may not work). This time you will do some of the graphing. So you might want to check out two spreadsheeting instructional videos I made: EXCEL GRAPHING LESSON (Links to an external site.) and EXCEL SORTING LESSON (Links to an external site.)which uses this practice EXCEL FILE. These might also be helpful Excel (Links to an external site.) Tutorial #1 (Links to an external site.), Excel Tutorial #2 (Links to an external site.).

ALSO, If you are interested, here is a Bonus Lecture on my view of the major arguments and counter-arguments to the AGW theory...what we talked about last week: Zimmerman CC Arguments lecture (Links to an external site.)
Supplemental Materials

1. 'The Perfect Brainstorm', Chapter 4 in The Art of Innovation. Kelly, T., 2001.. New York: Doubleday.

Week 6

Objectives. Students will be able to:
- outline the purpose and types of models used in science generally and climate science specifically
- evaluate the relative degree that difference forcing impact the climate system and global temperatures
- understand how models are used and can inform climate policy decisions

To Do List
1. Week 6 Intro Video

2. Spark Discussion on Models

3. Required Textbook Reading: pages 68-117

4. Lecture 1: Modeling (Links to an external site.) (Matyas) Here is a link to the website mentioned in the modeling lecture: http://nas-sites.org/climate-change/climatemodeling/page_3_1.php (Links to an external site.)

5. Lecture 2: Predicting Future Climate (Links to an external site.) (Matyas). You may want to look again at the IPCC document AR5 The Physical Science Basis Report. from Module 4 more more information on the material presented here.

6. Week 6 Quiz

7. The semester project Initial Proposal assignment is due FRIDAY MIDNIGHT!. You should be brainstorming with your new project group members on your group webpage. See the Semester Project page

8. Bring laptop to class this week. Prepare your computer to run a model in class by verifying that this Executable Jar File works on your computer : www.atmosedu.com/meteor/ejs/ejs_EBMA.jar (Links to an external site.). Computer must have Java run-time environment installed (download for free from

http://www.java.com/en/download/index.jsp (Links to an external site.)) (if you have a Mac, you may need to open your System Preferences, Go into "Security & Privacy", unlock the lock at the bottom left corner, in the section 'Allow apps to download from', click the box for 'Anywhere'. Then re-lock the settings.)

Supplemental Materials
Models are the Building Blocks of Science (Links to an external site.)
Modelling the climate system (Links to an external site.)

Week 7

Objectives. Students will be able to
- define ecosystems and how ecosystem are linked to climate
- name key impacts of climate change on ecosystems
- understand the role of humans as a component of Earth's ecosystems
- appreciate the value of collaboration and synthesis of different scientific disciplinary perspectives in many scientific endeavors

To Do List
1. Week 7 Intro Video

2. Spark Discussion

3. Take MIDTERM EXAM Monday evening (see announcement)
On everything from weeks 1-6 including in-class activities: 30 multiple choice questions (60%), 4 essay questions (40%), closed book, 2 hour time limit.

4. Required Dire Prediction textbook reading: pages 124-131 + 188-189

4. Lecture on CC Ecosystem Impacts (Links to an external site.) (Gerber)

5. Required Other Readings

- Listen to the NPR story “A Drying Amazon Could Speed Climate Change (Links to an external site.)”
- Davidson et al., 2012, The Amazon basin in transition. You don't have to read all of it: PLEASE FOLLOW THESE READING INSTRUCTIONS. It is important that you read your assigned section of this paper as your group will be discussing it in class.

6. Quiz 7

Supplemental Materials
- EPA: Climate Impact on Ecosystems (Links to an external site.)
- Ecological Society of America Fact Sheet: Ecosystem Services (Links to an external site.)
- Tips to being successful as a team scientist: How to Collaborate
- Costanza et al., 1997. The value of the world's ecosystem services and natural capital.

Week 8

Objectives. Students will be able to
-Understand how resource use combined with population growth has changed the Earth.
-Evaluate different strategies, how individual countries and their population contribute to CO2 emission reduction goals.
-Realize the implications of our personal lifestyle choices / consumption patterns on the resources that are available to others
-Understand the linkages between ethics and climate change

To Do List
1. Introduction to Week 8 (video)

2. Spark Discussion on your C footprint

3.Lecture on Population, Consumption and CC (Links to an external site.) (Zimmerman)

4. Required Textbook Reading, Dire Predictions: pages 136-149 & 206-207

5. Lecture on Ethics and Climate Change (Links to an external site.) (Bartels)

6. Required Other Readings: Gardiner, 2010, Ethics and Climate Change: An Introduction (WIREs Climate Change v1: 54-66)

7. Quiz

REMINDER: Be sure to check the feedback given to you on your Semester Project Initial Proposals. Then get started on your idea. Submission of your Hypothesis and Sources will be due the day before our next class meeting.

Supplemental Materials
-Rockstrom et al., 2009. A safe operating space for humanity, Nature 461, 472-475
- UF Sustaintbility - Buildings and Gounds (Links to an external site.)
-TED Talk on Anthropocene (Links to an external site.)
- Broome, 2008. The Ethics of Climate Change
- Brown and Taylor, 2014. IUCN Report by on National Climate Change Commitments - Introduction
- Gardiner, S.M.2006, A Perfect Moral Storm: Climate Change, Intergenerational Ethics and the Problem of Moral Corruption, Environmental Values

Week 9

Objectives. Students will be able to:
-Consider competition for land & other natural resources among urban, agricultural and natural systems within the context of increasing population densities and climate change.
-Understand climate-related risks associated with agriculture and ways in which farmers can prepare for and adapt to these changes
-Appreciate the diverse communication strategies required to build adaptive capacity among different audiences.

To Do List
1. Intro Video (Links to an external site.)

2. Spark Discussion on an elevator talk

3. Required Textbook Reading: Dire Predictions: pages 150-163 & 184-187

4. Lecture: Communicating Climate Science (Links to an external site.) by Dr. Wendy-Lin Bartels

5. Lecture: Agriculture and Adaptation (Links to an external site.) by Dr. Dan Dourte.

6. Lecture: Land Use and Climate Change (Links to an external site.) by Peggy Carr

7. Required Reading: CRED Columbia University The Psychology of Climate Change Communication

8. Week 9 Quiz

9. Semester Project: This week you will submit your project hypotheses/sources assignment by the end of the week (Friday midnight).

Supplemental Materials
- Climate Change in the American Mind: October 2015 (Links to an external site.)
- Global Warming's Six Americas in September 2012 (Links to an external site.)
- Breaking the climate change gridlock (Corner and Groves, Nature Climate Change, 2014)
- Bartels et al., 2012. Warming up to climate change: a participatory approach to engaging with agricultural stakeholders in the Southeast US

Week 10

Objectives. Students will be able to:
-Understand characteristics of different forms of energy (renewable energy and nonrenewable) and their relative contribution in powering our economy.

-Evaluate the efficacy and feasibility of different actions that could be done to reduce energy consumption (CO_2 emissions)

To Do List
1. Week 10 Intro VideoView in a new window Click to view

2. Spark Discussion on energy policy: Some arguments against a major change in U.S. energy policy as a way to fight climate change are related to the large GHG emissions of China and the high price of renewable energy technologies. Read this article: The Year the Dam of Denial Breaks on Climate Change (Links to an external site.), and discuss why you think these arguments are or are not valid.

3. Required Textbook Reading, Dire Predictions: pages 164-177 + 182

4. Lecture on Fossil Fuels (Links to an external site.) (Dr. Porter)

5. Lecture on Renewable Energy (Links to an external site.) (Dr. Porter)

6. In Class Activity Preparation Reading/Homework: Instruction and readings are in this document.

It contains actions that could significantly reduce GHG emissions from the U.S in each of four categories: Oil Transformations, Electricity Transformations, Natural Gas Transformations, Renewable Energy Transformations.

Your homework assignment is to pick at least one of the actions in each category and, for each, come to class with questions answered on one sheet to turn in at the start of class, and a document for you to use during class.

7. Week 10 Quiz

8. Semester Project: Your groups should receive feedback on your hypothesis this week. Your group presentation outlining your proposal and quantitative methods will be turned in and presented to the class next week (Week 11 during class meeting).

Week 11

Objectives. Students will be able to
-detail the impact of the built environment on climate change
-describe how modifications to built environment can reduce climate change
-demonstrate that individual choices impact carbon emissions and climate.

To Do List
1. Video Introduction

2. Spark Discussion on changing your C footprint

3. Required Textbook Reading, Dire Predictions: pages 178-199

4. Lecture on Livable Communities/Sustainable Communities (Links to an external site.) (Carr)

5. Lecture on LEED Core Concepts (Links to an external site.) (Armaghani)

6. Required Other Readings/Resources/Websites: None

7. Week 11 Quiz

8. Semester Project: Finalize your 5-8 minute presentations to be given in class this week. Upload the presentation in advance of class here. Be prepared also to evaluate the presentation of another group and give and accept constructive criticism. Be sure to look at the Semester Project Student Handout so you know what is required in your presentation.

Supplemental Materials
UF Green Building Program (Links to an external site.)

The Atlanta Belt Line (Links to an external site.)

Here are two relevant journal articles that will provide you with additional information on the above topics.
- One looks at the relationship between urban density and the use of transit: Bertaud_Transit and Density
- The other looks at the relationship between urban sprawl and health : Ewing03_Relationship between urban sprawl and physical activity

Week 12

Objectives. Students will be able to:

- compare the difference in the legal framework for international, national, state and local climate change policy.
- differentiate between incentive and regulation-based environmental policy.
- compare and contrast examples of climate change policy at each regulatory level.
To Do List

1. Week 12 intro. Video.

2. Spark Discussion on the 'tragedy of the commons'

3. Required Textbook Reading, Dire Predictions: pages 200-213

4. Lecture on Policy Fundamentals (Links to an external site.) (Carr)

5. Lectures on policy examples:
a. A Local Policy Example (Links to an external site.)
b. A National Policy Example (Links to an external site.)
c. An International Policy Example (Links to an external site.) (Carr)

6. Other Readings Required :
- 'Curbing Climate Change: The Deepest Cuts' The Economist, 2014
- Mejean et al., 2015. Equity, burden sharing and development pathways: reframing international climate negotiations.

7. Week 12 Quiz

Supplemental Materials
-The original Garret Hardin article on Tragedy of the Commons
- Cap and trade fact sheet
- Carbon Offsets fact sheet

Week 13
Objectives. Students will be able to:
- explain the mechanisms that cause both global and relative sea level variation
- outline the history and causes of sea level variation in the distant and recent past and predictions for the future
- detail the potential impacts of sea level rise and possible societal response strategies
- evaluate the role of science in society, particularly in policy development
- understand how public policy on 'wicked problems' such as climate change or sea level rise might be made and implemented.

To Do List
1. Week 13 Intro. Video

2. Spark Discussion on the role of a scientist

3. Required Textbook Reading, Dire Predictions pages 36-37 & 97 & 110-111 & 122-123 & 158-159

4. Lecture on Sea Level Past and Present (Links to an external site.)

5. Lecture on Sea Level Impacts and Responses (Links to an external site.)

6. Required Other Readings: Review of Pielke book, 'The Honest Broker', Minerva2008

7. Week 13 Quiz (last one!)

8. The subject of the in-class activity this week is a sea level rise adaptation plan for Volusia County. Prepare for class activity by familiarizing yourself with the different informational documents in the Supplemental Material section below.

9. Semester Project: Continue to work on final presentation and paper. Your group presentation is in class next week (Week 14) and you will need to upload your presentation before next week's class here. Your group paper as well as your 'Individual Assessment Statement' is due one week later on Friday of Reading period.

Supplemental Materials

-Why the City of Miami Is Doomed to Drown _ Rolling Stone
-South Florida Rising Seas Video (26 min) (Links to an external site.)
- Ahead of the Tides Videos (Links to an external site.)