Cover Sheet: Request 14145

IDS2935 Zimmerman UFQ2 CLIMATE CHANGE SCIENCE AND SOLUTIONS

Info

Process	Course|New/Close/Modify|Ugrad|Gen Ed
Status	Pending at PV - General Education Committee (GEC)
Submitter	Andrew Zimmerman azimmer@ufl.edu
Created	8/21/2019 11:04:15 AM
Updated	8/22/2019 9:50:51 AM
Description of request	IDS2935 is the course "shell" through which the first offerings in the new UF Quest curriculum will be offered. I am asking that the Gen Ed committee temporarily approve a section of IDS2935 titled CLIMATE CHANGE SCIENCE AND SOLUTIONS as an offering that fills the P and N Gen Ed requirements. This temporary approval will last for three semesters.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CLAS - Geological Sciences 011610000	David Foster		8/21/2019
Zimmerman-IDS2935 UFQ2 Climate Change Sci and Sol_syllabus.pdf					8/21/2019
College	Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane		8/22/2019
No document changes					
General Education Committee	Pending	PV - General Education Committee (GEC)			8/22/2019
No document changes					
Office of the Registrar					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Original file: Cover sheet.pdf

Course|Gen_Ed|New-Close-Modify for request 14145

Info

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Submitter: Andrew Zimmerman azimmer@ufl.edu
Created: 8/20/2019 4:44:23 PM
Form version: 1

Responses

Course Prefix and Number

Response:
IDS2935

Enter the three letter prefix, four-digit course number, and lab code (if applicable), as the course appears in the Academic Catalog (or as it has been approved by SCNS, if the course is not yet listed in the catalog).
If the course has been approved by the UCC but is still pending at SCNS, enter the proposed course prefix and level, but substitute XXX for the course number; e.g., POS2XXX.

Course Title
Enter the title of the course as it appears in the Academic Catalog (or as it has been approved by SCNS, if the course is not yet listed in the catalog, or as it was approved by the UCC, if the course has not yet been approved by SCNS).

Response:
IDS 2935 Zimmerman UFQ2: CLIMATE CHANGE SCIENCE AND SOLUTIONS

Delivery Method
Please indicate the delivery methods for this course (check all that apply). Please note that content and learning outcome assessment must be consistent regardless of delivery method.

Response:
Classroom

Request Type

Response:
Change GE/WR designation (selecting this option will open additional form fields below)

Effective Term
Enter the term (semester and year) that the course would first be taught with the requested change(s).

Response:
Spring

Effective Year

Response:
2020

Credit Hours
Select the number of credits awarded to the student upon successful completion. Note that variable credit courses are not elegible for GE or WR certification.

Response:
3

Prerequisites

Response:
n/a

Current GE Classification(s)
Indicate all of the currently-approved general education designations for this course.

Response:
None

Current Writing Requirement Classification
Indicate the currently-approved WR designation of this course.

Response:
None

Requesting Temporary or Permanent Approval
Please select what type of General Education Approval you desire for this course. Selecting 'Permanent', will request a perment General Education designation. You may also select a temporary General Education assignment for 1, 2, or 3 semesters.

Response:
3 semesters

Requested GE Classification
Indicate the requested general education subject area designation(s) requested for this course. If the course currently has a GE designation and the request includes maintaining that designation, include it here.

Response:
P - Physical Sciences, N - International

Requested Writing Requirement Classification

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Indicate the requested WR designation requested for this course. If the course currently has a WR designation and the request includes maintaining that designation, include it here.

Response:
None

Accomplishing Objectives
Please provide an explanation of how the General Education Objectives will be accomplished in the course. A numbered list is the recommended format (see example GE syllabus). Inclusion of this explanation is a required component of GE courses and syllabi.

Response:
The general education (P) objectives will be accomplished through the examination of the issue of climate change; science, impacts, and approaches to finding solutions to the 'wicked problem' of climate change. Each week, students will study on-line material on a 'hard science' climate change (Fundamental) topic and a 'doing science' or 'science and society' (Framework) topic. Then, in the 2-period class meetings each week, the two topics will be brought together and reinforced by doing critical thinking and application activities and discussions.

The general education (N) 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 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.

Content: Explanation of Assessment
Please provide an explanation of how the General Education Content SLO will be assessed in this course. This is a required component of a General Education syllabus.

Response:
Gen Ed P: 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.
AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…
- Explain fundamental concepts relating to the scientific method, experimentation, and uncertainty.
- identify and explain the drivers and past record of climate change,
- Detail the major lines of evidence for, and uncertainties relating to, the theory of anthropogenic climate change. - - - Explain in depth how climate change affects natural and human systems and how these effects may be reduced.
ACHIEVEMENT OF THIS LEARNING OUTCOME WILL BE ASSESSED THROUGH: weekly on-line quizzes (10% of final grade) as well as in the mid-term exam (15% of final grade). Content mastery is also assessed each week as a portion of the weekly In-class activity and semester project (25% of final grade). (Total = 50% of final grade).

Gen Ed N: Identify, describe, and explain the historical, cultural, economic, political, and/or social experiences and processes that characterize the contemporary world.
AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…
- Explain the historical, cultural, economic, political factors that contribute to the variation in causation of climate change across nations of the world
- Explain in depth how the effects of climate change vary across nations and with socioeconomic factors and cultures worldwide.

- Identify and describe the values, attitudes and norms that shape the attitudes toward climate change in citizens of various countries.
ACHIEVEMENT OF THIS LEARNING OUTCOME WILL BE ASSESSED THROUGH: weekly on-line quizzes (10% of final grade) as well as in the mid-term exam (15% of final grade). Content mastery is also assessed each week as a portion of the weekly In-class activity and semester project (25% of final grade). (Total = 50% of final grade).

Critical Thinking: Explanation of Assessment
Please provide an explanation of how the General Education Critical Thinking SLO will be assessed in this course.This is a required component of a General Education syllabus.

Response:
Gen Ed P: 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.
AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…
- Formulate empirically-testable hypotheses relating to climate change
- Apply the process of critical thinking and scientific inquiry in discovering, understanding, and addressing the challenges of climate change.
- Critically analyze how the biases inherent in different biophysical science methods and theories influence and shape pressing questions about the human condition and the state of our planet.
- Synthesize course lectures and activities to develop a strategy for mitigating climate change and use critical thinking and quantitative skills to evaluate the efficacy of that strategy.
ACHIEVEMENT OF THESE LEARNING OUTCOMES WILL BE ASSESSED THROUGH: completion of exercises, sometimes individually and sometimes in groups, which require them to synthesize and interpret scientific data, and lead them to support or reject existing scientific hypotheses. 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. Critical thinking is also assessed as a portion of the semester project (total 30% of final grade).

Gen Ed N: analyze and reflect on the ways in which cultural, economic, political, and/or social systems and beliefs mediate understandings of an increasingly connected contemporary world.
AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…
- Analyze the ways in which cultural, economic, political, and/or social systems and beliefs shape the causation and understandings and potential solutions of climate change in various regions of the world.
- Evaluate the cultural, economic, political factors that will influence the efficacy of a proposed climate change mitigation strategy in various regions of the world.
ACHIEVEMENT OF THESE LEARNING OUTCOMES WILL BE ASSESSED THROUGH: completion of exercises, sometimes individually and sometimes in groups each week. Analysis and reflection upon the ways in which cultural, economic, political, and/or social systems and beliefs mediate understandings of the issue of climate change is a major component of the activity assigned each week as well as of the semester project (Total = 30% of final grade).

Communication: Explanation of Assessment
Please provide an explanation of how the General Education Communication SLO will be assessed in this course. This is a required component of a General Education syllabus.

Response:
Gen Ed P: 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.
AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO….
- Explain key scientific findings in written, oral, and visual formats.
- Effectively communicate, in both oral and written form, multi-disciplinary scientific challenges and strategies for addressing the issue of climate change.
ACHIEVEMENT OF THESE LEARNING OUTCOMES WILL BE ASSESSED THROUGH: weekly class meetings, in which students will be required to participate in open-ended thoughtful discussions, within their student groups and then to the class as a whole, regarding the climate change topics and policy implications, the process of scientific discovery, ethics, and applications. Communication skill is assessed each week as a portion of the weekly In-class activity and semester project (total 20% of final grade).

Gen Ed N: Communication outcomes are listed in other subject areas.

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SYLLABUS: CLIMATE CHANGE SCIENCE AND SOLUTIONS
UF Quest 2 IDS 2935/####

Spring 2020 Class Meeting place: XXXXXX
Class Meeting time: Tuesday 6th period (12:50-1:40 pm) & Thursday 6th-7th period (12:50-2:45 pm)

INSTRUCTORS

Lead Instructor: Dr Andrew Zimmerman, Department of Geological Sciences
Office: 364 Williamson Hall Ph# 392-0070 e-mail: azimmer@ufl.edu Office Hours: XXXXX

Graduate Teaching Assistant: NAME Office: XXXX
Office Hours: Tues. XXXX pm (or by appt.) e-mail: XXXXX

COURSE DESCRIPTION

Global climate change is the defining issue of our time. It will impact every aspect of life, from the economy, to agriculture, health and ecology, in the 21st century and beyond, and in every country of the Earth. And yet, because of its complexity, multidisciplinary nature, and the preconceptions held by individuals, most people only have a dim understanding of the evidence for, predicted effects, and potential solutions to this issue. In addition to presenting students with the scientific background necessary to evaluate the evidence for the theory of anthropogenic climate change and the global effects of climate change, we will use the topic of climate change to examine how modern science 'is done' and how it is viewed and used in society, globally. Working collaboratively and using the scientific method, we will explore the multi-disciplinary evidence behind climate change and its global and cross-cultural effects and develop potential novel adaptation and mitigation solutions and to communicate this work effectively.

Prerequisites: none **Credits:** 3 **Course Fee:** none

This Class in the Quest 2 Curriculum and fills Physical Science (P) and International (N) Gen Ed Requirements

COURSE DELIVERY

The course will require both on-line and in-class participation. Each week, students will:

1) Complete a 'Spark' Discussion on topic of following week
2) Attend 1 class period that will focus on direct content delivery, i.e. mainly lecture by instructor (Tuesday)
3) Do assigned readings (in textbook and provided on-line) and take on-line quiz (before Thursday)

Attend 2-period class (Thursday) in which students will:

4) Take a team readiness assurance-test (t-RAT) and review material
5) 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. These weekly activities/discussions (led by the instructor and/or TA) will build on lecture content by introducing qualitative and quantitative data analysis and experiential learning through real-life problem assessment. While lectures and discussions emphasize identifying and understanding major course themes, group activities challenge students to synthesize this information and create novel solutions for person, national, and international dilemmas.

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 mitigating climate change.

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 MATERIALS

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.

Required Textbook

Dire Predictions: Understanding Global Warming, by Mann and Kump, 2015, Pearson, 2nd edition ($10-20 used 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

14%	Homework (individual):	
	4% 12 'Spark' Discussions (2 lowest dropped)	4 pts each, 40 total
	10% 12 Quizzes (2 lowest dropped)	12 pts each, 100 total
10%	In-class Quiz (group t-RAT), 12 quizzes, 2 lowest dropped	10 pts each, 100 total
25%	In-class Activities (group) 12 assignments, 2 lowest dropped	25 pts each, 250 total
6%	In-class Attendance (individual) (12 meetings)	5 pts each 60 pts. total
30%	Final Project (group)	300 pts. total
	Initial Proposal (group assessment)	1% = 10 pts.
	Hypothesis/Sources (group assessment)	1% = 10 pts.
	Quant. Method (group assessment)	5% = 50 pts.
	Final Presentation (group assessment)	10% = 100 pts.
	Final Paper (group assessment)	10% = 100 pts.
	Effort and Reflection (individual assessment)	3% = 30 pts.
15%	Mid-term Exam* (Curved to a median of 85%, No Final Exam)	150 pts.
		1000 pts. Total

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 grade of 'C-' or below does not qualify for major, minor, Gen. Ed., or college basic distribution credit. Information on UF grading policies may be found at: catalog.ufl.edu/UGRD/academic-regulations/grades-gradingpolicies/.

Discussions
Discussion are meant to initiate thinking on next week's topic before any material has been presented. For each 'Spark Discussion', each student must make one substantive original comment (2 pts.) and one substantive response to the comment of another student (2 pts.). 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 the 2-period class consisting of 12 multiple choice questions (open book) on all lecture and reading materials presented 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 each 2-period class, 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: ½ for 2 scratches, ¼ for 3 scratches). All team members 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 the 7th class week (7:20-9:10 pm, see schedule below), 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 instructor 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:

- 2 points – Assignment was submitted by the due date (1 points if submitted within 1 day of due date)
- 8 points – Demonstrates complete competence in the terminology, concepts, methodologies and theories used within the subject area.
- 8 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
Attendance scoring will be managed by the Canvas system. Check to make sure all values are recorded correctly. 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.

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Semester Project
Students, in groups of 3-4, will be asked to work as a team to create and evaluate either a strategy to mitigate climate change. The strategies will range widely, e.g., from a solar-powered bicycle to a change in international law. We encourage student groups to consider a local or regional problem and solution, but it is important that the project also be evaluated from an international and multicultural perspective as well. Each group will also quantitatively evaluate the cost and/or potential impacts that would result from the adoption of their strategy. 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) during the semester (see schedule below). 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.

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 and demeanor
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.

Students are expected to arrive to class on time and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones and restrict eating to outside of the classroom. Opinions held by other students should be respected in discussion, and conversations that do not contribute to the discussion should be held at minimum, if at all.

Academic Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by

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the Honor Code. 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 Honor Code (sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Materials and Supplies Fees: There are no additional fees for 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.

Students Requiring Accommodations
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Health and Wellness
U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit umatter.ufl.edu/ to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit counseling.ufl.edu/ or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit shcc.ufl.edu/.

University Police Department: Visit police.ufl.edu/ or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road,
Gainesville, FL 32608; ufhealth.org/emergency-room-trauma-center.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/.

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.

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Weekly CCSS Due Dates*

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Class Lecture (1 period)	Finish Readings **On-line Quiz due 11:59 pm**	**Class** (2 periods) **Turn in ICA on-line by 11:59 pm**	**On-line 'Spark Discussion' due 11:59 pm**	

*this does not include due dates of assignments relating to the Semester Project, Midterm Exam or Field Trip

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Spring 2020 COURSE SCHEDULE

Week Of:	Week #	Module	Fundamental Science Topic	Framework Topic	Other Activities	Reading in 2nd Ed. *Dire Predictions* pgs.
4 - Jan	1	Introduction to climate and CC	Disciplines of climate change	Interdisciplinary Science		
12 - Jan	2		Climate Drivers	Scientific Method		6-29
19 - Jan	3		Climate History	How Science is Done		30-51
26 - Jan	4		Evidence for Anthro. CC	Uncertainty/Consensus		30-51
2 - Feb	5		CC and the Weather	Research and Big Data	Intro. Semester Project (2nd hr)	52-67 & 112-115 & 132-135
9 - Feb	6		CC Projections	Models	Sem. Proj. Initial Proposals	68-117
16 - Feb	7	Problems and Solutions	Ecological Impacts of CC	Team Science	Midterm Exam – Feb. 17 (Mon. 7:20 pm)	124-131 & 188-189
23 - Feb	8		Agriculture/ Land Use	Communicating Science		150-163 & 184-187
1 - Mar	x		- No Class – Spring Break -			
8 - Mar	9		Population/Consumption	Ethics /Sustainability	Sem. Project Hypoth./Source	136-149 & 206-207
15 - Mar	10		Energy	From Lab to the Real	Field trip – Mar. 17	164-177
22 - Mar	11		Built Environment	Effecting Change	Sem Proj. Quant. Method Pres.	178-199
29 - Mar	12	CC Policy	Environmental Policy	Science in Action		200-213
5 - April	13		Sea Level Rise	Science in the Public Realm		36-37 & 110-111 & 122-123 & 158-159
12 - April	14		- - - - - - - - - - - - - - - Semester Project Presentations During Class - - - - - - - - - - - - - - - -			
19 - April	15		Wrap up/Evaluations	- - - - Semester Project Paper & Individual Assessment Due April 28 - - - -		

GENERAL EDUCATION DESCRIPTIONS AND STUDENT LEARNING OUTCOMES

Quest 2 General Education

Quest 2 Objectives

Grounded in the modes of inquiry and analysis characteristic of the social and/or biophysical sciences, Quest 2 courses invite students to address pressing questions facing human society and the planet—questions that outstrip the boundaries of any one discipline and that represent the kind of open-ended, complex issues they will face as critical, creative, and thoughtful adults navigating a complex and interconnected world.

Accomplishment of Quest 2 General Education Objectives

Quest 2 courses will:

- address in relevant ways the history, key themes, principles, terminologies, theories, or methodologies of the various social and biophysical science disciplines that enable us to address pressing questions and challenges about human society and the state of our planet.
- present different social and biophysical science methods and theories, and consider how their biases and influences shape pressing questions about the human condition and the state of our planet.
- enable students to analyze and evaluate (in writing and other forms of communication appropriate to the social and biophysical sciences) qualitative or quantitative data relevant to pressing questions concerning human society and/or the state of our planet.
- analyze critically the role social and the biophysical sciences play in the lives of individuals and societies and the role they might play in students' undergraduate degree programs.
- explore or directly reference social and biophysical science resources outside the classroom and explain how engagement with those resources complements classroom work.

NOTE: A detailed outline the course's week-by-week Topics, Activities, and Learning Objectives is provided below.

Quest 2 General Education Student Learning Outcomes

At the conclusion of the Quest 2 course, students will be able to:

- identify, describe, and explain the cross-disciplinary dimensions of a pressing societal issue or challenge as represented by the social sciences and biophysical sciences incorporated into the course. (Content)
- critically analyze quantitative or qualitative data appropriate for informing an approach, policy, or praxis that addresses some dimension of an important societal issue or challenge. (Critical Thinking)
- develop and present, in terms accessible to an educated public, clear and effective responses to proposed approaches, policies, or practices that address important societal issues or challenges (Communication)
- connect course content with critical reflection on their intellectual, personal, and professional development at UF and beyond. (Connection)

Quest 2 General Education Student Learning Outcomes Assessment

- Content: Describing and explaining the cross-disciplinary dimensions of climate change is a major component of the activity assigned each week as well as of the semester project (Total = 20% of final grade).
- Critical Thinking: Critical analysis of quantitative data and use of data to inform CC approach or policy is a major component of the activity assigned each week as well as of the semester project (Total = 20% of final grade).
- Communication: Presentation of clear and effective responses to proposed approaches, policies, or practices that address the climate change issue is a major component of the activity assigned each week as well as of the semester project (Total = 20% of final grade).
- Connection: A final component of the semester project will be a self-assessment which will encourage students to connect course content with critical reflection on their intellectual, personal, and professional development (Total = 3% of final grade).

NOTE: Assessment rubrics are provided below.

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General Education (Physical Sciences)

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 objectives will be accomplished through the examination of the issue of climate change; science, impacts, and approaches to finding solutions to the 'wicked problem' of climate change. Each week, students will study on-line material on a 'hard science' climate change (*Fundamental*) topic and a 'doing science' or 'science and society' (*Framework*) topic. Then, in the 2-period class meetings each week, the two topics will be brought together and reinforced by doing critical thinking and application activities and discussions.
NOTE: A detailed outline the course's week-by-week Topics, Activities, and Learning Objectives is provided below.

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 SLOS:

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.

AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…
- Explain fundamental concepts relating to the scientific method, experimentation, and uncertainty.
- identify and explain the drivers and past record of climate change,
- Detail the major lines of evidence for, and uncertainties relating to, the theory of anthropogenic climate change.
- Explain in depth how climate change affects natural and human systems and how these effects may be reduced.

ACHIEVEMENT OF THIS LEARNING OUTCOME WILL BE ASSESSED THROUGH: weekly on-line quizzes (10% of final grade) as well as in the mid-term exam (15% of final grade). Content mastery is also assessed each week as a portion of the weekly In-class activity and semester project (25% of final grade). (Total = 50% of final grade).

CRITICAL THINKING SLOS:

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.

AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…
- Formulate empirically-testable hypotheses relating to climate change
- Apply the process of critical thinking and scientific inquiry in discovering, understanding, and addressing the challenges of climate change.
- Critically analyze how the biases inherent in different biophysical science methods and theories influence and shape pressing questions about the human condition and the state of our planet.

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- Synthesize course lectures and activities to develop a strategy for mitigating climate change and use critical thinking and quantitative skills to evaluate the efficacy of that strategy.

ACHIEVEMENT OF THESE LEARNING OUTCOMES WILL BE ASSESSED THROUGH: completion of exercises, sometimes individually and sometimes in groups, which require them to synthesize and interpret scientific data, and lead them to support or reject existing scientific hypotheses. 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. Critical thinking is also assessed as a portion of the semester project (total 30% of final grade).

COMMUNICATION SLOS:
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.

AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO….
- Explain key scientific findings in written, oral, and visual formats
- Effectively communicate, in both oral and written form, multi-disciplinary scientific challenges and strategies for addressing the issue of climate change.

ACHIEVEMENT OF THESE LEARNING OUTCOMES WILL BE ASSESSED THROUGH: weekly class meetings, in which students will be required to participate in open-ended thoughtful discussions, within their student groups and then to the class as a whole, regarding the climate change topics and policy implications, the process of scientific discovery, ethics, and applications. Communication skill is assessed each week as a portion of the weekly In-class activity and semester project (total 20% of final grade).

NOTE: Assessment rubrics are provided below.

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General Education (International)

Objectives (International)

International courses promote the development of students' global and intercultural awareness. Students examine the cultural, economic, geographic, historical, political, and/or social experiences and processes that characterize the contemporary world, and thereby comprehend the trends, challenges, and opportunities that affect communities around the world. Students analyze and reflect on the ways in which cultural, economic, political, and/or social systems and beliefs mediate their own and other people's understanding of an increasingly connected world.

Accomplishment of General Education Objectives (International)

The general education 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 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. **NOTE:** A detailed outline the course's week-by-week Topics, Activities, and Learning Objectives is provided below with International components of each highlighted.

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 SLOS:

Students identify, describe, and explain the historical, cultural, economic, political, and/or social experiences and processes that characterize the contemporary world.

AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…

- Explain the historical, cultural, economic, political factors that contribute to the variation in causation of climate change across nations of the world
- Explain in depth how the effects of climate change vary across nations and with socioeconomic factors and cultures worldwide.
- Identify and describe the values, attitudes and norms that shape the attitudes toward climate change in citizens of various countries.

ACHIEVEMENT OF THIS LEARNING OUTCOME WILL BE ASSESSED THROUGH: weekly on-line quizzes (10% of final grade) as well as in the mid-term exam (15% of final grade). Content mastery is also assessed each week as a portion of the weekly In-class activity and semester project (25% of final grade). (Total = 50% of final grade).

CRITICAL THINKING SLOS:

Studnets analyze and reflect on the ways in which cultural, economic, political, and/or social systems and beliefs mediate understandings of an increasingly connected contemporary world.

AT THE END OF THE COURSE, STUDENTS WILL BE ABLE TO…

- Analyze the ways in which cultural, economic, political, and/or social systems and beliefs shape the causation and understandings and potential solutions of climate change in various regions of the world.
- Evaluate the cultural, economic, political factors that will influence the efficacy of a proposed climate change mitigation strategy in various regions of the world.

ACHIEVEMENT OF THESE LEARNING OUTCOMES WILL BE ASSESSED THROUGH: completion of exercises, sometimes individually and sometimes in groups each week. Analysis and reflection upon the ways in which

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cultural, economic, political, and/or social systems and beliefs mediate understandings of the issue of climate change is a major component of the activity assigned each week as well as of the semester project (Total = 30% of final grade).

COMMUNICATION SLOS:
n/a

NOTE: Assessment rubrics are provided below.

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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	Rating/Points			
Submission	2.0 pts In-class activity was submitted by the due date.		1.0 pts In-class activity was submitted within 1 day of the due date.	0.0 pts ICA was submitted between 1 and 7 days after the due date.
Content	8.0 pts Demonstrates complete competence in the terminology, concepts, methodologies and theories used within the subject area and fully describes its cross-disciplinary and cross-cultural dimensions.	5.0 pts Demonstrates some competence in the terminology, concepts, methodologies and theories used within the subject area and somewhat describes its cross-disciplinary and cross-cultural dimensions.	2.0 pts Demonstrates poor competence in the terminology, concepts, methodologies and theories used within the subject area and poorly describes its cross-disciplinary and cross-cultural dimensions.	0.0 pts No demonstration of competence in the terminology, concepts, methodologies and theories used within the subject area and does not describes its cross-disciplinary and cross-cultural dimensions.
Critical Thinking	8.0 pts Carefully, logically, and fully analyzes information from multiple perspectives and develops reasoned solutions to problems within the subject area and beyond. Effectively uses data to inform CC approach or policy.	5.0 pts To some extent, analyzes information from multiple perspectives and develops reasoned solutions to problems within the subject area and beyond. Uses data to inform CC approach or policy to some extent.	2.0 pts Mostly description or summary, without consideration or support of evidence. Generally unfocused and no connections made between ideas and beyond subject area. Little use of data to inform CC approach or policy.	0.0 pts Displays no evidence of engagement with the topic.
Communication	7.0 pts Clearly and effectively communicates knowledge, ideas, and reasoning in forms appropriate to the subject area.	4.0 pts Somewhat clearly and effectively communicates knowledge, ideas, and reasoning in forms appropriate to the subject area.	2.0 pts Poorly communicates knowledge, ideas, and reasoning in forms appropriate to the subject area.	0.0 pts The assignment is unfocused and/or displays little or no degree of completion.
				Total = 25 Points

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Rubric for Grading of Semester Project Final PRESENTATION (Final Paper Rubric is similar)

ELEMENT COMPLETION (10 points total)
___/1 pt Title Slide, Introduction, Detailed proposal
___/1 pt Well-worded hypothesis and subhypotheses as to the efficacy of the project
___/1 pt Hypothesis testing method clearly explained. Equations presented are clear and all numbers have units
___/1 pt All benefits factored into equations (e.g. if C emissions were reduced, this was monetized)
___/1 pt All data used to solve equations clearly explained and sources given
___/1 pt Quantitative error analysis conducted (not just qualitative list of uncertainties)
___/1 pt Conclusions drawn linked directly to quantitative analysis (hypothesis testing) done
___/1 pt Separate section discussing larger significance provided (importance beyond the scope of the project)
___/1 pt Citations made on each slide where fact was used. Bibliography alphabetic and lists all references cited.
___/1 pt Figures on almost every slide. Text not too small. Presentation shared equally by group members.

Criteria/Score	Outstanding:	Satisfactory:	Unsatisfactory:
CONTENT (P) **__ /18 pts**	Complete competence in applying the terminology, concepts, methodologies and theories used within the subject area (18-16 pts).	Some competence in applying the terminology, concepts, methodologies and theories used within the subject area (15.9-12 pts).	Poor competence in applying the terminology, concepts, methodologies and theories used within the subject area (<12 pts).
CONTENT (Q & N) **__ /18 pts**	Completely describes the cross-disciplinary and cross-cultural (economic, political/social) dimensions of the project (18-16 pts).	Somewhat describes the cross-disciplinary and cross-cultural (economic, political/social) dimensions of the project (15.9-12 pts).	Little or no description of the cross-disciplinary and cross-cultural (economic, political/social) dimensions of the project (<12 pts).
CRITICAL THINKING (P) **__ /18 pts**	Very effectively applies logical reasoning skills through scientific criticism and argument within the subject area. Very effectively applies techniques of discovery and critical thinking to solve experiments and to evaluate outcomes (18-16 pts).	Somewhat effectively applies logical reasoning skills through scientific criticism and argument within the subject area. Somewhat effectively applies techniques of critical thinking to solve experiments and to evaluate outcomes (15.9-12 pts).	Poorly applies logical reasoning skills through scientific criticism and argument within the subject area. Poorly applies techniques of discovery and critical thinking to solve experiments and to evaluate outcomes (<12 pts).
CRITICAL THINKING (Q & N) **__ /18 pts**	Thorough consideration of issues from multiple perspectives (cross-disciplinary and cross-cultural), logically analyzes evidence from credible, relevant sources, and develops fully reasoned conclusions and policy responses (18-16 pts).	Considers issues from multiple perspectives (cross-disciplinary and cross-cultural), logically analyzes evidence from credible, relevant sources, and develops reasoned conclusions and policy responses (15.9-12 pts).	Does not consider issues from multiple perspectives (cross-disciplinary and cross-cultural), or logically analyze evidence from credible, relevant sources, and develop reasoned conclusions or policy responses (<12 pts).
COMMUNICATION **__ /18 pts**	Communicates knowledge, ideas, and reasoning clearly and effectively, very polished and practiced (18-16 pts).	Communicates knowledge, ideas, and reasoning, somewhat polished, with some polish & practice (15.9-12 pts).	Does not communicate ideas and reasoning effectively, not polished or practiced (<12 pts).
Total: ____ /100 Points			

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DETAILED WEEKLY SCEDULE

NOTE: This document outlines the overall and week-by-week Topics, Summary of Activities, and Learning Objectives covered in IUF2100 (Climate Change Science and Solutions). International components of each are highlighted with yellow shading.

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

5) Assigned Readings

Leiserowitz, A., Maibach, E., Roser, Renouf, C., Feinberg, G., & Rosenthal, S. (2015). Climate change in the American mind: October, 2015. Yale University and George Mason University. New Haven, CT: Yale Program on Climate Change Communication. https://climatecommunication.yale.edu/publications/more-americans-perceive-harm-from-global-warming-survey-finds/

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

5) Assigned Readings

Dire Predictions Textbook pgs. 6-29.

Understanding Science. 2019. University of California Museum of Paleontology. 3 January 2019, http://www.understandingscience.org.

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

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

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.

5) Assigned Readings

Dire Predictions Textbook pgs. 30-51.

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

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

Monnin et al., 2010. Atmospheric CO_2 Concentrations over the Last Glacial Termination. Science. 291: 112-114. DOI: 10.1126/science.291.5501.112.

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.

5) Assigned Readings

Dire Predictions Textbook pgs. 30-51.

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/.

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

Sense About Science, Making Sense of Uncertainty, 2013.
http://www.senseaboutscience.org/resources.php/127/making-sense-of-uncertainty.

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

Doran and Zimmerman, 2009. Examining the Scientific Consensus on Climate Change, Eos, v.90 no.3. DOI: 10.1029/2009EO030002.

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.

5) Assigned Readings

Dire Predictions Textbook pgs. 52-67 & 112-115 & 132-135.

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

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

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.

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

5) Assigned Readings

Dire Predictions Textbook pgs. 68-117.

Goosse H., P.Y. Barriat, W. Lefebvre, M.F. Loutre and V. Zunz, (2008-2010). Introduction to climate dynamics and climate modeling. Online textbook available at http://www.climate.be/textbook, Modelling the climate system.

Constructing a Climate Model, 2012 by the National Academy of Sciences. http://nas-sites.org/climate-change/climatemodeling/page_3_1.php.

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

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- 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.*

5) Assigned Readings

Dire Predictions Textbook pgs. 124-131 & 188-189.

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.

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

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

5) Assigned Readings

Dire Predictions Textbook pgs. 150-163 & 184-187.

Center for Research on Environmental Decisions. (2009). The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public. New York.

Global Warming's Six Americas in December 2018. Report by Yale Project on Climate Change Communication and the George Mason University Center for Climate Change Communication.

UNEP (2014) Assessing Global Land Use: Balancing Consumption with Sustainable Supply. A Report of the Working Group on Land and Soils of the International Resource Panel. Bringezu S., Schütz H., Pengue W., O´Brien M., Garcia F., Sims R., Howarth R., Kauppi L., Swilling M., and Herrick J.

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.

5) Assigned Readings

Dire Predictions Textbook pgs. 136-149 & 206-207.

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

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

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

Mata FJ, Onisto LJ, Vallentyne JR (2012) Consumption: the other side of population for development. Ethics Sci Environ Polit 12:15-20. https://doi.org/10.3354/esep00122.

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.

5) Assigned Readings

Dire Predictions Textbook pgs. 164-177 & 182.

Project Drawdown Electricity Sector Summary: https://drawdown.org/solutions/electricity-generation

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.

Rühl, C., P. Appleby, J. Fennema, A. Naumov, M. Schaffer, Economic development and the demand for energy: A historical perspective on the next 20 years, Energy Policy, Volume 50, November 2012, Pages 109-116, ISSN 0301-4215. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/economic-development-demand-for-energy.pdf

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

Students design a sustainable piece of infrastructure (community, building, transportation route, etc.) and surroundings that will help Gainesville mitigate and/or adapt to CC. The design process starts with conceptualization (a sketch perhaps) and then progressively becomes more refined, adding more and more levels of detail. Students must annotate your final product with at least 6 features from LEED categories.

5) Assigned Readings

Dire Predictions Textbook pgs. 178-199.

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.

Ewing R, Schmid T, Killingsworth R, Zlot A, Raudenbush S., 2003. Relationship Between Urban Sprawl and Physical Activity, Obesity, and Morbidity. Am. J. Health Promot. 2003 Sep-Oct;18(1):47-57.

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.

5) Assigned Readings

Dire Predictions Textbook pgs. 200-213.

Curbing climate change: The deepest cuts. The Economist, 2014. https://www.economist.com/briefing/2014/09/20/the-deepest-cuts

Nachmany, M. and J. Setzer. Global trends in climate change legislation and litigation 2018 snapshot. Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, 2018. http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2018/04/Global-trends-in-climate-change-legislation-and-litigation-2018-snapshot-3.pdf

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.

5) Assigned Readings

Dire Predictions Textbook pgs. 36-37 & 110-111 & 122-123 & 158-159.

Larson, B., 2009. Scientizing Politics: The Honest Broker: Making Sense of Science in Policy and Politics by Roger A.

Pielke, Jr., Alternatives Journal 35:2 2009

Miami: How Rising Sea Levels Endanger South Florida, Jeff Goodall, *Rolling Stone*, 2013, https://www.rollingstone.com/politics/politics-news/miami-how-rising-sea-levels-endanger-south-florida-200956/

Hallegatte, Stephane, Green, Colin, Nicholls, Robert J., and Corfee-Morlot, Jan. 2013. Future flood losses in major coastal cities, Nature Climate Change, 3: 802.

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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.

We encourage student groups to consider a local or regional problem and solution - be it state of Florida, Gainesville, or on the UF campus or even in one's dormitory), but it is important that the project also be evaluated from an international and multi-cultural perspective as well. 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. 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. What economic, social or cultural barriers might there be in other locations?

Week 14:

Group Oral Presentation of Semester Project - See posted 'Semester Project Student Handout' in the Semester Project Module for details on what information to include.

Week 15:

Group Written Presentation of Semester Project - See posted 'Semester Project Student Handout' in the Semester Project Module for details on what information to include. It will include revisions/improvements based upon comments made during the Final Presentation AND some additional elements. In particular, you will provide a more in depth discussion of the broader implications of your work and thought about whether/how/where your project should be nationalized/globalized.

Submit Individual Assessment - This will include a self-reflective evaluation of: 1) a recounting of the role that you and others in your group played in completing the semester project, 2) the success of the collaborative efforts of your group, 3) how the course content has affected your intellectual, personal, and professional development.

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