UNIVERSITY OF CALIFORNIA, MERCED

ES 200 Environmental Systems

Course Information

Spring Term 2017
M-W 9:30-11:20
CLASSROOM 274

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Course Description:

Human activities are profoundly affecting the global environment. The magnitude of human-induced changes is capable of changing global biogeochemical cycles. In this course we will investigate Earth as a system through a multidisciplinary lens. Initially we will focus on background concepts (cycles, formation of the Earth, evolution) and modeling approaches. We will then study key reservoirs (water, atmosphere, soils and oceans) and modeling approaches. We will use an Operation-oriented programming (e.g. STELLA or a similar model) to model complex systems. We will discuss how climate change is affecting all aspects of the Earth's system.

Course Goals Learning Outcomes

The ultimate goal in studying Earth systems is to understand enough to explain past changes and predict the future system. To do so, we will use a multi-disciplinary approach. Tools that we will learn to use include an object-oriented computer code (e.g., STELLA) to model systems by approximating Earth as a series of boxes with fluxes in and out. Our goal is for students to become proficient in

1. the basic concepts about global biogeochemical cycles,

2. modeling Earth systems with object-oriented programming (e.g., STELLA)

3. estimating the importance of Earth system processes using fundamental principles

4. formulating a proposal to investigate Earth system processes

5. orally presenting material to class.

Teaching Philosophy

Learning without thought is labor lost. ~Confucius

I believe learning is accomplished by approaching the subject using different approaches. In this course students will read, attend lectures and computer workshops, problem solve, use object-oriented programs to define systems, write papers, do a project as well as two in-class presentations. I expect students to come to class primed to discuss the material they have read in preparation for the class.

Texts:

Our Changing Planet: an introduction to Earth system science and global environmental change.

By Fred T. Mackenzie

A supplemental reading list is attached developed, there will be class exercises using *Consider a Spherical Cow* by John Harte (highly recommend you purchase it) and *Modeling the Environment* by Andrew Ford.

Class Participation:

The material for which you are responsible is defined by the content and scope of the lectures and class discussions. *Copies of all handouts will be available on the website or else from instructors.*

For the classes covering material after Chap 2, students will be asked to find a current paper/report relevant to the material to be covered that week. It should be posted the week prior to allow all students to read it. In addition study questions will be posted ahead of time.

Homework:

Six homework assignments will be given on approximately a bi-weekly basis and will be due on the date indicated. Homework will be corrected as soon as possible. Some homework will involve use of object oriented programs. Late homework will not be accepted.

Students are expected to present a class and to write and to present a research proposal (see below).

Class Presentation:

Each student will present a case study on the changing Earth. Topics will be chosen from Chapters 8 and 15. The presentations will be done in teams, so teamwork and coordination is important. The presentations will be about 10-12 min per student, so there will be typically 5 per class time. Students will be expected to cover major aspects of the changes (historic trends, effects and societal response). Students will be graded on visuals (how effective and readable), presentation (both delivery and answering questions), coordination and content. Be sure to credit sources of graphics, data, etc. All non-presenting students will be asked to comment on the presentation.

Rubric for class presentation is posted on CATCOURSES.

Proposal:	Write a research proposal related to your graduate research topic or a topic of interest. Develop a question & hypothesis for the proposed work. Develop a model of a process or system related to this topic and use it to test what are the key parameters or if the proposed work is of interest/feasible. Models should be appropriate for the project, but should include a sensitivity analysis of key parameters. The sensitivity analysis is key, to show that the variable of interest is important to the behavior of the system.Write up a project proposal, including a description of the model and its testing (including sensitivity analysis). Describe your findings from this exercise and their implications on your project proposal. Include a workplan to test your hypothesis and a proposed budget. Proposal grade will include quality of proposal as well as analysis presented (we will consider content, organization and writing style). Students are expected to get approval for proposal topic before Apr. 4. If you want feedback, provide a draft proposal before that date. The proposal is due at the final class for the semester (May 6). The proposal is for this class and not a summary of research already performed. This proposal should be unique for this class and can be a basis for other uses (e.g. qualifying exam proposals); remember that one can only get credit in one setting (e.g. class) for an assignment. Proposal length 5-10 pages (1.5 spacing) Rubric for grading proposal is posted on CATCOURSES.
Proposal Presentation:	Each student will give a 10 min presentation of their project. Other students will be required to make anonymous written critique of presentation. Similar to cycle presentations, students will be graded on visuals, presentation and content. Rubric for oral presentation is posted on CATCOURSES.
Office Hours:	There will be office hours for questions, review, etc. All other office hours are by appointment, dropping by is encouraged (at your own risk of finding no one there).
OOP (object oriented programs):	German Gavilan (Assistant Dean, Deans Office, School of Engineering) has arranged for you to use STELLA (an OOP) remotely (ggavilan@ucmerced.edu). There is a good support website for it: http://www.iseesystems.com/softwares/Education/StellaSoftware.aspx
Web Site:	Powerpoint presentations, problem sets and solutions and other material will be posted on the class web site, which may be accessed at https://ucmcrops.ucmerced.edu All registered students should have access the course web page.
Exams:	There will be no exams

Grades: There is no strict formula, but the weighting will be approximately: Homework 30%; Project 30%; Presentation 10%, Class participation 15%, Class presentation 15% . All components are essential, you will not receive a passing grade in this course if you haven't completed a component of the course. For example, let us assume John Doe didn't hand in any homeworks, but received a 'B' grade or better in all other components. His final grade will be 'F' without any exceptions. The grading scale is determined by the students' performances (with A representing "excellent" work).

Academic Integrity:

I. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work. For this course, collaboration is allowed in discussing of homework problems (see II)

II. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

III. Posting of any of the course material on a website other than the official course website is considered a copywrite infringement.

Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations

Useful Reference books for ES 200 Spring 2015

Consider a Cylindrical Cow
John Harte
University Science Books
ISBN 1-891389-17-3

Consider a Spherical Cow
John Harte
University Science Books
ISBN 0-935702-58-X

Global Environment: Water, Air and Geochemical Cycles
Elizabeth Berner and Robert Berner
Prentice Hall
ISBN 0-13-301169-0

Biogeochemistry: An analysis of global change
William Schlesinger
Academic Press
ISBN 0-12-625155-X

Modeling the Environment
Andrew Ford
Island Press
ISBN 1-55926-473-3

Earth System Science: from biogeochemical cycles to global change
Edited by Michael C. Jacobson, Robert J. Charlson, Henning Rodhe and Gordon Orians
Elsevier
ISBN 0-12-379370-X

UNIVERSITY OF CALIFORNIA, MERCED

ES 200 Environmental Systems Course Schedule 2/17/17*

Class	Date	Topic	Reading	Presentor+
1	Jan 18	Introduction course description	Ch 1 & Suppl.	
2	Jan 23	System environmental change	Suppl.	
3	Jan 25	Earth's lithosphere: isotopes	Ch 2	
4	Jan 30	No class		
5	Feb 1	Earth's lithosphere: geologic time & building blocks	Ch 2	
6	Feb 6	Eath's lithosphere: plate tectonics	Ch 3	
7	Feb 8	Object oriented programming & problem solving	AF Ch 2-4	
8	Feb 13	Object oriented programming & problem solving	AF Ch 5	
9	Feb 15	Fluid Earth: atmosphere	Ch 4	
	Feb 20	President's day		
10	Feb 22	Fluid Earth: atmosphere	Ch 4	
11	Feb 27	Fluid Earth: hydrosphere & air-sea interactions	Ch 5	
12	Mar 1	Fluid Earth: hydrosphere & air-sea interactions	Ch 5	
13	Mar 6	Earth's ecosphere	Ch 6	
14	Mar 8	Earth's ecosphere	Ch 6	
15	Mar 13	Biogeochemical cycles: C	Ch 7	
16	Mar 15	Biogeochemical cycles: nutrients	Ch 7	
17	Mar 20	Global N cycle perturbations	Suppl.	
18	Mar 22	CA ag lands & N cycle perturbations	Suppl.	
	Mar 27	Spring break		
	Mar 29	Spring break		
19	Apr 3	Terrestrial vegetation: forests**	Ch 10	
20	Apr 5	Terrestrial vegetation: agroecosystems	Ch 10	
21	Apr 10	Human forcing on ecosphere: resources	Ch 9	Students
23	Apr 12	Human forcing on ecosphere: population	Ch 9	
23	Apr 17	Land & Water	Ch 11	
24	Apr 19	Land & water	Ch 11	
25	Apr 24	Stratospheric ozone depletion	Ch 14	
26	Apr 26	Greenhouse gases	Ch 14	
27	May 1	Human dimensions: approaches & sustainability	Ch 15	Students
28	May 3	Human dimensions: approaches & sustainability	Ch 15	
	May 10	Project presentations 6:30-9:30 pm	—	Students

*Subject to change; +student presenting paper

**get approval about your project topic by this date