GEOGRAPHY/SOILS 526

HUMAN TRANSFORMATIONS OF EARTH SURFACE PROCESSES (TRANSFORMING EARTH SYSTEMS)

Schedule: Mondays and Wednesdays 2:30-3:45 pm in Science Hall 450
Credits: 3 (Counts toward the Natural Science requirement.)
Credit Information: This class meets for two 75-minute class periods each week over the spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc.) for about 3 hours out of classroom for every class period.
Instructor: Prof. Erika Marín-Spiotta, marinspiotta@wisc.edu, Science Hall 223
Office Hours: Tuesdays 1-2 pm, Thursdays 12-1 pm or by appointment

SYNOPSIS

This course takes an earth systems approach to explore the role of human societies in shaping earth surface processes from local to global scales. We address how alterations to our landscapes and waterways affect biological, physical and chemical interactions among our biosphere, geosphere, hydrosphere and atmosphere. We discuss methods used to distinguish the "human impact" from background variability.

FULL COURSE DESCRIPTION

The influence of human activities is now recognized to extend all over the globe, which has led some researchers to propose renaming our current geologic epoch the Anthropocene, for the "Age of Humans." This course takes an earth systems approach to explore the role of human societies in shaping earth surface processes. We address how alterations to our landscapes and waterways affect biological, physical and chemical interactions among our biosphere, geosphere, hydrosphere and atmosphere. In particular, we focus on the methods used to distinguish the "human impact" from background variability. Topics covered include: approaches to understand earth system interactions, major alterations to biogeochemical cycles and geomorphic processes, biophysical consequences of changes in land cover and land use, urban biogeochemistry, and emergence of novel environmental conditions. For each topic, we delve into the biophysical science behind each relevant process and discuss different approaches for characterizing and quantifying changes due to human activities. We explore the recent literature to evaluate how biogeochemical and earth system models incorporate human influences to better understand feedbacks between the earth surface, atmosphere and climate.

COURSE LEARNING OUTCOMES

At the end of the semester, students should be able:

1) To synthesize how major global biogeochemical cycles and earth surface processes are influenced by human activities;
2) To identify positive and negative feedbacks among the biosphere, geosphere and atmosphere at different spatial and temporal scales;
3) To explain how different methods are used to characterize and quantify human effects on the earth system;
4) To interpret and analyze research findings in the primary literature, that is, scientific articles in peer-reviewed journals;
5) To summarize research for different audiences.

DELIVERABLES
The final products for this course will be:
(1) an annotated bibliography;
(2) an opinion to the editor essay;
(3) a methods tool-box; and
(4) a research proposal. (Grad students)

READINGS
All required readings will be posted on Canvas. There is no required textbook for this course.

Tips on How to Read a Scientific Paper
http://cbc.arizona.edu/classes/bioc568/papers.htm

COURSE POLICY:
This course has a large in-class discussion component and I expect you to attend all class meetings, complete the reading assignments and come prepared to ask questions, share your reactions and engage in the conversation. Please respect your fellow students, professor and guest speakers and turn off the ringers on your cell phones and refrain from texting during class time. Only class-related internet and computer use is allowed during the class period. There will be no extra credit.

EVALUATION:
- Discussion facilitations (two): 15 points
- Reading reflections (two): 10 points
- Annotated bibliography: 10 points
- In-class quizzes (six): 5 points each for a total of 30 points
- Op-Ed essay: 30 points
- Methods tool-box: 35 points

Undergrad students total: 130 points.

Grad students: All of the above plus:
- Research proposal: 35 points

Grad students total: 165 points.

Final letter grades will be determined out of 100 % following these guidelines: (A (100-93); AB (92-88), B (87-81), BC (81-78), C (77-70), D (69-60), F (≤ 59)).

1. Participation
- Discussion: Every week, you are expected to read all the assigned readings prior to class and to think about them critically in preparation for participation in class discussions.
- Written discussion questions: By 8 pm the day prior to each class, you will be responsible for posting one question on the online discussion board to help steer the discussion.

2. Discussion facilitation (15 points): Each student will lead one week (two class discussions) in pairs. Leaders will summarize required readings and be responsible for

leading discussion in class, addressing appropriate questions that the other participants will have posted on the discussion board. You may use activities to help promote deeper understanding of the material being explored. The discussion leaders will be responsible for compiling all the submitted questions into one Word document and sending it to me by 1 pm the day of class for printing.

3. Reading reflections (10 points): Please submit two 1-page, single-spaced reading reflections (5 points each) on two readings of your choice additional to those required for the class. These readings may come from the course bibliography and be a peer-reviewed article or chapter or a news article that expands on the topics discussed in class. Summarize the reading, describe how it relates to course concepts and other readings and reflect on how it advances your understanding of the topic. These are due by the last day of class.

4. Annotated bibliography (10 points): An annotated bibliography is an organized list of sources by topic where we will compile summaries of all read papers that can serve as a reference for future work. Discussion facilitators will be responsible for writing (in your own words- do not just rewrite the paper abstract) an abstract for the assigned papers *the days you lead seminar discussion only*. At the end of the semester, abstracts for each weekly topic will be compiled and shared with the rest of the seminar participants. Abstracts should be around 100 words and provide a brief review of the major themes and/or questions brought up in the reading. The abstracts should distill the main ideas of the paper. All reading summaries are due on Monday, April 30th although I encourage you to submit them while the papers are still fresh on your mind.

5. Quizzes (30 points total): We will have six in-class quizzes, each worth 5 points, to test understanding of concepts discussed in the readings and in class. These will occur during class-time every two weeks or so as noted on the schedule and will consist of short answer essays, multiple-choice questions or interpretation of a figure. There are no full-length examinations and there will be no exam during finals week.

6. Op-Ed essay (30 points): An Op-Ed ("opposite the editorial page" or "opinion editorial") is a written piece that expresses an opinion. Choose an audience and venue (magazine, newspaper, blog) and write a short essay (500-600 words only) to make an argument about a topic related to the course. You will receive separate writing guidelines for the op-ed.

- First draft (10 points) due on Wednesday, March 7th.
- Peer-reviews due (5 points). Each student is responsible for providing a peer-review of two other Op-Eds. Reviews are due on Wednesday, April 4th.
- Final draft (10 points) due on Monday, April 16th.
- In-class presentations (5 points) of Op-Ed on Monday, April 16th and Wednesday, April 18th.

7. Methods Tool-box (35 points): Compile an annotated list of methods (experimental, observational, inferential, modeling…) from different disciplines to compare and contrast approaches. We will discuss this project in more detail.

- Outline (10 points) due on Wednesday, February 28th.

- Presentations in class (5 points) on Wednesday, April 30th and Wednesday, May 2nd.
- Final draft (20 points) due on Wednesday, May 2nd.

GRADUATE STUDENTS:

8. Research proposal (35 points): Write a 5-page (single-spaced) research proposal to fund research on a topic related to the course. Please consult your final topic with me. I will hand out writing guidelines for the proposal.

- First draft (10 points) due on Moday, March 19th.
- Peer review (5 points) due on Monday, April 2nd.
- Final draft (20 points) due on Monday, April 23rd.

COMMENTS:

At the beginning of each class period I will devote time for questions on any material from previous class meetings. I expect you to let me know if any of the material is confusing either in person before or after class, by email or in my office hours. Comments are welcome at any time. I encourage you to come to office hours. Anectodal evidence suggests that asking questions in class and coming to office hours helps students learn course material. Please let me know in person or via email if you need any special accommodations throughout the semester. I'm happy to work with you to make this a productive learning experience.

ACADEMIC INTEGRITY:

Academic honesty requires that all course work a student presents to an instructor honestly and accurately indicates the student's own academic efforts. Please review the university's guidelines on proper conduct:
http://students.wisc.edu/saja/misconduct/UWS14.html
Examples of academic misconduct include: cutting and pasting text from articles or from the web without proper citation and paraphrasing without crediting the source. When in doubt about how to properly cite something, come talk to me.

ADDITIONAL RESOURCES FOR STUDENTS:

I am happy to work with students who need additional accommodations for learning. Please talk to me early on in the semester, or as challenges arise, so I can help you find the best accommodations.

- McBurney Disability Resource Center. http://www.mcburney.wisc.edu/
- GUTS (Greater University Tutoring Service) tutoring. See their homepage to inquire about individual tutors/general tutoring sessions. http://www.guts.wisc.edu/
- UW Writing Center. See their website for information about drop-in or scheduled appointments with expert writers. They will help with just about any type of writing assignments/needs. http://www.writing.wisc.edu/
- L&S Student and Academic Affairs. See their website for questions regarding medical absences and other emergencies that may affect your ability to attend courses and complete coursework. http://saa.ls.wisc.edu
- Mental Health Services. University Health Services mental health providers understand the complexities of student life and offer and open, safe and

confidential environment to help students through challenges that may interfere with their development, well-being and academic productivity. https://www.uhs.wisc.edu/mental-health/

- Campus Women's Center: https://occfr.wisc.edu/parent-resources/campus-womens-center/
- Multicultural Student Center: https://msc.wisc.edu
- LGBT Campus Center: https://lgbt.wisc.edu/
- Veterans Resource Center: https://veterans.wisc.edu/
- International Student Services: https://iss.wisc.edu/
- Title IX Office: https://compliance.wisc.edu/titleix/
- Any student facing food and/or housing insecurity and who believes this may affect their performance in the course, is urged to contact the Dean of Students for support: https://doso.students.wisc.edu/student-assistance/. Please notify me if you don't feel comfortable doing so, so I can help you access resources. As a student at UW-Madison there are numerous resources available to you, including your Deans. Each student has two Deans, an **Academic Dean,** whose role is to assist students with academic matters pertaining to his/her/their respective School or College, and the Dean **of Students**, whose role is to assist students with personal matters.

Geography 526				**Spring 2018 Schedule**		
			Week	Topics	Assignments	Readings
Jan	24	W	*1*	Introduction & Measuring the Anthropocene I		
	29	M	*2*	Measuring the Anthropocene II		Waters et al. 2016; Ellis et al. 2016; Smith & Zeder 2013
	31	W		Critiques of the Anthropocene		Malm & Hornborg 2014; Ruddiman et al. 2015; Davis & Todd 2017
Feb	5	M	*3*	Earth systems approach I (Kevin Burke)		Heavens et al. 2013; Scholze et al. 2012
	7	W		Earth systems approach II		Jacobson et al. 2000; Chin et al. 2014
	12	M	*4*	Carbon cycle I		Ciais et al. 2014
	14	W		Carbon cycle II		Shoemaker et al. NOAA/ESRL websites
	19	M	*5*	Nitrogen cycle I		McLauchlang et al. 2007
	21	W		Nitrogen cycle II	*Calculate your N footprint*	era et al. 2017; Fissore et al. 2011; http://calc.nprint.org/::YYYI
	26	M	*6*	Land-atmosphere interactions I		Devaraju et al. 2015; Kirschbaum et al. 2011
	28	W		Land-atmosphere interactions II	*Methods Toolbox outline due*	Garcia et al. 2016
Mar	5	M	*7*	Land cover reconstructions I		Gaillard et al. 2010; Klein Goldewijk et al. 2017
	7	W		Land cover reconstructions II	*Op-ed first draft due*	Houghton et al. 2012
	12	M	*8*	Agriculture I		Hartman et al. 2011
	14	W		Agriculture II		Ruddiman et al. 2014
	19	M	*9*	Soil Erosion	*Grad student proposal first draft due*	McWethy et al. 2010
	21	W		Mining		Tarolli and Sofia 2016; Induced Earthquakes (USGS)
	26	M	*10*	*No class- Spring break*		
	28	W		*No class- Spring break*		
Apr	2	M	*11*	Urbanization I	*Grad student proposal peer-review due*	Lookingbill et al. 2009
	4	W		Urbanization II (David Abel)	*Op-Ed peer-reviews due*	
	9	M	*12*	*Methods Toolbox workshop*		
	11	W		*Methods Toolbox workshop*		
	16	M	*13*	*Op-Ed presentations I*	*Final Op-Ed pieces due*	
	18	W		*Op-Ed presentations II*		
	23	M	*14*	Land-water interface I	*Final grad student proposal due*	Jefferson et al. 2013; Walling 2006
	25	W		Land-water interface II (Chris Kucharik)		
	30	M	*15*	*Methods Toolbox presentations*	*Annotated bibliography due*	
May	2	W		*Methods Toolbox presentations*	*Final Methods Toolbox due*	