GEOL 5315 Selected Topics
ESE 6307 Interdisciplinary Problem Solving
Sustainable Socio-Environmental Systems
Spring 2015

Lecture: MWF 10:30-11:20 GEO 302

Instructor
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GEO 305C
dddennington@utep.edu
Office Hours: MWF 11:30-12:30 or by appointment

General Information
Increasingly, scientists are called upon to marshal their efforts towards addressing a variety of complex societal challenges. This graduate seminar will explore the emerging literature around interactions between land, water, biotic, atmosphere, infrastructure and human processes, along with calls for “actionable science” for decision-making. The course will include key literature describing the need for such integrated analyses; case studies of integrated research projects; invited speakers from integrated research projects; evaluation of methodological strategies; and assessment of barriers to integrated research and actionable science.

Prerequisite: None

Course Objectives
• Know the fundamental issues underlying sustainability
• Learn how to analyze complex socio-environmental systems using qualitative techniques
• Connect the workings of socio-environmental systems with implications for sustainability
• Discover approaches for quantitative analysis of socio-environmental systems
• Be familiar with some examples of current research in this area
• Think creatively about how policy and management alternatives impact sustainability
• Communicate concisely about complex socio-environmental problems

Class participation
VERY IMPORTANT: This course will be comprised of numerous in class activities. The instructor will drop any student who misses 3 classes or more. Reading assignments must be completed before class. There will be discussion and in-class exercises based on the reading.

Course Textbooks
Additional readings of journal articles will be provided during the semester. These readings will be made available to you in one of the following ways (depending on logistics and copyright issues):

- on the Internet (e.g., certain open-access journal articles and websites);
- at UTEP library hardcopy reserve at the Circulation Desk;
- on UTEP library electronic reserve via library homepage (choose: Services => course reserves => type “Geol5315” => Pennington => Readings);
- from a UTEP library database (go to the UTEP library home page, and type the exact name of the journal’s title into the search window on the left side under E-Journals. This usually results in your being able to access the journal from one or more sources. Be aware that sometimes the listing suggests that fewer years are available than actually are, so always click as far as you can); or
- sent by email to the email address that UTEP has on file for you.

**Academic dishonesty**
A student’s submission of work for academic credit indicates that the work is the student’s own. Any outside assistance should be acknowledged. While cooperation throughout this course is encouraged, the homework and white papers must be constructed and written by each individual student. The group presentation must be a group effort.

**Academic deadlines**
The UTEP Spring 2015 drop deadline is April 6, 2015. The College of Science and the University and not approve any drop requests after that date. If you have any concerns about whether or not to drop, please see me.

**Makeup policy**
Due dates are firm. 10% will be deducted for each day an assignment is late. No late summaries of the reading will be accepted, since these are intended to ensure you prepare before class.

**Students with Disabilities**
Students with disabilities are encouraged to meet with the instructor in order that course materials can be updated and adapted appropriately to better foster a positive teaching and learning experience.

**Grading**

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Class participation</td>
<td>5%</td>
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<tr>
<td>SSES article</td>
<td>5%</td>
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<tr>
<td>6 Homeworks</td>
<td>30%</td>
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<tr>
<td>3 White papers</td>
<td>40%</td>
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<tr>
<td>Group presentations</td>
<td>10%</td>
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<tr>
<td>Final project</td>
<td>10%</td>
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A grade of Incomplete will only be given in extraordinary circumstances confined to a limited even such as a missed exam, project, or lab due to unexpected circumstances such as illness. If a student has missed a significant amount of work (e.g. multiple assignments or tasks), a grade of Incomplete is not appropriate or warranted. All grades of Incomplete must be accompanied by
an Incomplete Contract, signed by the instructor of record, student, Geology Department Chair, and the Dean of Science. Although UTEP will allow a maximum of one year to complete this contract, the College of Science limits it to one month after the end of class.

**SSES Article (1)**
Submit a peer-reviewed SSES article of interest to you. You will work on this throughout the semester, and turn this in as your final project in lieu of a final exam. The article must be drawn from current literature (since 2013) from one of the three following sources:


Ecology and Society is an Open Access Journal; everyone has access. For the first two, go to [http://libraryweb.utep.edu](http://libraryweb.utep.edu). In the search area in the middle of the page, select the E-Journals tab. Search for the journal name. Sustainability Science is available through SpringerLink. PNAS is available through several sources, but you should select the National Academy of Science. Click on the source hyperlink and you will be taken to the journal index of volumes and issues, where you can browse until you find an article of interest. At some point, you will be asked to log in with your UTEP credentials. This will give you full access to the articles.

Instructions will be given in class regarding the kind of article you will select. It must describe scientific research on a subject that has both social and environmental aspects. The article should describe both the science and something about the societal context within which the work was embedded. For example, an article on coastal water resources should have investigations into environmental processes (e.g. dune migration, surf erosion, animal habitat, etc.) and social processes (e.g. property values, water usage, etc.). The societal context might be something like a decision about converting residential zoned property to commercial for the purpose of building more hotels. The goal is to find an article that will enable you to analyze the scientific problem while also placing the science in a policy or decision-making context. Throughout the semester you will apply what you learn in class to your article. These will be compiled into a Final Report. I will review what you submit to ensure it is appropriate for the final project.

*To get credit* for submitting your article:
- Provide a full academic citation for the article. If you are unsure how to do this, please review the library tutorial at [https://www.youtube.com/watch?v=y8BzoOh6nXM&feature=youtu.be](https://www.youtube.com/watch?v=y8BzoOh6nXM&feature=youtu.be)
- Provide a full url for your article.
- Write a paragraph about what you found interesting in the article and how it may be pertinent to your own academic pursuits.

**Homeworks (6)**
Homeworks will be comprised of a set of exercises and accompanying questions to be answered. These will be based on material covered in the class, and will prepare you for the final report. If you miss class, you will be unable to adequately complete the homework because this information is not available in a textbook, and that will impact your white papers as well.
White papers (4)

Each major topical area will be comprised of two weeks of readings, class activities, and guest lectures. At the end of the two weeks, each student will prepare a professional white paper that provides a detailed analysis of the topical area, using methods and tools for complex problem solving. A report template with explicit instructions will be provided. USE THE TEMPLATE, and ensure that you address all of the points requested. The white paper will be due on the following Friday. Please refer to the Makeup Policy above. Late assignments will have 10% deducted for each day they are late.

Group Project & Presentation

At the end of the four topic sections, we will spend a week going back over the material, discussing the major issues of each, and collectively developing sets of key questions of interest for each of the topics. The class will be divided into groups of 3, with each member from different disciplines. Each group will select one of the topics and work together for the following two weeks to analyze the key questions of interest for that topic. Students are responsible for dividing the work among themselves equitably. Each student is responsible for contributing to their group in meaningful ways.

Definition: Loafer (noun). A person who idles time away. Synonyms: deadbeat, layabout, good-for-nothing, loung, shirker, slaggard, laggard, slacker, slob, lazybones, bum, drone – DON’T BE ONE OF THESE
Antonyms: doer, go-getter, hustler, self-starter – BE ONE OF THESE

The final week of class, each group will present their findings in a presentation to the class. The presentation must include a one-page handout containing a summary with one figure, and a set of diagrams. In addition, each individual student will submit a reflection paper on the group work. More details about the handout, diagrams, presentation, and reflection paper will be provided in class.

Final project

The final project will a professional write up of your selected journal article, based on everything you have learned throughout the semester. More information will be provided.

Tentative schedule

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<tr>
<th>DATE</th>
<th>MODULE</th>
<th>TOPIC</th>
<th>DUE</th>
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<tbody>
<tr>
<td>Jan 21-23</td>
<td>Introduction to SSES</td>
<td>Course overview; What is SSES? What are complex problems?</td>
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<tr>
<td>Jan 26-30</td>
<td>Solving complex problems</td>
<td>M: Modeling frameworks  W: Actionable and translational science. Articles Schlesinger (2010); Palmer (2012) F: Jan 30 Guest lecture: Dr. Mark Brunson, Utah State Univ. -- Translational science</td>
<td>SSES article (30th)</td>
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<td>Date</td>
<td>Topic</td>
<td>Details</td>
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<td>Feb 23-27</td>
<td>Tools: Causal diagramming</td>
<td>Guest lecture: Jeff Cavner, Jim Beach, &amp; Aimee Stewart University of Kansas Biodiversity Informatics Institute</td>
<td>HW 2 (23rd) Concept map</td>
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<td>Mar 2-6</td>
<td>Land Cover/Land Use Change</td>
<td>No class Mar 6 Chin et al. 2014, Feedbacks in Human-Landscape Systems; Strategies: Ecosystem Services</td>
<td>B&amp;EC white paper (2nd)</td>
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<td>Mar 9-15</td>
<td>Spring break</td>
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<td>Mar 23-27</td>
<td>Mar 23: Guest speaker Dr. Ken Bagstad, Artificial Intelligence for Ecosystem Services (ARIES) Framework comparison Group work selected framework</td>
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<td>Mar 30-Apr 3</td>
<td>M: Group work</td>
<td>Wed: Groups report out No class Apr 3 (Spring study day)</td>
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<th>AP 13-17</th>
<th><strong>Royal Society B: Biological Sciences, 367(1606), 3062–3075.</strong></th>
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| APR 20-24 | **M:** workflows & data flow diagrams  
Reading: TBD  
Guest lecture: Dr. Shane Walker, Civil Engineering, UTEP, Water quality  
**HW4 (13th) Framework** |
| **Apr 27-May 1** | **Dr. Pennington out Apr 20-24**  
Groups: Actors/stakeholders, issues, concept maps, causal diagrams, workflows  
**Presentation; Handout & diagrams** |
| **May 4-8** | **Wrap up**  
M Course debrief (food provided)  
WF no class  
**WR white paper (6th)** |
| **May 15** | **Turn in final project by Friday May 15, 12:45 pm** |