

**ESE 6307 Interdisciplinary Problem Solving**  
**ESCI 5315 Selected Topics**  
**Sustainable Water Systems**  
**Fall 2017**

**Class: F 9:30-12:20 GEO 302**

**Instructor**

Deana Pennington  
Department of Geological Sciences  
GEO 305C  
[ddpennington@utep.edu](mailto:ddpennington@utep.edu)  
Office Hours: By appointment

**General Information**

Scientific synthesis across disciplines is at the heart of addressing important challenges such as trade-offs between water, food, and energy; declines in biodiversity and ecosystem services; and the need for sustainable cities. In this course students will gain the knowledge, skills, and dispositions necessary to work collaboratively in interdisciplinary teams on complex socio-environmental problems, using a model-based reasoning approach being developed through a grant from the National Science Foundation. The course will focus on learning to integrate diverse knowledge, perspectives, methodologies, and data using socio-environmental water systems as an exemplar problem.

Prerequisite: None except graduate standing

**Course Objectives**

- Know the fundamental issues underlying sustainability
- Learn how to analyze complex socio-environmental problems using qualitative modeling 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

**Course Texts**

No required textbook. Readings of journal articles will be assigned 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); or
- 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).

### **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 in teams throughout this course is mandatory, the homework assignments must be constructed and written by each individual student. The only exception is a group presentation, which will be a group effort.

### **Academic deadlines**

The UTEP Fall 2017 drop deadline is November 3. The College of Science and the University will 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**

Class participation	10%
Reading summaries	10%
5 Reflective writings	25%
5 Figures	25%
Team presentation	10%
Final synthesis project	20%

Please read the sections below for a description of each of the grade categories.

A grade of Incomplete will only be given in extraordinary circumstances confined to a limited event 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.

### **Class Participation (10%)**

Based on three items:

1. Attendance – Class will start promptly at 9:30. Sign in as you arrive at each class. You will receive full credit if you arrive by 9:30; half credit if you arrive after 9:30.

2. Class discussion – Each class will have one or more opportunities for discussion. The TA will keep track of how many comments are made by each student during discussion.
3. Team participation – Assessed starting September 15 and continuing through the remainder of the course. Assessment will be based on: 1) observations by the instructor; 2) observations by the TA; and 3) anonymous feedback from teammates to the instructor via a CATME survey. The CATME survey is designed by teamwork researchers at Purdue University, specifically to support teamwork training in classrooms. More information will be provided in class. This survey will be given three times throughout the semester.

Students will receive feedback from me several times throughout the semester so that they can work towards improving their team participation grade, if needed.

### **Reading summaries (10%)**

It is essential that you read the assigned articles before class each Friday. There will be a short lecture expanding on the topic presented in the articles, discussion based on the articles, and most importantly – a team activity that in many cases depends on your having completed the reading. Therefore, a summary of the reading must be submitted to Blackboard by midnight on Thursday. No late summaries will be accepted. The summary must include:

- One paragraph for each article describing the topic, methods, and findings. You must cite the article within the paragraph, using an accepted scholarly citation format, either Chicago or APA.
- One paragraph synthesizing the articles' perspectives with your own experience/perspective. What do you think about the article(s)? Does it resonate with you, or is it not very relevant? I am not looking for particular answers here – just thoughtful commentary.
- Reference information for the article(s) being summarized (please use an accepted scholarly reference format, either Chicago or APA. If you do not know what these are, look them up. As a graduate student you should know how to cite in a standard format.

### **6 Reflective Writings (25%)**

Reflective practice is an important skill to learn as a graduate student. Reflective practice is the ability to think back on a situation and one's actions within that situation, to learn from the experience. Learning theory suggests that simply experiencing something does not necessarily lead to learning from that experience; thoughtful reflection on the experience is required.

One objective of this course is for you to engage in complex problem solving across disciplines, and to learn from that experience. Hence, the first portion of the class will involve consideration of the many factors that influence the effectiveness of interdisciplinary teamwork. These writings are designed for you to reflect on the reading, lecture, and hands-on activities that are provided and reflect on how all of these worked together (or didn't) to develop new understanding and skills for interdisciplinary teamwork.

Your reflective writing should include the following parts:

- Describe what happened (one paragraph).
- Describe what was good and bad about the experience. What were you thinking and feeling?

- Analyze the situation that confronted you. Consider the questions that will be provided by the instructor.
- Describe how this experience might be relevant to situations you may be confronted with in the future – outside a classroom setting. What are the take home, key points that you will remember and try to enact?

### **5 Figures (25%)**

Once we enter the phase of the course where we focus on water issues in the Middle Rio Grande as an exemplar of interdisciplinary teamwork, your team will work through a series of activities designed to enable you to provide increasing structure to the complex problem. The output from each activity is an external representation (diagram or other physical artifact) that will be co-created by your team. Each team member will start with that diagram, and create a formalized figure that would be appropriate to include in a research proposal. You may modify the co-created representation in whatever ways make sense to you as you are working on the figure. The figure must include the following:

- Well-organized content
- Easy to follow visual formatting (color codes, line widths, shapes, etc.)
- Legend explaining the visual formatting
- Caption explaining what the figure shows.

### **Team Presentation (10%)**

At the end of the semester, each team will prepare and deliver a presentation to the class. Students are responsible for dividing the work among themselves equitably. Each student is responsible for contributing to their group in meaningful ways. Be aware of the following descriptions of team members:

Loafer (noun). A person who idles time away and does not contribute.

Synonyms: deadbeat, layabout, good-for-nothing, lounge, shirker, sluggard, laggard, slacker, slob, lazybones, bum, drone – DON'T BE ONE OF THESE

Antonyms: doer, go-getter, hustler, self-starter – BE ONE OF THESE

More details about the presentation will be provided in class.

### **Final synthesis project (20%)**

The final synthesis project will a professional write up of water issues that you could potentially investigate with your team and how you would approach the problem, based on everything you have learned throughout the semester. It will be an individual write up unique to each student, due on dead day. There will be no final examination in this course.

## Tentative schedule

DATE	READ	TOPIC	DUE
1-Sep		Introduction; complex problems & systems Activity: Characteristics of Wicked Problems	Reflective writing #1
8-Sep	Rittel & Webber, 1973; Norris et al., 2016	Science of Team Science; Teams as complex systems Activity: Challenges and Opportunities in IDR	Reflective writing #2
15-Sep	Pennington, 2008; Rogers et al., 2013	Team assignments; Learning across disciplines Activity: Share Your Research	Reflective writing #3
22-Sep	Hall & O'Rourke, 2014	Team member dispositions and disciplinary cultures Activity: Dispositional Distance; Toolbox Project	Reflective writing #4
29-Sep	Pade-Khene et al., 2013; Mitchell et al., 2015 sections 1 and 3	Working with stakeholders Activity: Stakeholder Analysis	Reflective writing #5
6-Oct	flyers about field sites	Field trip: Desalination plant; American Dam	
7-Oct		Saturday field trip: Rio Bosque; Agriculture	
13-Oct	Select 2 from list	Problem framing; Divergent and convergent thinking Activity: Explore the Problem Space	Figure #1
20-Oct	Binder et al., 2013	Developing and using integrated frameworks Activity: Mapping to Frameworks	Figure #2
27-Oct	Arnold & Wade, 2015	Systems Thinking Activity: Mental Modeler	Figure #3
3-Nov	Zvoleff & An, 2014	Analytical approaches	Figure #4
10-Nov	Describe two datasets/IT systems	Planning for data management Activity: TBD	Figure #5
17-Nov	Van Noorden, 2015; Bromham et al., 2016	Putting it all together: Interdisciplinary research proposals Activity: Mock Solicitation	
24-Nov		Thanksgiving holiday	
1-Dec		Team presentations	Presentation
8-Dec		Dead day - no class	Synthesis project

## Bibliography

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- Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155–169.
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