



## Interdisciplinary Modeling: Water-Related Issues NRES 701D (Summer 2008)

### Syllabus (3 credits)

**Course Dates:** July 14 – August 1, 2008, 8 a.m.-5 p.m.; 4 hrs lecture and 4 hrs lab per day

**Course Web Page:** [www.cabnr.unr.edu/saito/classes/nres701d/nres701d.htm](http://www.cabnr.unr.edu/saito/classes/nres701d/nres701d.htm)

**Course Instructors:** Coordinating Instructors:

- Laurel Saito (Dept. of Natural Resources and Environmental Science (NRES), University of Nevada Reno (UNR); aquatic ecosystem modeling)
- Bill Fleenor (Dept. of Civil and Environmental Engineering (CEE), University of California at Davis (UCD); water quality modeling)

Co-Instructors:

- Kumud Acharya (Desert Research Institute (DRI); ecosystem modeling)
- Chris Fritsen (DRI; algal/microbial modeler)
- Derek Kauneckis (Department of Political Science, UNR; environmental policy analysis)
- Darko Koracin (DRI; ocean-atmospheric modeler)
- Geoffrey Schladow (Dept. of CEE, UCD; hydrodynamic modeling)
- Mark Stone (DRI; water resources modeling)
- Scott Tyler (Dept. of Geological Sciences and Engineering (GSE), UNR; vadose zone hydrology)

Guest lecturers:

- Scott Bassett (Dept. of Geography, UNR; landscape modeling)
- Bobby D. Bryant (Dept. of Computer Science and Engr., UNR; computer science)
- Richard Howitt (Dept. of Agricultural Economics, UCD; economics modeling)
- Steve Jenkins (Dept. of Biology, UNR; modeling philosophy and history)
- Anna Panorska (Dept. of Mathematics and Statistics, UNR; statistical modeling)
- Rina Schumer (DRI; groundwater modeling)
- Rick Susfalk (DRI; hydrologic modeling)
- Aleksey Telyakovskiy (Dept. of Mathematics and Statistics, UNR; mathematical modeling)

**Course Goal:** The science and management of many environmental issues is inherently interdisciplinary. One of the ways to approach the diversity of needs in managing and understanding these issues is to employ mathematical modeling. Models based on available scientific knowledge and theories can be used to bridge the gap between the ability to scientifically predict with reasonable certainty, and the need to make management decisions. However, despite the strengths of interdisciplinary modeling approaches, there are several impediments to successfully implementing these approaches, including (1) understanding the advantages and limitations of using models; (2) different spatial and temporal scales that specific disciplines are concerned with; (3) differences in degrees of uncertainty of data and models, and (4) lack of

awareness of what modeling options are available in an interdisciplinary sense. All of these are intertwined with (5) difficulties in communication between disciplines, where different terminology and perspectives can get in the way of discussing common issues or concerns. And finally, (6) scientists and modelers need to be educated and trained about interdisciplinary approaches. *The objective of this course is to engage students in interdisciplinary discourse in modeling* by addressing each of these impediments.

**Course Description:** Students will be introduced to models that are available in different disciplines and how such models might be applied together to address water-related issues, address issues of variability and uncertainty in implementing interdisciplinary approaches, and gain experience in working in interdisciplinary teams to apply interdisciplinary modeling approaches to increase knowledge about water-related issues. Students will use a common software to do an interdisciplinary project.

**Course Objectives:** Successful students will accomplish the following in this course:

1. Discuss the philosophy of modeling
2. Become aware of models in different disciplines used to address water issues
3. Work in interdisciplinary teams to explore issues and approaches associated with interdisciplinary modeling
4. Complete an interdisciplinary modeling project that addresses one or more water-related issues

**Prerequisite:** At least one course in modeling or consent of coordinating instructors.

**Required Textbook:** None. Students are required to prepare with material posted on the website.

<b>Grading:</b>	<u>Description</u>	<u>Points</u>
	In-class assignments during labs (8)	400
	Interdisciplinary modeling project	500
	Class participation and attendance	100
	TOTAL	1000

*In-class assignments:* In-class assignments are designed to promote interdisciplinary discussions and interactions in the context of water-related modeling. Detailed instructions will be provided on the course website and when the assignments are handed out during the course. Topics include introduction to STELLA, data management, ecological modeling, statistical/mathematical modeling, watershed modeling, water quality modeling, groundwater modeling, energy budget modeling, atmospheric modeling, economic modeling, and GIS/remote sensing.

*Interdisciplinary modeling project:* The project is designed to promote interaction between students in different disciplines to gain experience with interdisciplinary modeling. Project topics will focus on an interdisciplinary issue pertaining to Lake Tahoe. Students will be assigned to interdisciplinary teams to work with available data and address the issue with interdisciplinary modeling using STELLA and/or Excel. Each team will prepare a written report (due August 8) and present the outcomes of their project to the class participants on August 1, 2008 as a 20-minute presentation.

*Class participation and attendance:* Attendance and participation is a key element to your success in this class. There are no exams associated with this class; rather, the class involves a variety of lectures, discussions and exercises to enhance interdisciplinary interactions. It is essential that students attend the entire course to participate in these activities. You are expected to be at the course each day for all activities. Participation includes completing evaluations of the lectures, exercises, and course, asking questions and providing comments on the issues in class, and contributing actively to group exercises in class.

If you have a disability and will be requiring assistance, please contact the instructor or the Disability Resource Center (Thompson Building Suite 101) as soon as possible to arrange for appropriate accommodations.