Interdisciplinary Modeling: Water-Related Issues and Changing Climate
NRES 730 (Summer 2010)

Syllabus (tentative)

(3 credits)

Course Dates: July 12 – 30, 2010, 8 a.m.-5 p.m.; 4 hrs lecture and 4 hrs lab per day

Course Location: University of Nevada Reno, Room KRC 127

Course Web Page: www.cabnr.unr.edu/saito/classes/nres730/nres730.htm

Course Instructors: Coordinating Instructors:

- **Laurel Saito** (Dept. of Natural Resources and Environmental Science, University of Nevada Reno (UNR); aquatic ecosystem modeling)
- **Alexander Fernald** (Dept. of Animal and Range Sciences, New Mexico State University (NMSU); surface-groundwater interaction modeling)
- **Timothy Link** (Dept. of Forest Resources, University of Idaho (UI); snowpack energetics modeling)

Co-Instructors:

- **Darko Koracin** (Div. of Atmospheric Sciences, Desert Research Institute (DRI); ocean-atmospheric modeler)
- **Sajjad Ahmad** (Dept. of Civil and Environmental Engineering, University of Nevada Las Vegas (UNLV))
- **Caiti Steele** (Jornada Agricultural Research Service, NMSU; remote sensing and GIS)
- **Mark Stone** (Dept. of Civil and Environmental Engineering, University of New Mexico (UNM); water resources modeling)

Guest lecturers:

- **Kumud Acharya** (Div. of Hydrologic Sciences, DRI; ecosystem modeling)
- **Franco Biondi** (Dept. of Geography, UNR; data and models)
- **Cliff Dahm** (Dept. of Biology, UNM; nutrient spiraling modeling)
- **Levan Elbakidze** (Dept. of Agricultural Economics and Rural Sociology, UI; economics modeling)
- **Steve Jenkins** (Dept. of Biology, UNR; modeling philosophy and history)
- **Derek Kauneckis** (Department of Political Science, UNR; environmental policy analysis)
- **David Kreamer** (Dept. of Geology, UNLV; thermal stratification modeling)
- **Anna Panorska** (Dept. of Mathematics and Statistics, UNR; statistical modeling)
- **Rina Schumer** (Div. of Hydrologic Sciences, DRI; groundwater modeling)
- **Aleksey Telyakovskiy** (Dept. of Mathematics and Statistics, UNR; mathematical modeling)
- **Vince Tidwell** (Geohydrology Dept., Sandia National Labs; systems dynamics modeling)
- **Scott Tyler** (Dept. of Geological Sciences and Engineering (GSE), UNR; vadose zone hydrology)

Course Goal: The science and management of many environmental issues including climate change 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. This course will address: (1) 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, (4) interdisciplinary modeling options; (5) communication between disciplines, where different terminology and perspectives can be a barrier to productive discussion of common issues or concerns; (6) education and training of scientists and modelers about applying interdisciplinary approaches; and (7) interaction with stakeholders and the public. *The objective of this course is to engage students in interdisciplinary discourse in modeling* by addressing each of these challenges.

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 regarding climate change, 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 regarding climate change. 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 related to climate change
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 related to climate change

Prerequisite: Graduate students in any discipline related to water including, but not limited to: hydrology, engineering, political science, law, economics, geology, atmospheric science, geochemistry, environmental science, chemistry, water resources, etc. Students should have some experience with modeling and/or 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.

Grading:

Description	Points
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 regarding climate change. 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 climate change and water resources. 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 6) and present the outcomes of their project to the class participants on July 30, 2010 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.