ENVIRONMENTAL SCIENCE & POLICY 890

MODELING ENVIRONMENTAL & SOCIAL SYSTEMS

FALL SEMESTER 2023

Instructor *Arika Ligmann-Zielinska, Ph.D.* (she/her/hers)
Class Meetings Mondays 12 pm – 1:40 pm
Classroom 274 Giltner Hall
Office Hours Mondays 2:15a – 3:35p or by appointment
Office Geography Building, 673 Auditorium Rd, Room 121 (or Zoom for individual meetings)
Email arika@msu.edu
Course website: https://d2l.msu.edu/d2l/home/1826967

COURSE OVERVIEW:

This course examines how researchers in different disciplinary fields and interdisciplinary settings model environmental and social systems. In addition to learning to effectively communicate strategies for modeling complex, interrelated systems, students will learn to understand and assess the application of select modeling approaches to the environment-social systems nexus. This course aims to provide students with the skills necessary to critically evaluate contemporary interdisciplinary research on the relationship between environment and social systems and how to incorporate critical tenets of these approaches in their research. Prerequisites for this course include ESP850 and two elective modeling courses: https://espp.msu.edu/education/modeling_certificate.html

I rarely send emails – everything is posted as an announcement on the introductory page of the course. This keeps the history of communication between you and me in one place, and you can always go back to previously circulated information. If you do not check often, I strongly suggest you set up email notifications about our class announcements as follows. Log into D2L. Go to your profile (top bar, right) and select Notifications. On the notifications site, scroll down and check/update your contact methods. Then scroll down and check boxes for all the types of notifications you want to be forwarded to your email/phone.

COURSE DESCRIPTION:

In this course, students will work on either:

[1] building an independent modeling project they have already designed, or
[2] designing an independent modeling project.

In both cases, they will build a conceptual model using an interdisciplinary approach. They will also provide feedback on other students' drafts.

For option [1], students will quantify/implement the model using specialized toolboxes or modifying already developed models (from other studies), verify and validate model results, and evaluate model effectiveness in addressing the selected research problem. Details on the stages of the model development will be covered in

class. A draft version of the model development stages (pending changes) is available under *Content – Project* on D2L.

For option [2], students will describe how they will do so in the grant proposal format. General instructions on the grant proposal format are posted on the course website under *Content – Grant* on D2L.

For computer applications, students will work on a predetermined project in conjunction with their supervising or major thesis/dissertation professor; the course instructor **will not be assisting with software**.

COURSE REQUIREMENTS, EVALUATION, AND GRADING:

ESP 890 is an application-oriented course with minimal predefined readings (listed below and posted on the course D2L website under *Content – Readings*). Furthermore, students must familiarize themselves with the specialized literature for their research project.

Students are encouraged to work on an ongoing project for which this course serves as an external check of its interdisciplinary and multidisciplinary content and relevance. Students have two options for assignments in the class listed above.

Assignments for Both Options

[1] **Preproposal (outline)** on a topic of interest (worth 10% of the final grade), which should include title, problem statement, project objectives, the (draft of) the conceptual model, the modeling approach, tools and data sources, and project timeline.
[2] **Student-led team meeting** on a topic of their choice (10%).
[3] In-class **participation** (20%; 4 lectures, 5% each).
[4] **Presentation** (20%) of the final paper in front of the class (about 30 min presentations followed by 10 min questions).

Assignments for Option One

[5] **Report draft** (10%) of the project, including the application (research topic), the conceptual model, the modeling approach, model development, implementation, verification, validation, uncertainty and sensitivity analysis, and consideration of policy implications. Students will follow the guidelines of a journal of their choice for the report. The draft should list the journal requirements (sections, formatting, citation style, etc.) as an appendix.
[6] A **final report** of a completed project (30%) in the form of a publishable research manuscript (up to 6,000 words) based on the instructor's and class peers' feedback.

Assignments for Option Two

[5] **Proposal draft** (10%) following the grant proposal instructions.
[6] A **proposal** (30%) is a refined version of the **proposal draft** based on feedback from the instructor and peers in class.

COURSE SCHEDULE (SUBJECT TO CHANGE):

August 28	***Course Overview; Assignment due Sep 11 @ 11:59 pm:*** *Final Paper - Option and Topic (~ 1 paragraph) uploaded to D2L under Assessments – Assignments – Topic*
September 4	***No class – Labor Day***
September 11	***Choosing modeling methods***
Readings:	[1] Oreskes, Naomi. 2015. "How Earth Science Has Become a Social Science." Historical Social Research, Bonn 40 (2 (152)): 246–70. [2] Badham, J. (2010). A Compendium of Modeling Techniques. Integration Insights. G. Bammer. Canberra, Australian National University. 12.
September 18	***The modeling process***
Readings:	[1] Beven, K. (2008). "How to make predictions," Chapter One in Environmental Modelling: An Uncertain Future? New York, Routledge (pdf on D2L). [2] Ören et al. (2023) "Simulation as Experimentation" Chapter 3 in Body of Knowledge for Modeling and Simulation, eds. Ören, Zeigler, and Tolk, Springer, pp. 77-119
September 25	***Output analysis***
Readings:	[1] Grimm and Berger (2016) "Robustness Analysis: Deconstructing Computational Models for Ecological Theory and Applications." Ecological Modelling 326 (April): 162–67 [2] Fachada et al. (2017) "Model-Independent Comparison of Simulation Output." Simulation Modelling Practice and Theory 72: 131–49
October 2	***Uncertainty and sensitivity analysis***
Readings:	[1] Oreskes, N. (1998). "Evaluation (not validation) of quantitative models." Environ Health Perspect 106 Suppl 6: 1453-1460. [2] Ligmann-Zielinska et al. (2020) 'One Size Does Not Fit All': A Roadmap of Purpose-Driven Mixed-Method Pathways for Sensitivity Analysis of Agent-Based Models," Journal of Artificial Societies and Social Simulation 23 (1), online: https://www.jasss.org/23/1/6.html
October 9	***Reporting individual progress on the final paper***
Friday October 13	**PREPROPOSAL or REPORT OUTLINE DUE @ 11:59 pm** *uploaded to D2L under Assessments – Assignments – Preproposal or Outline*
October 16	***Individual consultations on the preproposals***

October 23	***Break Days; no Class***
October 30	***Student-led meeting: the topic of choice – presentation and a write-up*** *uploaded to D2L under Assessments – Assignments – Student-Led Meeting before class*
November 6	***Individual consultations***
Friday November 10	**PROPOSAL OR REPORT DRAFT DUE @ 11:59 pm** *uploaded to D2L under Assessments – Assignments – Draft*
November 13	***NO CLASS; Assignment: feedback on other students' drafts; due Tue Nov 21 @ 11:59 pm*** *uploaded to D2L under Assessments – Assignments – Peer Feedback (this assignment is not graded),* ***NOTE****: we should meet later this week for individual consultations!*
November 20	***Individual consultations***
November 27	***STUDENT PRESENTATIONS,*** *slides, etc. should be uploaded to D2L under Assessments – Assignments – Presentations due before class*
December 4	***Individual consultations***
Friday December 8	**FINAL REPORT or PROPOSAL DUE @ 11:59 pm** *uploaded to D2L under Assessments – Assignments – Final*

COURSE POLICIES

Respect for Diversity: I intend to create a classroom conducive to everyone's learning. Along with the expectations for coursework, I expect that we will treat each other with respect and collegiality and be open to conversations and perspectives that challenge the established status quo. I intend to present materials and activities that respect diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or other students or student groups. Also, if you have a concern about the class's policies and procedures or the course's content, please contact me. Please let me know if you would like to use a different name or pronouns than those provided by the University.

LATE ASSIGNMENTS

Assignments are due on indicated dates and times. Completion of work on time is mandatory. A 0.5pt deduction will be made for every day an assignment is late. Assignments over a week late will not be accepted without my prior agreement. For extenuating circumstances, send me an email.

ACADEMIC INTEGRITY

Academic honesty means using your own words to communicate an idea. Therefore, changing a few words of another's text and/or rearranging words from another source constitutes plagiarism. If you paraphrase material, you must still cite and reference the source. To paraphrase means to restate a text or passage in other words, often to clarify meaning. Paraphrasing is a restatement of an idea, not a rearrangement of specific words. If you copy material exactly, you must use quotation marks and then cite and reference the source. Copying one sentence, two sentences, a paragraph, or an entire paper constitutes plagiarism/cheating. D2L has anti-plagiarism software that automatically checks your submitted work. You will also be checked for AI-generated content.

As a graduate student, you share with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards. Therefore, although you may be discussing your assignments with each other, you are expected to turn in individual, original work. You may not submit coursework you completed for another class to satisfy the requirements for this course. Students who violate these rules may receive a penalty grade, including but not limited to a failing grade on the assignment or in the course. In that case, I am also responsible for filing an Academic Dishonesty Report. This policy also applies to the dishonest use of generative AI for any assignment. For MSU policy regarding academic integrity, please see https://ossa.msu.edu/academic-integrity.

MANDATORY REPORTING POLICY

As a professor, one of my responsibilities is to help create a safe learning environment for my students and the campus. As a member of the university community, I am responsible for reporting any instances of sexual harassment, sexual violence, and other forms of prohibited discrimination. If you would instead share information about sexual harassment, sexual violence, or discrimination with a confidential employee who does not have this reporting responsibility, consult this website https://centerforsurvivors.msu.edu/

INSTITUTIONAL EQUITY

MSU is committed to creating and maintaining an inclusive community where students, faculty, and staff can work together in an atmosphere free from discrimination. The Office for Civil Rights and Title IX Education and Compliance (https://civilrights.msu.edu/) reviews concerns related to discrimination and harassment based on sex, gender, gender identity, race, national origin, religion, disability status, and any other protected categories under *University Anti-Discrimination Policy* and *Policy on Relationship Violence and Sexual Misconduct*. If you experience or witness acts of bias, discrimination, or harassment, please report these to https://civilrights.msu.edu/file-a-report/index.html

NAME AND PRONOUN POLICY

All people have the right to be addressed and referred to following their identity. Many people do not identify with the name on their birth certificate, school ID, or other forms of identification. In this class, I include the opportunity for students to indicate their names and the pronouns they use. More information about MSU's preferred name policy can be found at https://gscc.msu.edu/trans-msu/msu-name-and-gender.html. I will do my best to respect students by using the correct name and pronouns for them. Please advise me at any point if you need to update your name or pronouns in my records.

ACCOMMODATIONS FOR PERSONS WITH DISABILITIES

Michigan State University is committed to providing equal opportunity for participation in all programs, services, and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities https://www.rcpd.msu.edu/ (see https://www.rcpd.msu.edu/documentation for required documentation). Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation ("VISA") form. Please present this form to me at the start of the term or two weeks before the accommodation date (test, project, etc.). Requests received after this date will be honored whenever possible.

OFFICE OF THE UNIVERSITY OMBUDSPERSON

The Office of the University Ombudsperson (https://ombud.msu.edu/) offers students a confidential and impartial place to discuss academic and nonacademic concerns. Staff will assist students in defining problems, exploring options, outlining strategies, reviewing policies, finding resources, and managing expectations while upholding the values of respect, integrity, diversity, and freedom from bias or harassment.