ESP 850-730: Introduction to Modeling Environmental and Social Systems

Fall 2023 Online
D2L Course Title: ***ESP850 Intro to Environmental and Social Systems Modeling***

(one credit course)

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Office Hours Mondays noon – 1:30p or by appointment
Office location Geography Building, 673 Auditorium Rd, Room 121 or Zoom
Course website **https://d2l.msu.edu/d2l/home/1826969**

Course Overview
Introduction to MESS provides students with the theoretical background to understand the diversity of modeling problems that arise from complex socioecological systems. Students are exposed to various modeling approaches and learn to discern which modeling tool is the most appropriate in various contexts.

This is an online readings course. **FIVE sessions** include readings, handouts, web links, video lectures, online discussion forums, and assignments/write-ups. Students are required to read assigned literature and participate in online discussions.
All readings for this course are published on D2L under *Content – Readings*.

Other materials for each session are published by the following days: **Aug 28, Sep 11, Sep 25, Oct 9, and Oct 19 (earlier due to the fall break).** Each session has an introductory ~5 min recording.

Prerequisites: None *Course structure*: Five online asynchronous sessions

Sessions are scheduled ~ every two weeks. **This is a half-semester course – all coursework must be submitted by Monday, November 6, 2023, including the final paper.** Plan wisely!

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.

Grading

Discussion forum participation	25 pts. (5x5 pts.)	Cum. 25pts.
Discussion forum summary (one-time assignment)	10 pts.	Cum. 35pts
Readings summary	15 pts. (3x5 pts)	Cum. 50pts
Assignments	20 pts. (2x10 pts.)	Cum. 70pts.
Test	10 pts.	Cum. 80pts.
Final essay	20 pts.	Cum. 100pts.

Grade Scale	
Course points	*grade points*
90 – 100	4.0
87 – 89.9	3.5
80 – 86.9	3.0
75 – 79.9	2.5
70 – 74.9	2.0
65 – 69.9	1.5
60 – 64.9	1.0
below 60	0.0

Discussion Forum Participation

Following each session, you must participate in a discussion forum on a topic (posted in advance) related to the material covered in the session and the required readings. To encourage dialogue, you have to participate twice (2x2.5 pts.), for example, by directly responding to the topic and other students' comments. The forum is open for eight days from the due date the material is posted (e.g., for session one, the forum will close @ 11:59 pm on Tuesday, September 5th). The forums are posted on D2L under *Communication – Discussions*. The following are due dates for the forums (by 11:59 pm): Sep 5, Sep 19, Oct 3, Oct 17, and Oct 26.

Discussion Forum Summary

In addition, each session will have a designated group of students responsible for summarizing the discussion. The designated team has ~ five to seven days to prepare the summary. The format of the summary is unrestricted. You can write an essay, prepare a presentation, a poster, a poem, or a song - whatever your muse is. SURPRISE me. The summaries should be uploaded to *Assessments – Assignments – Forum Summary*. Please include your names and session number in the summary submission. The following are due dates for the forum summaries (by 11:59 pm): Sep 11, Sep 25, Oct 10, Oct 26, and Nov 2. The schedule of designated teams will be posted by Sep 1.

Readings Summary

Each session has two required readings. Before each session, you must summarize the readings (400 to 500 words). The papers/chapters etc., are packed with material, so be concrete and focus on your vision of the take-home message. Short and to the point is what I expect. It is not a literature review. The deadline is 11:59 pm on the day of session publication, except for session one. The summaries should be uploaded to *Assessments – Assignments – Reading No. Summary*. The following are due dates for the readings summaries: Sep 6, Sep 11, Sep 25, Oct 9, and Oct 19.

Assignments

There are two individual assignments - after sessions two and four. Details on the assignments will be posted on D2L. Your submissions should be uploaded to *Assessments – Assignments – Individual Assignment No*. The following are the due dates for the assignments (by 11:59 pm): Oct 13 and Oct 25.

Test

After session four, a 20-question, 30-minute online (D2L) test will be administered. The material will cover the lecture material from sessions one to four. Additional material from the readings not covered in the lecture (i.e., the recording and the slides) **will not** be included. The test is scheduled on October 30. You will have a 24-h window to take the test (12:01 am to 11:59 pm). The test will be randomly generated from a pool of questions, so there is a high chance you'll get a unique version. You'll be graded immediately after the test completion. There is a maximum of *two attempts,* but both have to be taken on the day of the test. Note that each attempt will, most likely, have a slightly different set of questions. Your *top score* will be recorded in the grade book. The test will be posted under *Assessments - Quizzes – Test*.

Final paper

For the final, you will write a short (up to 1500 words) **position paper**. In this paper, you will take an argument on a selected philosophical and/or theoretical topic from the material covered in class and apply it to a modeling problem you wish to explore. This is not a methodology paper—the point is not to describe what type of modeling you wish to do. Instead, this paper should take a philosophical or theoretical issue covered in sessions one and two (e.g., uncertainty, model ontology, the predictive role of models,

or complexity) and describe your perspective on it using a real-world problem of your choice. It is crucial to support your argument with evidence to ensure the validity of your claims and to address the counterclaims to show that you are well-informed about both sides. The paper should be supported by 5+ references. You can include figures: one figure is equivalent to 200 words.

You need to provide a tentative title (~topic) and a one-paragraph summary (mini-proposal) by Thursday, September 28 @ 11:59 pm. See the table below on what to include in the summary. Submit under: *Assessments - Assignments – Final Paper Proposal*.

Final papers are due on Monday, November 6 @ 11:59 pm: *Assessments – Assignments – Position Paper*.

Example
Suppose I'm interested in forecasting household decision-making on climate-induced migration between the Southwest and Midwest States in the next 50 years (e.g., this is the general goal of my dissertation). I am also interested in the aspect of predictive modeling. My paper title could be:

Should I stay or should I go? The (un)predictability of climate-induced migration modeling

The argumentation would then start with an introduction to the problem of human climate migration (with a specific geographic case study) – what it is, what are its causes, what would push people to abandon everything and move to a different state – a decision that is a last resort even in extreme weather conditions; all aspects that can be relatively easily modeled but are highly uncertain. Then I'd move to a discussion on predicting such movements (the pro argument) and on the limits (or impossibility, depending on your stance) of such predictions (the con argument).

More details on a position paper's objectives, content, and structure are posted on D2L under *Content – Final Paper*.

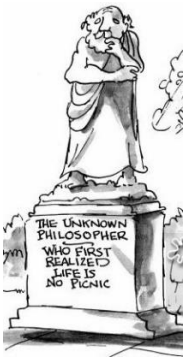
The following grading rubric will be used for the final paper:

CRITERIA	**MAX POINTS**	**PTS. EARNED**	**COMMENTS**
Mini-proposal	1		Included: the real-world problem, the aspect of modeling, and the pro and con statements.
Final paper: content analysis	6		[1] A clear statement of the theoretical/philosophical topic and the real-world problem you want to synthesize. [2] Justification of using modeling to tackle the problem. [3] Linking your problem to the material discussed in the course.
Final paper: critical thinking	6		Assessing pros and cons (argument and counterargument).
Final paper: articulating the main argument	4		Clarity of writing, including paper structure, writing style, and argument flow.
Final paper: formatting and citations	3		Clarity and neatness of presentation.

Schedule and Readings

All assignments are due **@ 11:59 pm** on the designated date.

Session One: Philosophy of Modeling



READINGS:

[1] Epstein, J. M. (2008). "Why Model?" Journal of Artificial Societies and Social Simulation 11(4): 12: http://jasss.soc.surrey.ac.uk/11/4/12.html

[2] Models in Science (last updated Feb 2020): http://plato.stanford.edu/entries/models-science

PUBLISHED on D2L BY:

8/28/23 @ 12:01am

Presentation and assignments are published by this deadline. Readings are already available on D2L.

You will be notified by email when the materials are released.

DUE in the next two weeks:

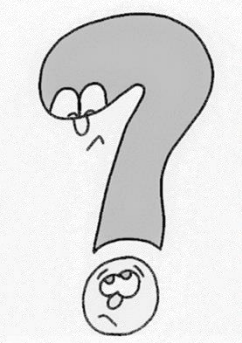
Individual forum entry Sep 5

Reading one summary Sep 6

Group summary 1 (selected students) Sep 11

Reading two summary Sep 11

Session Two: Systems and Uncertainty



READINGS:

[1] Ligmann-Zielinska et al. (2020), Principles of Participatory Ensemble Modeling to Study Complex Socioecological Systems, Innovations in Collaborative Modeling, Edited by Laura Schmitt-Olabisi, Miles McNall, William Porter and Jinhua Zhao, Michigan State University Press, **pp. 3-28, Sections 1-3 only**

[2] Oberkamp et al. (2004). Challenge problems: Uncertainty in system response given uncertain parameters. Reliability Engineering & System Safety, 85(1-3), **11-19, Sections 1-3 only**

PUBLISHED on D2L BY:

9/11/23 @ 12:01am

Presentation and assignments are published by this deadline. Readings are already available on D2L.

You will be notified by email when the materials are released.

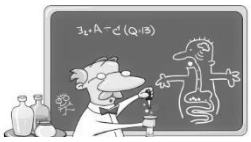
DUE in the next two weeks:

Individual forum entry Sep 19

Group summary 2 (selected students) Sep 25

Reading three summary Sep 25

Session Three: Anatomy of Modeling



READINGS:

[1] Birta and Arbez (2019) "Modelling and Simulation Fundamentals." In Modelling and Simulation: Exploring Dynamic System Behaviour, edited by Louis G. Birta and Gilbert Arbez, 3rd ed, **19–52**.

[2] Jakeman et al. (2006). "Ten Iterative Steps in Development and Evaluation of Environmental Models." Environmental Modelling & Software 21 (5): **602–14**.

PUBLISHED on D2L BY:

9/25/23 @ @ 12:01am

Presentation and assignments are published by this deadline. Readings are already available on D2L.

You will be notified by email when the materials are released.

DUE in the next two weeks:

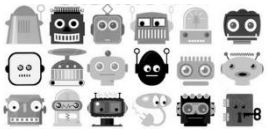
Final paper proposal Sep 28

Individual forum entry Oct 3

Reading four summary Oct 9

Group summary 3 (selected students) Oct 10

Session Four: Model Typology



READINGS:

[1] Badham, J. (2010). A Compendium of Modelling Techniques. Integration Insights.

[2] Kelly et al. (2013). "Selecting among five common modelling approaches for integrated environmental assessment and management" EMS, 47, pp. **159–181**.

PUBLISHED on D2L BY:

10/9/23 @ 12:01am

Presentation and assignments are published by this deadline. Readings are already available on D2L.

You will be notified by email when the materials are released.

DUE in the next two weeks:

Assignment One Oct 13

Individual forum entry Oct 17

Reading five summary Oct 19

Session Five: Modeling and Collaboration

READINGS:

[1] Schmitt Olabisi et al. (2013) "Modeling as a Tool for Cross-Disciplinary Communication in Solving Environmental Problems." In Enhancing Communication & Collaboration in Interdisciplinary Research. M. O'Rourke, et al. (Eds.), **271-291.**

[2] Van den Belt, M (2004). "Introduction" (Chapter 1), "The Role of Mediated Modeling" (Chapter 2), and "The Mediated Modeling Process" (Chapter 3), **pp. 1-58** in Mediated Modeling: A System Dynamics Approach to Environmental Consensus Building. Washington, DC: Island Press.

PUBLISHED on D2L BY:

10/19/23 @ @ 12:01am

Presentation and assignments are published by this deadline. Readings are already available on D2L.

You will be notified by email when the materials are released.

DUE in the next three weeks:

Assignment Two Oct 25

Group summary 4 (selected students) Oct 26

Individual forum entry Oct 26

Test Oct 30

Group summary 5 (selected students) Nov 2

Position Paper Nov 6

COURSE POLICIES

Respect for Diversity: I intend to create a classroom conducive to everyone's learning. Along with the expectations for coursework, I expect we will treat each other respectfully and collegially 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 are concerned 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, please 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. You must use quotation marks and cite and reference the source if you copy the material exactly. 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. It also checks 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.

USE OF GENERATIVE AI

The use of generative AI tools (such as ChatGPT, DALL-E, etc.) is not permitted in this class; therefore, any use of AI tools for work in this class may be considered a violation of Michigan State University's policy on academic integrity, the Spartan Code of Honor Academic Pledge and Student Rights and Responsibilities, since the work is not your own. The use of unauthorized AI tools will result in a failed grade for the assignment, including exams and quizzes (zero points earned) and filing the Academic Dishonesty Report mentioned above.

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.