

ESS 292 Topics in Environmental Systems/ ESS 192 Topics in Environmental Systems

COURSE SYLLABUS

Instructor Information:

Catherine M. Keske, Ph.D., Associate Professor
Management of Complex Systems Department, School of Engineering

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Office Hours: Tuesdays 4:00-5:00 PM;
Wednesdays 10:00 AM-11:00 AM, 1:00 PM-3:00 PM
By appointment

Course Information:

CLASSROOM: 140 Granite Pass
MEETING TIMES: Tuesdays and Thursdays, 10:30 AM-11:45 AM
CREDITS: 3

Course Description:

This course presents theoretical foundations and practical applications of research methods used in coupled natural and human (CNH) systems research and for the management of complex systems (MCS). Qualitative and quantitative socio-economic and socio-ecological research methods will be emphasized.

This emerging area considers complex, practical research questions that involve the study of both natural systems (e.g. life systems science) and social systems (e.g. socio-economic issues). For example, research conducted on global climate change or waste management requires consideration of biological processes as well as human interests.

In this course, students will identify research questions that involve both natural and social science research phases; students will also become familiar with qualitative and quantitative social science research methodologies that may be effective for studying these issues. Students will develop a research project that considers natural and social science research, as well as qualitative and quantitative social science research methodologies. At the end of the course, students will deliver a comprehensive research proposal that includes social science research methods to study a complex human and natural system topic of their choice. Ideally, projects will provide synergy with the student's intended program of graduate study.

This is still considered an experimental course that is pending course review and approval as ES 253 and MIST 253, Methods for Coupled Natural and Human Systems Research and the Management of Complex Systems.

Course Learning Outcomes:

- Students will demonstrate an understanding of the theoretical underpinnings of coupled natural and human systems research and the methodologies used in the management of complex human systems, as assessed through written and participatory exercises. (ES PLOs: 1,2), (MCS PLOs: 1, 2, 3)
- Students will identify at least one CNH system problem and design a pilot research study iteratively and incrementally over the semester. In doing so, they will develop research questions involving both the natural and social science research phases, and the combined study phases, with the intention of advancing their own thesis research. (ES PLOs: 1,2), (MCS PLOs: 1, 2, 3, 4a, 4b, 5)
- In written exercises and graded work, students will demonstrate that they are able to:
 - Explore a continuum of **social science research methodologies** and make appropriate selections to investigate their research questions.
 - Conduct a **literature review** of research methods to investigate research questions.
 - Develop **discipline-appropriate hypothesis tests** disciplines to investigate research questions.
 - Design appropriate **data gathering** and **data analysis** approaches to minimize bias.
 - Identify **ethical considerations**
 - **Propose** and **develop appropriate research instruments** and **models** to implement their research study.(ES PLOs: 1, 2, 3), (MCS PLOs: 1, 2, 3, 4a, 4b, 5)
- Students will develop practical skills for producing scholarly work, including research design, communication, and writing. In doing so, students will write an abstract and provide peer reviewed feedback on paper drafts to create a product that may be submitted to a professional conference. (ES PLOs: 1, 2, 4), (MCS PLOs: 1, 2, 3, 4a, 4b, 5)
- At the conclusion of the course, students will deliver a presentation and professional paper pertaining to a complex system in order to demonstrate growth in written and oral communication skills. (ES PLOs: 2), (MCS PLOs: 3)
- Ideally, the cumulative nature of the graded projects and presentations will support student progress in completing a thesis in the subject matter of his/her choice. (ES PLOs: 1, 2, 3, 4), (MCS PLOs: 1, 2, 3, 4a, 4b, 5)

Program Learning Outcomes:

Environmental Systems, Ph.D.

1. Core Knowledge - Graduates will be knowledgeable, skillful and self-directed in the observation and analysis of environments systems in terms of their capacity to independently identify important research questions, formulate experimental plans, analyze data, and formulate conclusions in the context of a doctoral dissertation
2. Communication Skills - Graduates will be conversant in at least two areas of environmental systems, and be adept at oral, written and visual communication of research results to peers and non-technical decision makers
3. Ethics, Community, and Life-long Learning - Graduates will understand the importance of research and professional ethics, engagement in the needs of their community, and life-long learning
4. Career Placement and Advancement - Graduates will find suitable career placement and achieve advancement in government agencies, non-government organizations, private industry, and/or academic teaching and research institution

Management of Complex Systems, M.S., Ph.D.

1. Foundations - Apply disciplinary concepts and theories for framing and defining research questions and plans from business, management, economics, sociology, psychology, cognitive science, environmental science and engineering
2. Methods - Apply contemporary social science and scientific methods needed to conduct rigorous research in their area of specialization
3. Communication - Communicate effectively to experts and non-experts, in professional (scientific and management) and community settings, preparing and delivering oral and written presentations using appropriate technologies
- 4a. Research Practice and Independence (Ph.D. and Thesis track M.S.) - Initiate and conduct independent research (e.g. review of literature, development of a research question and methodology, analysis, discussion, and conclusion) that makes an original contribution to knowledge, and which may be published in a peer reviewed outlet
- 4b. Research Practice and Independence (Non-thesis track M.S.) - Initiate and conduct supervised research (e.g. review of literature, development of a research question and methodology, analysis, discussion, and conclusion)

5. Research Ethics and Societal Context - Demonstrate familiarity with all aspects of research ethics and the societal context of their work

Course Policies and Expectations:

1. Accommodations for Students: University of California, Merced is committed to creating learning environments that are accessible to all. If you anticipate or experience physical or academic barriers based on a disability, please feel welcome to contact me privately so we can discuss options. In addition, please contact Student Accessibility Services (SAS) at (209) 228-6996 or disabilityservices@ucmerced.edu as soon as possible to explore reasonable accommodations. All accommodations must have prior approval from Student Accessibility Services on the basis of appropriate documentation. If you anticipate or experience barriers due to pregnancy, temporary medical condition, or injury, please feel welcome to contact me so we can discuss options. You are encouraged to contact the Dean of Students for support and resources at (209) 228-3633 or <https://studentaffairs.ucmerced.edu/dean-students>.

2. Physical and Mental Wellbeing: Your success in this class is important to me. In addition to support for those of you with documented accommodation needs, it is helpful to let me know (as much as you are comfortable) about challenges that get in the way of your work. I can assist with referrals to the appropriate campus resources, which include Student Health Center and Counseling and Psychological Services. If an emergency occurs during the semester, please let me know so we can work together on a plan that meets your needs and the course requirements.

3. Basic Needs Resources: Any student who has difficulty affording groceries or accessing sufficient food, or who lacks a safe and stable place to live, is urged to contact the Dean of Students for support. Additional resources exist through the campus' Basic Needs services, located in SSM 130.

4. Classroom interaction: Personal views and critical inquiry based on the material and relevant topics are encouraged. Equally, it's expected that the viewpoints of others will be respected. Complex (and possibly controversial) topics will be discussed throughout the course, so please consider this a valuable opportunity to engage with your peers through professional communication and scholarly discourse. You are welcome to show differences of opinion and to ask questions, but please be courteous and show respect towards everyone (including me, guest speakers, and your classmates). Respectful disagreement is a skill that takes a lifetime to perfect, but please put your best foot forward. I promise to do the same.

5. Workload: This class meets for three hours of lecture and discussion each week. It is expected that preparation will require nine hours of time outside class each week to complete readings and assignments.

6. Cheating and Academic Honesty: Individual and group assignments will be indicated as such. Don't cheat, dude! Like all universities, UC Merced has formal policies on this: <http://studentlife.ucmerced.edu/content/uc-conduct-standards>
<http://studentlife.ucmerced.edu/what-we-do/student-judicial-affairs/academicy-honesty-policy>

7. Weather: In the event that class is cancelled due to inclement weather or unforeseeable circumstances, the assignment will be due on the next class day. If two or more classes are cancelled then the lecture and assignment due dates may be amended.

8. Attendance is required, although it will not be “enforced”, unless you miss an in-class assignment. If you must miss class on the day that an assignment is due, your assignment will be due no later than the end of class on that day (e.g. 11:45 AM). If you choose to email the assignment, then please plan for possible disruptions with the email system. If in doubt, the assignment due time will be determined according to the time I receive the email on the University system. If you choose to email the assignment, then please plan for possible disruptions with the email system. If in doubt, the assignment due time will be determined according to the time I receive the email on the University system.

9. Course Structure and the Non-Linear Research (and Learning) Process: The course is structured to flow like a research paper in the management of complex system (from study design and literature review through methods and data collection/model development). By its very nature, the course will be complex!

Moreover, research-and learning- usually aren't linear processes; they are a function of trial and error, and involve input from others. ***We all improve with feedback!***

Please anticipate making corrections to previously completed work to fulfill the next assignment. An “A” on a previous assignment may not necessarily be an “A” for the next cumulative paper. Throughout the course, students will be provided tools, methods and feedback for developing and revising their individualized research projects. Students will also refine how their research is written and presented, and practice critiquing academic and professional work in a constructive manner.

By its very nature, a research methods course is designed to provide you with an opportunity to ***practice scholarship***. You are bound to make mistakes, yet there is infinite opportunity to improve your scholarship and learning. Honest, respectful feedback is invaluable for growth, although it is not always fun to deliver or to receive. Please remain open-minded, as there is room every scholar to improve. Please keep this in mind when you deliver and receive feedback.

As students progress throughout the course, there will be higher expectations for written assignments, compared to earlier assignments. Practice is critical to improving written communication skills. **Every** scholar can benefit from writing practice and **every** scholar can improve upon his or her work.

10. Use of Electronic Devices: At times during class, it will be useful to use electronic devices for writing or accessing the University Library. Please bring computers to class and plan to use them productively. When conducted productively and mindfully, web surfing during lectures can supplement the learning process and can enhance an individual's learning experience. Understandably, it can be a distraction for the user and others around. Exercise mindfulness. Carefully choose when and how you wish to surf the web or text during lecture. Although I can't control whether you choose to text or email during class, I encourage you to be engaged during class and refrain from distracting those around you with private communications.

11. Breaks: There are no scheduled breaks during the class. Please come and go as needed, but be respectful of others. If you arrive late, leave early, or need a break during the lecture, please try to minimize disruptions to others.

12. Use of Video, Audio Recordings, and Social Media: *Please feel free to record my lectures or take photos of slides/board work for your own personal use to facilitate learning.* **Please don't:** record your classmates' presentations or conversations during class; take photos of your classmates or me, unless we explicitly provide permission that it's OK; or, make social media posts about the class. If there is something about the class that you think is worthy of sharing through social media, please approach me first.

13. Late assignments: Assignments are due at the end of the class period, and late assignments aren't accepted. Given the cumulative nature of the project, it's my goal to return your graded assignments as soon as possible, so that you can prepare for the next assignment. Therefore, once I return assignments to the class with my feedback, it would be an unfair advantage for students to turn in their assignments after this time.

Course Evaluation:

Grading: A passing grade in this course is "B".

A+: 98%-100%

A: 93%-97%

A-: 90%-92%

B+: 87%-89%

B: 82%-86%

B-: 80%-81%

Grades are determined as follows:

Assignments due dates and weights towards grades

Graded in-class exercises, including peer reviews, roughly 10 (10%)
In-class methods presentation (10%)
Written Assignment I (20%)
Written Assignment II (20%)
In-class data plan presentation (10%)
Final, cumulative paper (20%)
Final in-class presentation (10%)

Graded In-Class Assignments: The majority of these graded assignments involve reflection about how the course material applies to your research topic and research progress. The majority of the assignments will be graded either “S” or “U”, reflecting 1% of your final grade. Some assignments will require effort outside of class; others will involve in-class participation. Most assignment due dates are noted on the weekly planner; however, some class assignments may be spontaneous. (Like a “pop quiz”). Peer reviews of your classmates also count towards graded, in-class assignments.

Written Assignment I: Literature Review due February 26

The objective is to present your literature review and frame your coupled natural research questions. Please identify and discuss at least one method that you might use to investigate your research questions. Your literature review should focus around your research questions and explore trade-offs between multiple methods if several are being considered. Your essay will be concise (1000 words maximum, not including abstract and references). More details about the paper organization will follow.

Methods Presentation: March 5 and 7

The objective of this presentation is to present a summary of methods that you are considering for Assignment I. After writing Assignment I, it's possible that you might wish to change topics or explore a method that's different from the one delivered in your methods presentation. That's OK! If you like, you can select another completely different research question or method. Please prepare and provide a list of references that you can share with your professor and classmates.

After randomly drawing your presentation order, you have the option of trading with another student; however, once you sign your name to the presentation schedule, you're responsible for delivering your methods presentation on that date.

Each category in the grading rubric is worth 2% of your grade

Grading Rubric

- Presentation and content are well organized
- Presentation connects to ES 292 course material (and there is synthesis)
- Presentation delivery and flow are smooth
- References are appropriate and academically rigorous, and they are distributed to class
- Time is managed well: time is available for Q&A and presenter is prepared to speak more if necessary

Written Assignment II: Progressive Research Paper due April 2:

This is a progressive version of your research paper, which is comprised of an amended literature review, hypothesis test, methods, and your data collection plan.

This reflects your cumulative work on your research paper, though it will still be relatively brief (maximum of 2000 words, not including abstract, diagrams, and references). It's expected that your literature review section will be expanded and synthesized compared to Assignment I. You'll also include at least one **ORIGINAL** diagram that illustrates your coupled natural human systems problem.

Data Collection Presentation: April 9 and 11

The objective of this presentation is to share your plan for your instrument design, data collection, and analysis, for group feedback. It will be important to tie your plan to your literature review, methods, and hypothesis test (which will need to be presented in a succinct manner, as the focus of the presentation is on your data collection plan). Much like previous assignments, after writing Assignment II, it's possible that you might wish to refine your data plan! That's OK! Please prepare and provide a list of references that you can share with your professor and classmates. Some of you might be able to present preliminary results of your data collection. Be sure that you address how your data are used to address coupled natural human systems research questions.

After randomly drawing your presentation order, you have the option of trading with another student; however, once you sign your name to the presentation schedule, you're responsible for delivering your data plan presentation on that date.

Each category in the grading rubric is worth 2% of your grade

Grading Rubric

- Presentation and content are well organized
- Presentation connects to ES 292 course material (and there is synthesis)
- Presentation delivery and flow are smooth
- References are appropriate and academically rigorous, and they are distributed to class
- Time is managed well: time is available for Q&A and presenter is prepared to speak more if necessary

Final Presentation and Peer Reviewing: April 30, May 2, and May 7

Cumulative Written Reports Due and Peer Reviews Returned: May 9

Reports=2500 word limit, not including abstract, references, figures, and appendices. Final presentations and written report procedures are similar to previous presentations and assignments, but more specifics will be provided later in the semester, once performance on Assignments I and II is assessed.