

**SUSTAINABILITY SCIENCE:  
INTERACTIONS BETWEEN HUMAN AND ENVIRONMENTAL SYSTEMS  
SOS 526/ BIO 526/ GCU 526**

**Semester:** Spring term 2023

**Meeting Times:** Tuesday and Thursday, 10:30am-11:45am, LSE 505

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### A) COURSE OVERVIEW

This course addresses core ideas in sustainability science -- an emerging field of problem-driven research dealing with the interactions between human and environmental systems. The problem that motivates the course, and the field, is the challenge of sustainability: improving the well-being of present and future generations in ways that conserve the planet's life support systems over the long term. The goal of the course is to introduce students interested in sustainability science to the field's principle themes, cutting-edge findings, active debates and unresolved research questions. To this end, participants will critically discuss a

set of presentations and papers covering the field in a systematic way, drawing on and integrating contemporary research from earth systems science, resource economics, institutional analysis, ecology, geography, development studies, health sciences, engineering, and other disciplines.

The motivation for the course is the need to integrate the various communities working on sustainability science. The fragmentation of those communities, by discipline, by institution, by applications focus, is a major impediment to the growth and maturation of the field. In response, we are teaching this distributed, interdisciplinary graduate course on sustainability science. The goal of this course is to bring together faculty and students from different cultures, universities, and disciplinary backgrounds to discuss key concepts, findings and controversies in the field.

The course meets twice a week. The first session each week will be conducted individually at each university to prepare for focused discussion in the second session that will be held jointly with all participants linked through web conferencing technology. We will use Zoom software, hosted by ASU. For each joint session, a faculty member will begin by presenting a prepared lecture to all participants through video (30-45 minutes). Following the lecture, an interdisciplinary team of students drawn from each institution will present a short list of questions to guide discussion of critical themes raised by the readings and lecture. All participants in the seminar will be expected to have read both the assigned readings and the discussions questions and come prepared for an in-depth discussion. A faculty moderator will guide discussion on the material, paying special attention to the discussion. All students will be expected to contribute regularly to an on-line discussion of the lectures and assigned literature. Student collaboration across institutions is highly encouraged.

## **B) LEARNING OUTCOMES**

As a result of taking this class, the participants will gain the following:

1. Students will be able to understand the major approaches to measure sustainability at different scales from local to regional to global scales.
2. Students will be proficient in the concept of inclusive wealth and its applications.
3. Students will be able to understand the concepts of supply and demand of ecosystem services.
4. Students will be able to understand the relationship between stakeholder demand for ecosystem services and their values.
5. Students will understand the concepts of resilience and sustainability.
6. Students will comprehend the mathematical models that predict state transitions.
7. Students will comprehend the role of institutions in achieving sustainability at different scales.
8. Students will have hands-on experience analyzing examples of sustainability success and failures throughout human history.

## **C) COURSE GRADING**

Professors assume that all students wish to be here and are ultimately responsible for their own learning. Grades below a B are a very strong indication that the student is in trouble academically.

Assignment of letter grades is based on a percentage of points earned.

1. Participation in class 20 %
  2. Presentation of outline of final paper 15 %
  3. Final paper 65 %
- TOTAL 100%

The letter grade will correspond with the following percentages achieved. All course requirements must be completed before a grade is assigned.

- A 100 – 91%
- B 90 – 81%
- C 80 – 71%
- D 70 – 61%
- E 60% and below

#### **D) SCHEDULE OF CLASS SESSIONS**

| <b>Date</b>   | <b>Topic</b>  |
|---------------|---|
| <b>10-Jan</b> | <b>Course Introduction &amp; Rationale</b>  |
|               | <i>Rationale and framing of Sustainability Science</i>  |
| <b>12-Jan</b> | <b>Anthropocene as the antecedent of sustainability science</b><br><br>[Anthropocene condition as rationale for sust. sci.; geological time unit and rationale for its beginning; time unit or conceptual backdrop] |
| <b>17-Jan</b> | <b>Student project presentations</b>  |
| <b>19-Jan</b> | <b>Student project presentations</b>  |
| <b>24-Jan</b> | <b>Sustainability science: framing &amp; conditions of the Earth system</b><br><br>[Framing of sust. sci. & its challenges & the positive and negatives of human-environmental conditions.]                         |
| <b>26-Jan</b> | <b>Sustainability science: framing &amp; conditions of the Earth system</b>   |
|               | <i>Dimensions of Sustainability Science</i>   |
| <b>31-Jan</b> | <b>Ecosystem/environmental services</b>   |
| <b>2-Feb</b>  | <b>Ecosystem/environmental services</b>   |
| <b>7-Feb</b>  | <b>Inclusive wealth: metric of sustainable development</b>  |
| <b>9-Feb</b>  | <b>Inclusive wealth: metric of sustainable development</b>  |
| <b>14-Feb</b> | <b>Vulnerability and Resilience</b>   |
| <b>16-Feb</b> | <b>Vulnerability and Resilience</b>   |
| <b>21-Feb</b> | <b>Tipping Points To Planetary Boundaries</b>   |
| <b>23-Feb</b> | <b>Tipping Points Planetary to Boundaries</b>   |

|        |   |
|--------|---|
| 28-Feb | <b>Human Drivers of earth system demands &amp; Changes</b>  |
| 2-Mar  | <b>Human Drivers of earth system demands</b><br>[Proximate to distal explanations & inability of sciences to explore the relationships & human-environment complexity.] |
| 7-Mar  | <b>ASU Spring Break</b>   |
| 9-Mar  | <b>ASU Spring Break</b>   |
| 14-Mar | <b>Knowledge systems and action</b>   |
| 16-Mar | <b>Knowledge systems and action</b>   |
| 21-Mar | <b>Institutions for Sustainability</b>  |
| 23-Mar | <b>Institutions for Sustainability</b>  |
| 28-Mar | <b>Place-based sustainability &amp; the science of generalization</b><br>[Pasteur sci.; general principles to complex practice]   |
| 30-Mar | <b>Place-based sustainability &amp; the science of generalization</b>   |
| 4-Apr  | <b>The Bet, Naysayers &amp; how world views guide interpretation</b>  |
| 6-Apr  | <b>The Bet, Naysayers &amp; how world views guide interpretation</b>  |
| 11-Apr | Issues confronting paper & presentations  |
| 13-Apr | Development of final paper  |
| 18-Apr | Development of final paper  |
| 20-Apr | Student Presentations   |
| 25-Apr | Student Presentations   |
| 27-Apr | Student Presentations   |
| 2-May  | Student Presentations   |

### **E) REQUIRED READINGS AND BACKGROUND MATERIAL**

Our discussions in each week of the course will be anchored by readings from the primary literature. Specific assigned readings will be posted on the course web site well in advance of the week in which they will be discussed. Each week, we will specify 1-2 papers from the scholarly literature as assigned readings. Given the scope of the class, it is inevitable that some participants will want a more basic introduction to the topic, while others will have already encountered the core reading and will therefore want something more advanced. In addition to the required core reading, we will therefore try to post optional readings for

each session. At least one more basic and one more advanced paper will be posted for participants to read if they wish to do so. Faculty and students will be invited to suggest additional readings as appropriate from the literatures with which they are familiar.

## **F) RESPONSIBILITIES FOR ALL PARTICIPANTS**

**All participants** in the course are expected to do all of the work listed immediately below.

- a) **Attend all sessions** of the seminar, including the joint (Thursday) and local university (Tuesday) sessions. Participants who must miss a class should inform their lead faculty in writing in advance. Because this course is intended to accumulate knowledge as it proceeds, and to involve a lot of team work (see below), repeated absences are unfair to all.
- b) **Do all the assigned reading** for each week before the Tuesday class. Sustainability science is a complex, interdisciplinary field. We all – faculty and students – will find ourselves bewildered by some of the assigned readings that come far from our own fields of training. That means that “dumb questions” are fine. But comments or questions uninformed by a serious effort to grapple with the readings will impose an unfair burden on everyone.
- c) Participate actively in the **class discussions**.
- d) Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that violence and harassment based on sex is prohibited. An individual who believes they have been subjected to violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. Students can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>. As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <https://eoss.asu.edu/counseling> is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, <https://goto.asuonline.asu.edu/success/online-resources.html>.

## **G) SPECIFIC RESPONSIBILITIES**

Students taking the course must meet all the general requirements noted above.

In addition, each student must participate actively in the sessions of the course and complete a term paper.

**Term paper:** The purpose of this paper is to provide students with an opportunity to connect the themes of the course with the student’s own research or policy interests. Possible topics include: i) a proposal for research on a topic of human-environment interactions that engages relevant sustainability science theory; ii) a policy analysis of a particular sustainable development problem that uses relevant sustainability science to critique current practice and advance recommendations; iii) a critical review of the literature at the intersection of a particular substantive area and the relevant literatures of sustainability science; iv) another approach that meets the goal noted above that is proposed by the student and approved by the faculty. Students are invited to discuss possible paper topics with the faculty throughout the course.

Required submissions are:

- 1) A **proposal** submitted by **mid-March**. This should include a tentative title; a narrative of 100-500 words on the topic to be addressed describing its importance and connection to sustainability science; and a list of 5-10 of the principal sources from the literature [not including those from the syllabus] that the author intends to utilize in preparing the paper. Faculty will return comments to the student on the proposal.
- 2) A **final paper** submitted by **the end of classes**. This should be between 4000 and 8000 words, not including references, captions, tables and appendices.

#### **H) ABSENCES**

We expect all students to attend and to actively participate. This being said, life happens. If you are unable to attend class for any reason, please let the instructor know in advance. There will be no penalty for absences due to religious observances, research or academic activities (such as being away for a week to attend a conference for your dissertation), university sanctioned events/activities and genuine personal family emergencies (serious illnesses for you and/or your family). Every student will get one “no questions asked” absence. After this, they will be requested to provide some form of documentation. Unexplained or unwarranted absences will result in grades lost through the participation portion of the grade. There is no way to “make up absences” as each session is based around hands-on activities with your classmates. You will be expected to do readings for sessions you cannot attend as further sessions will refer back to previous ones.

#### **I) CLASSROOM DYNAMICS AND EXPECTATIONS**

This is a small, seminar style class. The only way that this works if everyone shows up on time and ready to work. It is expected that all readings will be done, and that all out of class activities will have been completed on time. Almost each class has an out of class or hands on activity related to it. Classroom discussions will be respectful and students will be asked to be considerate of their fellow students. Bullying will not be tolerated. Discrimination of any kind, including sexual discrimination, will not be tolerated. Faculty is obligated to report any information regarding alleged acts of sexual discrimination. Because the class is so small and we will be engaged in activities and/or discussion, We strongly discourage you from using cell phones in class. Laptops may be used for notetaking and at times a phone or recording device may be helpful for activities.

#### **J) ACADEMIC INTEGRITY**

Students are expected to be ethical not only in the classroom, but also out of the classroom. It is all students’ interest to avoid committing acts of academic dishonesty and to discourage others from committing such acts. Students should refrain from uploading any material that is not the student’s original work, unless the student complies with all applicable copyright laws. Faculty reserves the right to remove any and all materials if copyright infringement is suspected. Students should consult their instructors to seek clarification on what constitutes ethical behavior in and out of the classroom. There are several penalties including dismissal from the degree program for unethical behavior. Academic dishonesty includes, but is not limited to, the following examples: engages in any form of academic deceit; refers to materials or sources or uses devices (e.g., computer disks, audio recorders, camera phones, text messages, crib sheets, calculators, solution manuals, materials from previous classes, or commercial research services) not authorized by the instructor for use during any Academic

Evaluation or assignment; provides inappropriate aid to another person in connection with any Academic Evaluation or assignment; engages in Plagiarism; uses materials from the Internet or any other source without full and appropriate attribution; claims credit for or submits work done by another; signs an attendance sheet for another student, allows another student to sign on the student's behalf, or otherwise participates in gaining credit for attendance for oneself or another without actually attending; falsifies or misrepresents hours or activities in relationship to an internship, externship, field experience, workshop or service learning experience; or attempts to influence or change any Academic Evaluation, assignment or academic record for reasons having no relevance to academic achievement. ASU expects and requires all its students to act with honesty and integrity, and respect the rights of others in carrying out all academic assignments. For more information on academic integrity, including the policy and appeal procedures, please visit <http://provost.asu.edu/academicintegrity>.

### **K) ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**

ASU's Student Accessibility and Inclusive Learning Services (SAILS) is the entity that provides services to students with disabilities. If you desire accommodation for this course, contact SAILS at <https://eoss.asu.edu/accessibility> to establish your eligibility and make sure they can provide you with the services you will need for this course. Students with disabilities must meet the same standards, deadlines, etc. as any other student in the course.