O'Neill School of Public and Environmental Affairs

SPEA-E 555: Environmental Sustainability Science

Fall 2024 Syllabus

Instructor: Dr. Zhiying Li; Assistant Professor; zl68@iu.edu; Office – MSBII Room 418

Class Meeting: Mondays & Wednesdays 3:00 PM-4:15 PM; PV273

Office/Open Hours: Wednesdays 10:30 AM – 11:30 AM or by appointment

Course Description:

The world population increased from approximately 2.5 billion in 1950 to over 8 billion currently and continues to grow. According to the World Bank, global final consumption expenditure increased from about $25.75 trillion to $72.65 trillion in 2022 expressed in 2022 U.S. dollars. This rising population and increasing total resources consumption place significant pressure on the planet's ecosystems and natural resources, including food, water, air, and energy, thereby raising the importance of the issue of sustainability.

The course is to introduce students to the concepts, issues, and practices surrounding environmental sustainability science. Students will explore the environmental sustainability in the context of various Earth system components such as the atmosphere, hydrosphere, biosphere, as well as the interconnections between environmental, social, and economic sustainability. Topics will include climate change, air quality, water quality and quantity, soil health, biodiversity loss, and renewable and non-renewable energy. Through a combination of lectures, hands-on projects, student-led discussions, students will develop a deep understanding of environmental sustainability science and its critical role in shaping a sustainable future.

Learning Outcomes: By the end of the semester, you should know (concepts) and be able to do certain things (skills):

Concepts:

1) Understand the major natural resources and processes that support life and supply human needs.

2) Understand the science behind the major threats to environmental sustainability in the areas of air quality, water quality and quantity, soil health, biodiversity and ecosystem services, renewable and non-renewable energy, waste and contaminants, and climate change. Understand the connection of environmental sustainability with social and economic sustainability.

3) Understand the major efforts to reduce environmental threats and mitigate harm from environmental impacts, including relevant national and international programs and treaties.

4) Be familiar with the UN Sustainable Development Goals and where and how environmental sustainability is associated with each.

5) Be familiar with major environmental justice issues associated with environmental sustainability at local, regional, and global levels.

6) Be familiar with social and economic justice issues that result from environmental impacts.

Skills:

7) Navigate, interpret, and synthesize literature on planetary boundaries and the current state of knowledge and status of the various boundaries proposed to sustain life on earth.

8) Apply simple quantitative analyses to conceptualize the visions for a sustainable future.

9) Interpret formulas, graphs, tables, and schematics, and draw meaningful inferences.

10) Locate and analyze environmental data, create effective graphical representations (such as line graphs, pie graphs, box plots, etc.) to communicate information, support your arguments, and explain results.

11) Deliver clear and concise oral presentations.

12) Write a clear and well-organized research paper grounded in a synthesis of existing literature.

Course structure:
The course will begin with 4 weeks of lectures covering fundamental concepts in environmental sustainability science with a climate focus. These 4 weeks will feature a combination of lectures and hands-on activities such as in-class, quantitative, problem-solving sessions.

During the subsequent weeks, the focus will shift towards more applied topics. Each week will center around a specific theme, with some topics potentially spanning 1.5-2 weeks. I will deliver lectures to provide background information on a specific topic on Mondays, followed by student-led discussion on Wednesdays based on selected readings.

There is no required textbook for this course. All readings will be provided to students as PDF files via Canvas.

The focus of this course is Environmental Sustainability Science. Within that focus, I have selected class materials that present a variety of topics and arguments, including climate change, environmental justice, air quality, water resources, soil health, etc. It is possible that connections between our course and current and/or historical events outside the classroom will come up in lectures, class discussions, and/or assignments. Those connections may require careful thought rather than being immediately obvious, but the ability to understand and analyze connections among ideas and events is a core skill in professional career and will stand you in good stead in your life beyond IU.

Assessment and grading: Assessments in the course will include open-book reading quizzes, participation and discussion evaluations, and writing. Given the course's focus on readings and group discussions, it is important for each student to complete all assigned readings before class. Attendance is crucial for success, as the participation and learning that occur during group discussions cannot be replicated outside of class.

Before-class discussions	10%
In-class discussion and participation	20%
Assignments	20%
Paper proposal	10%
Final term paper and presentation	40%
TOTAL	**100%**

Explanation of each assessment is described below.

Before-class discussions (10%): Starting from Week 5, students will be asked to post discussion questions before Wednesday's class. The questions are intended to prime students to come to class ready to engage with the material. Assessment will focus on completion and thoughtfulness on complex sustainability issues rather than on correctness.

In-class discussion and participation (20%): Each student will be responsible for presenting and leading a number of discussions on the papers that are covered in class. Starting from Week 5, during the Wednesday class dedicated to a given topic, students assigned for that week will collaborate on a ~20-minute formal presentation summarizing readings and draw links between the readings. Following this, students will lead a class discussion (~45 minutes) on related questions. The student leader(s) for each discussion are expected to obtain and read additional articles where appropriate and synthesize all relevant information in their presentation and discussion. The student leader(s) should develop 6-10 questions related to the presentation's topics and be prepared to facilitate and guide the discussion as it proceeds. Groups can feel free to experiment with different discussion formats, such as small groups, exercises/mini-projects with report backs, if they find it more engaging. For those not leading the discussion, active participation is required by sharing viewpoints, comments, and/or questions. This assessment will focus on presenters' accuracy of information presented, effective use of terminology related to sustainability science, and discussants' familiarity with assigned readings and consistent contributions to the discussion.

If the student leader(s) find other papers more interesting and would prefer to lead on those instead of the readings I assigned, please inform me at least 10 business days before the presentation. This way, we can discuss and finalize the papers for that class together. Presentation materials, such as a PowerPoint file, etc., should be submitted at least 30 minutes before the begin of the class.

Assignments (20%): Assignments will be reading reflections or quantitative problems. The reading reflections will be short answer questions or multiple-choice questions, reflecting students' comprehension of foundational principles in sustainability and critical interpretation of key concepts in scholarly literature. The quantitative problems will use basic arithmetic and some algebra, but no calculus.

Paper proposal* (10%): A 1-page paper proposal, **due at the end of week 5**, should include at least 3-5 scholarly articles on the selected topic. The proposal should outline the topic, pose

relevant questions, identify potential case studies (if any), and begin formulating the argument. I will give you prompt feedback on your proposals to guide your progress.

Final term paper and presentation* (40%; 25% for term paper and 15% for presentation): Each student will pick one of the weekly topics covered for an in-depth exploration. Exploring multiple topics and discuss their interactions and/or interconnections are also encouraged. The final paper can follow the format of a literature review, a critical research paper including data analysis, research perspective, scientific report, or summary for policymakers. Regardless of the format, the paper should delve into academic literature on a topic of interest related to environmental sustainability science and articulate a clear and original argument based on readings or analysis. The paper should be single spaced, 12-point font, and a maximum of 10 pages including figures (but not including references). It should balance text and figures. It should also contain at least 10 scholarly references. If you perform original data analysis, I would like you to provide your code as well. Papers are due on **Wednesday December 18**.

* I will provide a separate document providing guidance on final term paper and presentation.

Course Policies:

1. Attendance

Attendance in class is necessary to pass this course, as the participation and learning that occur during group discussions cannot be replicated outside of class. If you need to miss more than 2 classes, please be in touch (so I can do my best to help you keep up with the course).

2. Late Assignments

All incomplete or missing assignments will receive a zero. Incomplete assignments include those submitted in the incorrect format or with the incorrect file - it is your responsibility to ensure that your work is uploaded correctly and that you have uploaded the correct file. When it comes to late assignments, you have a 24-hour grace period after the due date and time to submit an assignment without penalty. Therefore, late assignments are not accepted after 24 hours and will result in a zero.

3. Rounding

All final grades are rounded following standard mathematical practices (e.g., 82.5 is rounded to 83 for a B, but 82.4 is rounded to 82 for a B-). Final grades are not negotiable, and any requests for final grade changes for reasons other than calculation errors will be denied.

4. Late Withdrawal

After the auto-W deadline, withdrawal will be significantly limited, and you will need permission to withdraw and must meet requirements established by O'Neill.

Course Schedule:

Topics and assignments will follow the class schedule as closely as possible; however, this schedule is subject to change. See Canvas for updates throughout the semester.

Week	Date	Topic	Major Assignments
1	Aug 26	Course overview	
	Aug 28	Introduction to sustainability	Sign up for weekly topics
2	Sept 2	**Labor Day (NO CLASS)**	
	Sept 4	Anthropocene	Reading quiz
3	Sept 9	Modern climate change	
	Sept 11	Connecting climate and human systems	
4	Sept 16	Climate Extremes	
	Sept 18	Natural Systems and Contaminants	Extreme precipitation
5	Sept 23	Air pollution: Sources, impacts, and regulations	
	Sept 25	Air pollution: Student-led discussions	
6	Sept 30	Water quality: Sources, impacts, and treatments	**1-pg proposal due**
	Oct 2	Water quality: Student-led discussions	
7	Oct 7	Water availability: Hydrological cycle	
	Oct 9	Water availability: Student-led discussions	Reading quiz
8	Oct 14	Water availability cont'd: Drought	
	Oct 16	Water availability cont'd: Discussion led by Dr. Li	
9	Oct 21	Energy: Renewable and non-renewable energy	
	Oct 23	Energy: Student-led discussions	Energy consumption
10	Oct 28	Contaminants II: Integrated management	
	Oct 30	Contaminants II: Student-led discussions	
11	Nov 4	Soil health: Soil formation, erosion, and agriculture	
	Nov 6	Soil health: Student-led discussions	
12	Nov 11	Waste: Waste generation trends and reduction	
	Nov 13	Waste: Student-led discussions	
13	Nov 18	Biodiversity: Threats and restoration strategies	
	Nov 20	Biodiversity: Student-led discussions	Biodiversity distribution
14	Nov 25	**Thanksgiving Break (NO CLASS)**	
	Nov 27	**Thanksgiving Break (NO CLASS)**	
15	Dec 2	Interconnectedness of systems: discussions 1	
	Dec 4	Interconnectedness of systems: discussions 2	
16	Dec 9	Term paper presentation (via zoom)	
	Dec 11	Term paper presentation (via zoom)	
17	**Term paper due on Wednesday December 18**		

Use of AI (such as ChatGPT) in this class. Using AI (such as ChatGPT) to assist in completing assignments in this class is prohibited. If you do use AI, you will be committing plagiarism* and will be subject to penalties in this class and sanctions by Indiana University.

***Plagiarism**: Plagiarism is defined as presenting someone else's work, including the work of other students, as one's own. *Any ideas or materials taken from another source* for either written or oral use *must be fully acknowledged*, unless the information is common knowledge. What is considered "common knowledge" may differ from course to course. https://studentcode.iu.edu/responsibilities/academic-misconduct.html.

Note Selling: Several commercial services have approached students regarding selling class notes/study guides to their classmates. Selling the instructor's notes/study guides in this course is not permitted. Violations of this policy will be reported to the Dean of Students as academic misconduct (violation of course rules). Sanctions for academic misconduct may include a failing grade on the assignment for which the notes/study guides are being sold, a reduction in your final course grade, or a failing grade in the course, among other possibilities. Additionally, you should know that selling a faculty member's notes/study guides individually or on behalf of one of these services using IU email, or via Canvas may also constitute a violation of IU information technology and IU intellectual property policies; additional consequences may result.

Materials: The faculty member teaching this course holds the exclusive right to distribute, modify, post, and reproduce course materials, including all written materials, study guides, lectures, assignments, exercises, and exams. While you are permitted to take notes on the online materials and lectures posted for this course for your personal use, you are not permitted to re-post in another forum, distribute, or reproduce content from this course without the express written permission of the faculty member. Any violation of this course rule will be reported to the appropriate university offices and officials, including to the Dean of Students as academic misconduct.

Counseling and Psychological Services
For information about services offered to students by CAPS:
http://healthcenter.indiana.edu/counseling/index.shtml

TimelyCare
Indiana students have free, 24/7 access to virtual mental health care services with TimelyCare. Students do not need insurance to access TimelyCare services. https://www.iu.edu/mental-health/find-resources/timely-care.html#0

Religious Observation
In accordance with the Office of the Dean of Faculties, any student who wishes to receive an excused absence from class must submit a request form available from the Dean of Faculties for each day to be absent. This form must be presented to the course instructor by the end of the second week of this semester. A separate form must be submitted for each day. The instructor will fill in the bottom section of the form and then return the original to the student. Information about the policy on religious observation can be found at the following website: https://policies.iu.edu/policies/aca-59-accommodation-religious-observances/index.html

Accessible Educational Services (formerly Disability Services for Students)
Securing accommodations for a student with disabilities is a responsibility shared by the student, the instructor, and the AES Office. For information about support services or accommodations available to students with disabilities, and for the procedures to be followed by students and instructors: https://studentlife.indiana.edu/student-support/iub-aes/index.html

Sexual Harassment
As your instructor, one of my responsibilities is to help create a safe learning environment on our campus. Title IX and our own Sexual Misconduct policy prohibit sexual misconduct. If you have experienced sexual misconduct, or know someone who has, the University can help.

If you are seeking help and would like to talk to someone confidentially, you can make an appointment with:

i. The Sexual Assault Crisis Service (SACS) at 812-855-8900
ii. Counseling and Psychological Services (CAPS) at 812-855-5711
iii. Confidential Victim Advocates (CVA) at 812-856-2469
iv. IU Health Center at 812-855-4011

For more information about available resources: http://stopsexualviolence.iu.edu/help/index.html. It is also important to know that federal regulations and University policy require me to promptly convey any information about potential sexual misconduct known to me to our campus' Deputy Title IX Coordinator or IU's Title IX Coordinator. In that event, they will work with a small number of others on campus to ensure that appropriate measures are taken and resources are made available to the student who may have been harmed. Protecting a student's privacy is of utmost concern, and all involved will only share information with those that need to know to ensure the University can respond and assist. I encourage you to visit http://stopsexualviolence.iu.edu/help/index.html to learn more.

Commitment to Diversity: Find your home and community at IU

Asian Culture Center
Address: 807 East Tenth Street, Bloomington, IN 47408
Phone: 812-856-5361
Email: acc@indiana.edu
Website: https://asianresource.indiana.edu/index.html

First Nations Educational & Cultural Center
Address: 712 E 8th St., Bloomington, IN 47408
Phone: 812-855-4814
Email: fnecc@indiana.edu
Website: https://firstnations.indiana.edu/contact/index.html

Jewish Culture Center
Address: 730 E 3rd St., Bloomington, Indiana 47401

Phone: 812-336-3824
Website: https://iuhillel.org/iu-jewish-culture-center

LGBTQ+ Culture Center
Address: 705 E 7th St., Bloomington, Indiana 47408
Phone: 812-855-4252
Email: glbtserv@indiana.edu
Website: https://lgbtq.indiana.edu/contact/index.html

La Casa Latino Culture Center
Address: 715 E 7th St., Bloomington IN, 47408
Phone: 812-855-0174
Email: lacasa@indiana.edu
Website: https://lacasa.indiana.edu/

Neal-Marshall Black Culture Center
Address: 275 N Jordan Ave Bloomington, Indiana 47405
Phone: 812-855-9271
Email: nmgrad@indiana.edu
Website: https://blackculture.indiana.edu/index.html