Term Information

Effective Term	Autumn 2022

General Information

Course Bulletin Listing/Subject Area	Civil Engineering
Fiscal Unit/Academic Org	Civil, Envrnmntl & Geodtc Eng - D1427
College/Academic Group	Engineering
Level/Career	Undergraduate
Course Number/Catalog	3530
Course Title	Learning from disasters: Extreme events and their impact on infrastructure, engineering and society
Transcript Abbreviation	Learn from disast
Course Description	Introduction to six dimensions of sustainability while learning the main impacts and threats caused by various extreme events through the study of academic publications and reports covering six major extreme events. Long term impacts and recovery from extreme events, how historical decisions in planning, engineering and/or urban development, legislation play important roles
Semester Credit Hours/Units	Fixed: 4

Offering Information

Length Of Course	14 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	100% at a distance
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	None
Exclusions	Not open to students with credit for EarthSci 3530
Electronically Enforced	Yes

Cross-Listings

Cross-Listings	Cross-listed in EarthSci

Subject/CIP Code

Subject/CIP Code	14.0801
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore, Junior, Senior

Requirement/Elective Designation

Sustainability

Course Details

Course goals or learning objectives/outcomes

- Successful students will recognize and explain the multifaceted impacts that disasters resulting from extreme events have on people, communities, infrastructure, society, and nature.
- Successful students will apply multidisciplinary approaches from science and engineering to preparedness and hazard mitigation associated with of extreme events, including community preparedness, vulnerability, infrastructure robustness, resilience
- Successful students will analyze and explain how social and natural systems function, interact, and evolve over time; how human wellbeing and sustainability depends on these interactions;
- how actions have impacts on subsequent generations and societies globally; and how human values, behaviors, and institutions impact multi-faceted, viable solutions across time.

Content Topic List

- Examples and introduction to sustainability's six dimensions framework

  Hurricanes (wind and precipitation)

  Hurricanes (rescue and recovery)

  Lasting effects of extreme events and measures to increase resilience

  Global warming and sustainability
- Dam failures and flooding

  Wildfires, landslides and debris flows

  Earthquakes and tsunamis (hazard and effects)

  Extreme event disasters in developing countries

Sought Concurrence

Yes

Attachments

- CurriculumChairLetter-newGE-hazards.pdf: Concurrence

  (Concurrence. Owner: Tolchin Jr.,Barry Scott)

- Proposed syllabus of CE course - 2021-12-15.pdf: syllabus

  (Syllabus. Owner: Tolchin Jr.,Barry Scott)

- GE Learning from Disasters - Submission-sustainability 2021-12-15.pdf: GE submission

  (Other Supporting Documentation. Owner: Tolchin Jr.,Barry Scott)

- CIVILEN_EARTHSC_2540_interdisciplinary-team-taught-inventory.pdf: team taught inventory

  (Other Supporting Documentation. Owner: Quinzon-Bonello,Rosario)

- CE3530-AU2022 Syllabus - 2022-06-08.docx: updated syllabus - 6/8/22

  (Syllabus. Owner: Tolchin Jr.,Barry Scott)

- GE ASC Contingent Approval.pdf: GE Contingent Approval

  (Other Supporting Documentation. Owner: Tolchin Jr.,Barry Scott)

- contingenies for 2540 now 3530.docx: contingencies document

  (Other Supporting Documentation. Owner: Tolchin Jr.,Barry Scott)

- CourseRequest_1064564.pdf: updated ASC course request

  (Other Supporting Documentation. Owner: Tolchin Jr.,Barry Scott)

- CIVILEN_EARTHSC_3530_interdisciplinary-team-taught-inventory.pdf: updated team inventory

  (Other Supporting Documentation. Owner: Tolchin Jr.,Barry Scott)

- GE Learning from Disasters - Submission-sustainability 2021-12-15 (1).pdf: Updated GE Submission (taken from ES)

  (Other Supporting Documentation. Owner: Hilty,Michael)

Comments

- Updated syllabus with new course number per GE review. Contingent approval granted, and their requests have been addressed in the updated syllabus. *(by Tolchin Jr.,Barry Scott on 06/08/2022 01:32 PM)*
- The syllabus for the Earth Science version of the course is being reviewed by ASC Office of Distance Education for DL delivery. Once they receive the green light, please make sure that the most recent version of the DL syllabus is uploaded by you as well (indeed it is possible that ASC ODE will suggest revisions). *(by Vankeerbergen,Bernadette Chantal on 04/19/2022 01:07 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Tolchin Jr.,Barry Scott	01/07/2022 02:03 PM	Submitted for Approval
Approved	Quinzon-Bonello,Rosario	01/10/2022 12:24 PM	Unit Approval
Revision Requested	Quinzon-Bonello,Rosario	01/10/2022 04:14 PM	College Approval
Submitted	Tolchin Jr.,Barry Scott	01/10/2022 10:06 PM	Submitted for Approval
Approved	Quinzon-Bonello,Rosario	01/27/2022 11:15 AM	Unit Approval
Approved	Quinzon-Bonello,Rosario	01/27/2022 11:15 AM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	04/19/2022 01:07 PM	ASCCAO Approval
Submitted	Tolchin Jr.,Barry Scott	06/08/2022 01:32 PM	Submitted for Approval
Approved	Tolchin Jr.,Barry Scott	06/08/2022 01:39 PM	Unit Approval
Approved	Quinzon-Bonello,Rosario	06/08/2022 02:32 PM	College Approval
Pending Approval	Cody,Emily Kathryn Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	06/08/2022 02:32 PM	ASCCAO Approval

On Monday, May 9th, the Natural and Mathematical Sciences Panel of the ASC Curriculum Committee reviewed a new course request for Earth Sciences/Civil Engineering 2540. Please see below for the Panel's feedback.

The Panel unanimously approved the request with two contingencies and three recommendations. As a reminder, the Panel's contingencies must be satisfied by a revision submitted in curriculum.osu.edu while the Panel's recommendations may be implemented when the course is first taught.

- **Contingency:** The Panel asks that the departments submitting this course consider the implications of this being numbered at the 2000-level, as currently, in the College of Arts and Sciences, courses taught at the 2000-level in the physical and mathematical sciences (which the School of Earth Sciences falls within) are considered "upper division" credit. It is likely that students enrolled in the Civil Engineering section of the course will receive "lower division" credit (please double-check with your colleagues in that department) while students enrolled in the same, Earth Sciences, section will receive "upper division" credit. This is not tenable. One potential solution would be to renumber this course to the 3000-level, as 3000-level courses in the College of Arts and Sciences receive upper division credit regardless of their discipline.

Thank you for pointing out this potential issue with "upper division" credit. It was decided to change the course number to "3530" as the course content and delivery is an upper division course.

- **Contingency:** The Panel has some concerns they would like to see addressed in the syllabus regarding the course workload and how it is communicated in the syllabus. On page 7 of the course syllabus, under Credit hours and work expectations, it states that students should expect to spend 4 hours on direct instruction and 12 hours on out-of-classroom instruction. This is incorrect, as per the faculty rules, students should expect to have 1 hour of direct instruction and 2 hours of out-of-classroom work (for a total of 3 hours) per every 1 credit hour earned. For a 4-credit hour course, students should expect to spend 4 hours on direct instruction and 8 hours on out-of-classroom work. The Panel would like to ensure that the course proposers designed their course assignments to meet this 8 hours of outside work per week rather than 12 hours of outside work per week. For additional information, please see the faculty rules (3335-8-24) on credit hours at: https://go.osu.edu/credithours.

We appreciate the clarification here and have adjusted the work expectation following the guidelines (copied below with change highlighted in red). The syllabus now reads:

According to Ohio State policy, students should expect to have 1 hour of direct instruction and 2 hours of out-of-classroom work (for a total of 3 hours) per every 1 credit hour earned to receive a grade of (C) average.

- **Recommendation:** The Panel recommends not requiring a doctor's note for late submission of assignments (as found on page 14 of the syllabus), as the Wilce Student Health center will not provide written documentation that a student is ill or visited them for treatment, and obtaining a doctor's note may require a student to make an unnecessary out-of-pocket medical expense to obtain this note.

This is a good point, and the policy has been adjusted so that in now reads (copied from the syllabus with the change highlighted in red:

Late submission will not be accepted (grade = zero). In case of severe illness, the student shall notify the instructor as soon as possible of the extenuating circumstance.

- **Recommendation:** The Panel recommends adding the readings for the course directly to the course calendar on the corresponding dates.

The weeks (from the course schedule) have been added to the readings/resources list on pages 9-12.

- **Recommendation:** The Panel mentions that they view course syllabi as a "user manual" for students enrolled in the course to learn all the necessary information they need to be successful within the course. Therefore, they recommend either moving the relevant information in the course (such as details on assignments, the course calendar, etc.) higher in the syllabus or providing a useful table-of-contents to the front of the syllabus to allow students to quickly find the relevant section they seek.

The order of the material was adjusted following a more standard outline so that the material is more easily found for the students.

Thanks for the opportunity to revise the new course proposal.

CivilEng 3530/EarthSc 3530: Learning from disasters: Extreme events and their impact on infrastructure, engineering and society

AUTUMN SEMESTER 2022

COE Instructor: Dr. Daniel Pradel (Civil Engineering)
Email address: pradel.1@osu.edu
Phone number: 614-688-2708
CAS Instructor: Cristina Millan, PhD (Earth Sciences)
Email address: millan.2@osu.edu
Zoom link: https://osu.zoom.us/my/pradel (password: geo)
Office hours: Monday through Thursday 10:00–11:00AM via Zoom from Hitchcock 403. Additional office hours at alternative times or days are available by appointment (please request appointment 24hrs in advance).
Course credit hours: 4

COURSE OVERVIEW

Course description

The course is an introduction to the multidisciplinary study of extreme events and sustainability. The course will cover natural hazards, such as hurricanes, heat waves, flooding, earthquakes, landslides, volcanic eruptions, and tsunamis, which are of great importance because of their potential to cause extensive damage and their impacts on people, infrastructure, and nature. The course is structured in a seminar type format, where students will first perform individual scholarly research about a specific case history, then work with other students on a thematically organized presentation, and lastly, participate in class discussions. Through their study of case histories, students will gain in-depth multidisciplinary knowledge about extreme events, their relationship with our environment, their consequences, and the different approaches that societies have implemented to mitigate disasters.

During class discussions, students will examine the case histories in terms of preparedness, vulnerability, effects, robustness, flexibility, and resilience, which are important from a sustainability perspective. Students will also discuss the impact of local legislation, wealth/poverty, political decisions, local characteristics, and the major impacts that various engineering design methods/concepts have on damage. The case histories will include extreme weather events that had devastating environmental effects and long lasting economic as well as social consequences, e.g., hurricanes Katrina (2005) and Maria, Irma and/or Harvey in 2017. Natural hazards will include the 2011 Tohoku earthquake and tsunami in Japan, the 2010 Haiti earthquake, and/or the 2015 Gorkha earthquake in Nepal. The case histories will also include man-made disasters, such as dam and levee failures, the damage to the power grid in Puerto Rico in 2017, and/or the melt-down of the Dai-Ichi nuclear plant in Japan in 2011.

Through the study of case histories, students will gain an understanding of the long-term impacts and difficult recovery from extreme events, which are important from a sustainability perspective. Students will also examine the effects of extreme events in developing countries, where limited resources often result in medical threats from infectious diseases due to lack of clean water and emergency medical services (e.g., 2010 Haiti and 2015 Nepal earthquakes); similarly, students will examine how historical decisions in planning, engineering and/or urban development, as well as legislation play important roles that often magnify the destructive effects of extreme events (e.g., levee construction/design methods and urban planning used in New Orleans, the urban planning in the center of Kobe in Japan, the Jones Act that restricts the boats and crews that delivered emergency supplies to Puerto Rico after Maria).

Lastly, students will learn about the six dimensions of sustainability (listed below) and how most global warming models predict a sharp increase in the number, as well as severity, of extreme events.

Sustainability Six Dimensions Framework

1) **Systems:** coupled human-natural systems, integrating environmental, economic & social factors, systems thinking, resilience
2) **Environment:** environmental, earth, and natural resource systems; knowledge of planetary/natural systems, e.g., climate, aquatics, soils, forests, wildlife, geology, ecology, agriculture; understanding of how these systems impact human well-being (e.g., health, economy, social justice, future generations)
3) **Economic-political:** economic and political factors of sustainability (economy/consumption/ production; laws/policy/governance/institutions; business/strategy/management; costs/benefits/tradeoffs)
4) **Social-cultural:** social/cultural factors of sustainability (justice, equity, values, ethics, history, religion, the arts, citizenship, power, behavior and decision making, cultural critique...)

5) **Technology & design:** engineering; technological innovation; systems design; human-machine interface; manufacturing processes; life cycle; product design (design of technology and infrastructure to promote sustainability and human well-being)
6) **Well-being:** human health, safety, risk, sustainable livelihoods, social welfare and well-being

Course Prerequisites

None.

COURSE SCHEDULE

Week No.	Class Title / Topic
1	**Introduction:** Scope and organization of the course, discussion of Syllabus and student deliverables; group assignments. Examples and introduction to sustainability's six dimensions framework: 1) Systems: coupled human-natural systems, integrating environmental, economic and social factors, systems thinking, resilience 2) Environment: environmental, earth, and natural resource systems; knowledge of planetary/natural systems, e.g., climate, geology, ecology; understanding of how these systems impact human well-being (e.g., health, and economy) 3) Economic-political: economic and political factors of sustainability (economy/consumption/production; laws/policy/governance/institutions; business/strategy/management; costs/benefits/tradeoffs) 4) Social-cultural: social/cultural factors of sustainability (justice, equity, values, ethics, history, religion, citizenship, power, behavior and decision making, cultural critique...) 5) Technology & design: engineering; technological innovation; systems design; human-machine interface; manufacturing processes; life cycle; product design (design of technology and infrastructure to promote sustainability and human well-being) 6) Well-being: human health, safety, risk, sustainable livelihoods, social welfare and well-being

2	**Hurricanes (wind and precipitation):** Instructor presentation on the effects of Hurricanes Irma and Maria in Puerto Rico and US Virgin Islands (#1, 2 and 3). Assignment of specific topics related to hurricanes for student presentations **Hurricanes (rescue and recovery):** Instructor presentation on rescue efforts and recovery after a major hurricane and Puerto Rico's recovery after Hurricane Maria (#4 and 6). **Lasting effects of extreme events and measures to increase resilience:** Instructor presentation on the short and long term effects of Hurricane Katrina in New Orleans, and measures taken at the local and federal level to decrease New Orleans vulnerability of levees and buildings (#5).. Assignment of specific topics related to global warming for student presentations
3	**Thematic student presentations No.1 (hurricanes) / submission of report No.1**
4	**Global warming and sustainability:** Recent experience along the Gulf Coast, from Katrina in 2005 to the historical 2020 season (which ran out of hurricane names and had to use Greek letters); increased number of devastating hurricanes in recent decades and predictions from global warming models (#2)..
5	**Thematic student presentations No.2 (rescue, recovery and global warming) / submission of report No.2**
6	**Dam failures and flooding:** Instructor presentation on the causes and effects of the 1928 St Francis Dam Failure (California), 1976 Teton Dam Failure (Idaho) and 2020 Edenville Dam Failure (Michigan) (#1, 3 and 5).. Assignment of specific topics related to dam failures for student presentations
7	**Thematic student presentations No.3 (dam failures and flooding) / submission of report No.3**
8	**Wildfires, landslides and debris flows:** Instructor presentation on the 2005 landslide at La Conchita in California and 2014 Oso Landslide in Washington; deforestation caused by wildfires followed by erosion and debris flows (#2, 3, 4 and 6).. Assignment of specific topics for student presentations regarding landslides and mudflow disasters.
9	**Thematic student presentations No.4 (wildfires, landslides and mudflows) / submission of report No.4**
10	**Earthquakes and tsunamis (hazard and effects):** Instructor presentation on the effects of the 2011 Tohoku Earthquake and tsunami in Japan and on the geological record of past Earthquakes and tsunami events offshore of Japan (#1, 2, 3, 5 and 6).. Assignment of specific topics related to earthquakes for student presentations

11	**Thematic student presentations No.5 (Earthquakes and Tsunamis) / submission of report No.5**
12	**Extreme event disasters in developing countries:** Instructor presentation on the effects of the 2010 Haiti Earthquake and 2015 Gorkha Earthquake in Nepal (#2, 3, and 6). Assignment of specific topics for student presentations
13	**Thematic student presentations No.6 (disasters in developing countries) / submission of report No.6**
14-15	**Discussions and conclusions:** In-class discussions on topics including: vulnerability to extreme events, effects of global warming, lessons learned from case histories, preparedness, infrastructure robustness, and measures to enhance flexibility and resilience. Students suggestions to enhance resilience and reflections on sustainability (#1 to 6).

SAMPLE ASSIGNMENT

Introduction: Thematic Student Reports, Presentations and Discussions

For each thematic topic, students will be divided into groups and assigned a specific topic of research (a sample assignment with a list of thematic topics is provided below). During student presentations instructors will act as moderators and encourage questions from other teams and group discussions. The format of the sessions will be similar to that of a graduate student seminar where challenging each other opinions is encouraged. The instructors will moderate sessions according to their area of expertise (e.g., disaster assistance and recovery will be moderated by the instructor from Civil Engineering), and/or their field reconnaissance experience.

Example of Thematic Topic: Puerto Rico's Recovery from Hurricane Maria

Individual reports (single bullet) and thematic group presentations shall concentrate on the 2018-2021 recovery period from Hurricane Maria in Puerto Rico. Hence, submissions should only discuss briefly emergency actions taken between October and December 2017.

Thematic Group 1: Infrastructure topics (#2, 5 and 6)[1].

- Power generation and electric distribution (electric grid, hydroelectric dams, renewable sources, etc.)
- Water treatment and distribution of drinkable water.
- Transportation (airports, bridges, freeways, traffic lights, etc.)
- Short vs. long-term building repairs (e.g., blue roofs), differences between residential and commercial building repairs, etc.
- Emergency and long-term repairs of hospitals and other public buildings; impact on services

Thematic Group 2: Effects of federal legislation and political setting (#3 and 4).

- Impact of the "1920 Jones Act" legislation
- Political representation in Washington (impact of US territory vs. state)
- FEMA's funding, warehouses and asset allocation
- Distribution of federal funds between Texas, Florida and Puerto Rico after the 2017 hurricanes (Harvey, Irma and Maria)

Thematic Group 3: Economic topics (#1 and 3).

- Destruction of sources of income (e.g., tourism before vs. after Maria)
- Effect on manufacturing (e.g., pharmaceutical industry) both in Puerto Rico and on the mainland
- Impact of laws such as the "1920 Jones Act" on recovery in Puerto Rico
- Impact of public debt, fiscal policies and corresponding austerity measures of Puerto Rico's government during the decade prior to Maria

Thematic Group 4: Public health/wellbeing (#2, 4 and 6).

- Impact of damaged schools, hospitals, pharmacies on Puerto Ricans
- Estimated vs total death toll, and suicide rate
- Environmental impacts from mold and fungi on Puerto Ricans living in damaged buildings
- Impact on the island of residents' migration to the continental USA

Deliverables:

- Prior to each student presentation session, students will submit a research report regarding an aspect (assigned by instructor) of a case history and their group's PowerPoint presentation (an assignment example is provided above). The text portion of the research reports should be about ~500 words long (title and references excluded). There is no limit to the number of figures and/or photos that can be attached in a separate appendix.

[1] Highlighted numbers, indicate the primary dimensions of sustainability that are covered.

- Student presentations will be in groups of two to four students (depending on course enrollment) and will focus on a particular impact (assigned by instructor) of an extreme event (e.g., economic impact, flooding, transportation, power generation, clean water, impact of legislation, political setting, economics, medical needs, etc.). An assignment example is attached at the end of the syllabus; depending on the topic assigned by the instructor, student presentations will address some or all the following:
    - A brief description of the assigned topic and its main effects (e.g., type of devastation, health threats, economic impacts);
    - Preparedness of the city/region/country prior to the extreme event;
    - Remedial measures implemented after the extreme event;
    - Short vs. long term consequences of the extreme event;
    - Prevalence of the impact and increased risks following the event;
    - Societal and behavioral impacts;
    - Inequalities in disaster preparedness, data collection, emergency response and allocated resources;
    - Impact of local legislation and/or political setting;
    - News coverage, what is commonly remembered, and urban myths associated with the events;
    - Strategies for reducing similar threats (e.g., implemented at location or elsewhere).
    - **Important:** all student Presentations should have:
        - A “title” slide that identifies team members;
        - A slide where the main sources/references are listed;
        - A “conclusion” or “summary of findings” slide(s) at the end of the presentation.

ASSESSMENT AND LEARNING OUTCOMES

ABET Accreditation Program Learning Outcomes:

None

Engineering learning outcomes:

By the end of this course, students should successfully be able to:

- Identify the main impacts and threats caused by extreme events.
- Identify methods used to prevent and/or mitigate extreme events, and their immediate as well as long-term consequences.
- Identify how regulations, building codes and mitigation methods change following extreme events, and evolve through time.
- Understand how managers, designers and engineers apply mitigation and design procedures intended to reduce the impacts caused by extreme events
- Understand the importance of resilience in the development of infrastructure.

Earth Science learning outcomes:

- By the end of this course, students should successfully be able to: Describe the physical, chemical, and/or biological processes that drive extreme events
- Understand feedback loops between natural and anthropogenic factors that cause extreme events
- Identify precursory phenomena that allow scientists and engineers to monitor and/or predict extreme events
- Describe monitoring methods for extreme phenomena

OSU GENERAL EDUCATION PROGRAM STRUCTURE

GE Course Goals:

GOAL 1: Successful students will recognize and explain the multifaceted impacts that disasters resulting from extreme events have on people, communities, infrastructure, society, and nature.

GOAL 2: Successful students will apply multidisciplinary approaches from science and engineering to preparedness and hazard mitigation associated with of extreme events, including community preparedness, vulnerability, infrastructure robustness and resilience.

GOAL 3 (sustainability): Successful students will analyze and explain how social and natural systems function, interact, and evolve over time; how human wellbeing and sustainability depends on these interactions; how actions have impacts on subsequent generations and societies globally; and how human values, behaviors, and institutions impact multi-faceted, viable solutions across time.

GE Expected learning outcomes:

Successful students are able to:

GE ELOs:

GE 1.1 Locate and select information sources that are credible, relevant and appropriate to the context.

GE 1.2 Demonstrate critical and logical thinking by analyzing and integrating information from multiple sources and disciplines.

GE 1.3 Read, listen, compose and speak in a variety of genres and modalities for a range of purposes and audiences.

GE 1.4 Apply learned concepts and skills to new situations.

GE 2.2 Use methods of research, inquiry, creativity and discovery across disparate disciplines to generate and respond to socially and ethically important topics.

GE 3.3 Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world.

GE 4.1 Describe and apply skills needed to maintain resiliency and personal well-being in contemporary society.

GE 4.3 Employ technology effectively and ethically to enhance academic, professional and personal life.

GE 4.4 Appreciate and participate in a culture of engagement and service.

GE 4.5 Work collaboratively with others to achieve shared goals.

Sustainability Theme ELOs:

ELO 1.1: Engage in critical and logical thinking about extreme events.

ELO 1.2: Engage in an advanced, in-depth, scholarly exploration of extreme events.

ELO 2.1: Identify, describe, and synthesize approaches or experiences as they apply to extreme events.

ELO 2.2: Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts

ELO 3.1: Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world currently and in the future.

ELO 3.2: Devise informed and meaningful responses to problems and arguments in the area of sustainability based on the interpretation of appropriate evidence and an explicit statement of values.

HOW THIS COURSE WORKS

Mode of delivery:

The lectures are 100% online and will be conducted on Zoom at their scheduled time.

Participating in online activities for attendance:

Instructor will hold Zoom live lectures, where students are expected to attend and participate (e.g., make group presentations). There will be Top Hat quizzes on a regular basis during lectures and students must be connected in order to answer them. The live lectures will be recorded and links to lectures will be available shortly thereafter.

Office Hours and Live Sessions:

Office hours will be held at their scheduled time via Zoom. For students on the Columbus campus, in-person office hours are optional.

Credit hours and work expectations:

According to Ohio State policy, students should expect to have 1 hour of direct instruction and 2 hours of out-of-classroom work (for a total of 3 hours) per every 1 credit hour earned to receive a grade of (C) average.

Required Activities and Deliverables:

- Students are expected to attend all Zoom sessions (live lectures) and participate in seminar discussions.
- Weekly readings, student presentations, and individual research are expected.
- We expect that students will have the opportunity of working with peers from foreign universities (e.g., the University of Tsukuba[2], in Japan, where a similar course is approved). The type, format and extent of outside participation will depend on the respective enrollment from other universities and will be detailed once the semester has begun.

[2] http://www.tsukuba.ac.jp/en/

COURSE MATERIALS AND TECHNOLOGY

Required textbooks:

None

Suggested Readings/Resources

To research a topic the preferred source of information for students' research papers are academic/scholarly publications, professional societies reports, government reports. Examples of such publications are presented below:

Weeks 1-3:

2005 Hurricane Katrina (New Orleans only)

FEMA (2006) "Hurricane Katrina in the Gulf Coast Mitigation Assessment Team Report Building Performance Observations, Recommendations, and Technical Guidance" FEMA 549 report

NIST (2006) "Performance of Physical Structures in Hurricane Katrina and Hurricane Rita: A Reconnaissance Report" NIST Technical Note 1476

2017 Hurricane Irma & Maria (Puerto Rico only)

GEER/NSF report from http://www.geerassociation.org/administrator/components/com_geer_reports/geerfiles/180629_GEER_PR_Report_No_GEER-057.pdf

Weeks 4-6:

1928 St Francis Dam Failure (California)

Rogers, J. D. (2006, 6:2). Lessons Learned from the St. Francis Dam Failure. Geo-Strata, 14-17.

Rogers, J. D. & Hasselmann, K. F. (2013). The St. Francis Dam Failure: Worst American Engineering Disaster of the 20th Century. AEG Shlemon Specialty Conference: Dam Failures and Incidents. Denver: Association of Environmental and Engineering Geologists.

VandenBerge, D. R., Duncan, J.M., & Brandon, T. (2011). Lessons Learned From Dam Failures. Virginia Polytechnic Institute and State University.

2020 Edenville and Sanford Dam Failures (Michigan)

Pradel D. and Lobbestael A. (2021) Edenville and Sanford Dam Failures, Field Reconnaissance Report. ASCE GSP327.

Weeks 7-9:

2005 La Conchita landslide (California)

Pradel D. (2014), "The Progressive Failure Reactivation of La Conchita Landslide in 2005", ASCE Geo-Congress 2014: Geo-Characterization and Modeling for Sustainability, ASCE GSP 234, 3209-3222.

Weeks 10-13:

2015 Gorkha Earthquake (Nepal)

Tiwari B., Pradel D., et al. (2018), "Landslide Movement at Lokanthali, during the 2015 Earthquake in Gorkha, Nepal ASCE Journal of Geotechnical and GeoEnvironmental Engineering, 10.1061/(ASCE) GT.1943-5606.0001842

GEER/NSF reports from:

http://www.geerassociation.org/administrator/components/com_geer_reports/geerfiles/Nepal_GEER_Report_V1_15.pdf

2011 Tohoku earthquake and tsunami (Japan)

Pradel D., Tiwari B., and Wartman J. (2011), "Landslides Triggered by 2011 Tohoku Pacific Earthquake: Preliminary Observations", Geo-Strata (ASCE's Geo-Institute) Sept./Oct. 2011, 28-32

Pradel D., Wartman J., and Tiwari B. (2014), "Impact of anthropogenic changes on liquefaction along the Tone River during the 2011 Tohoku Earthquake", ASCE Natural Hazards Review. Vol.15, 13-26.

Pradel D., Wartman J., and Tiwari B. (2013), "Failure of the Fujinuma Dams during the 2011 Tohoku Earthquake", ASCE Geo-Congress 2013: Stability and Performance of Slopes and Embankments III, GSP 231, 1566-1580.

COURSE TECHNOLOGY:

General

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- Self-Service and Chat support: ocio.osu.edu/help
- Phone: 614-688-4357(HELP)
- Email: servicedesk@osu.edu
- TDD: 614-688-8743

Proctoring:

During lectures, some questions (e.g., Top Hat quizzes) may be graded using automatic proctoring tools.

Baseline technical skills for online courses:

- Basic computer and web-browsing skills
- Navigating Carmen: for questions about specific functionality, see the Canvas Student Guide

Required technology skills specific to this course:

- Zoom virtual meetings
- Microsoft Office 365, especially Excel for graphs and PowerPoint for drawings

Required equipment:

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection
- Other: a mobile device (smartphone or tablet) or landline to use for BuckeyePass authentication, as well as Top Hat quizzes.
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone

Required software:

- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Full instructions for downloading and installation can be found at go.osu.edu/office365help.

Carmen access:

You will need to use BuckeyePass multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click "Enter a Passcode" and then click the "Text me new codes" button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

Carmen Website:

All course material will be posted on the Carmen site at http://www.carmen.osu.edu.

Materials and submissions:

Lectures: Instructor's PowerPoint slides will be posted ahead of the Zoom live lectures. In advance of each lecture, students are expected to have researched the subject topic and studied the slides.

Assignments: A total of 6 research reports are anticipated, that require constant and continuous effort throughout the semester. Hence, students should plan ahead, and it is their responsibility to budget their time appropriately.

Presentations: A total of 6 group presentations are anticipated. Students' PowerPoint slides will be posted on Carmen ahead of the discussion session. Students are expected to have researched the discussion topic or extreme event case history in advance of the meeting.

Important: Potential problems (e.g., computer problems, cell phone or internet outages, etc.) can be anticipated by working/submitting ahead of time; furthermore, it is student's responsibility to verify that his/her files have been properly uploaded on Carmen. Hence, no penalty reduction will be provided for uploading issues or problems.

GRADING AND FACULTY RESPONSE

Grade	Point %
A	100% - 93%
A-	90% - 92%
B+	87% - 89%
B	83% - 86%
B-	80% - 82%
C+	77% - 79%
C	73% - 76%
C-	70% - 72%
D+	67% - 69%
D	60% - 66%
E	0% - 59%

Grading:

Boundaries between grades are firm (there will be no rounding up).

- Research reports 40%
- Group presentations 40%
- Class participation 15%
- Top Hat quizzes 5%

Attendance:

Attendance is expected to all Zoom live lectures, so that students can obtain the information necessary to comprehend the course material, make relevant presentations, participate in group discussions, etc. Attendance should enable students to successfully complete assignments and/or improve performance. Instead of taking attendance, there will be multiple-choice quizzes administered through ***Top Hat*** during most live lectures. The Top Hat quizzes will contribute to the grade and help instructor assess students' learning.

Assignments

- Students will have a week to complete their assignments, and all submissions will be due 3 hours before the relevant discussion session or lecture (e.g., if student presentations are assigned during lectures on a Monday, all Carmen submissions will be due 3 hours ahead of the meeting on the following Monday).
- Late submission will not be accepted (grade = zero). In case of severe illness, the student shall notify the instructor as soon as possible of the extenuating circumstance.
- Handwritten submissions are not allowed, and all assignments are to be submitted electronically in CARMEN. Students shall submit their reports and presentations as a single PDF file. Emailed assignments and/or different formats will not be accepted, nor receive points (grade = zero).

Grading and feedback:

- Feedback on homework and lab reports will be provided on Carmen, typically within a week.
- Instructor typically replies to emails within 24 hours
- Excused absences from quizzes and exams include illnesses or similar extenuating circumstance.

Tone and civility:

Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. The instructors are committed to making the classroom a comfortable space for all of us, and we ask that we all work toward this goal in all of the course's online spaces. We will respect each other and practice civility at all times. Disrespectful language will not be tolerated.

Academic integrity policy:

Quizzes: You must complete quizzes yourself, i.e., without any external help or communication.

Written assignments: Your written assignments, should be your own original work. Copy/paste from the internet will be severely punished.

Reusing past work: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on previous work or revisit a topic you've explored in previous courses, please discuss the situation with instructor.

Falsifying data or results: All the analyses you will conduct in this course are intended to be a learning experience; you should never feel tempted to adjust or modify data/results.

Collaboration and informal peer-review: The course includes many opportunities for formal collaboration with your classmates. While study groups and peer-review of written projects is encouraged, remember that the written reports you submit must be your own work.

Ohio State's Academic Integrity Policy: Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's *Code of Student Conduct*, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the

educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If we suspect that a student has committed academic misconduct in this course, we are obligated by university rules to report our suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact instructors.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages (COAM Home)
- *Ten Suggestions for Preserving Academic Integrity (Ten Suggestions)*
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on Title IX

All students and employees at Ohio State have the right to work and learn in an environment free from harassment and discrimination based on sex or gender, and the university can arrange interim measures, provide support resources, and explain investigation options, including referral to confidential resources.

If you or someone you know has been harassed or discriminated against based on your sex or gender, including sexual harassment, sexual assault, relationship violence, stalking, or sexual exploitation, you may find information about your rights and options at titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu. Title IX is part of the Office of Institutional Equity (OIE) at Ohio State, which responds to all bias-motivated incidents of harassment and discrimination, such as race, religion, national origin and disability. For more information on OIE, visit equity.osu.edu or email equity@osu.edu.

Your mental health

A source available at s a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you find yourself feeling isolated, anxious or overwhelmed, please know that there are resources to help: ccs.osu.edu. You can reach an on-call counselor when CCS is closed at (614) 292-5766 and 24 hour emergency help is also available through the 24/7 National Prevention Hotline at 1-(800)-273-TALK or at suicidepreventionlifeline.org. The Ohio State Wellness app is also a great resource go.osu.edu/wellnessapp.

Accessibility accommodations for students with disabilities

Requesting accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services (SLDS). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

SLDS contact information: slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- CarmenCanvas accessibility
- Streaming audio and video
- Zoom accessibility
- Collaborative course tools

Classroom Safety and Respect

CEGE Buckeyes take pride in masking up and physically distancing to protect others in public spaces. As members of the Ohio State University community, these actions are part of our personal and ethical responsibility to protect public health and safety.

GE THEME COURSES

Overview

Courses that are accepted into the General Education (GE) Themes must meet two sets of Expected Learning Outcomes (ELOs): those common for all GE Themes and one set specific to the content of the Theme. This form begins with the criteria common to all themes and has expandable sections relating to each specific theme.

A course may be accepted into more than one Theme if the ELOs for each theme are met. Courses seeing approval for multiple Themes will complete a submission document for each theme. Courses seeking approval as a 4-credit, Integrative Practices course need to complete a similar submission form for the chosen practice. It may be helpful to consult your Director of Undergraduate Studies or appropriate support staff person as you develop and submit your course.

Please enter text in the boxes to describe how your class will meet the ELOs of the Theme to which it applies. Please use language that is clear and concise and that colleagues outside of your discipline will be able to follow. You are encouraged to refer specifically to the syllabus submitted for the course, since the reviewers will also have that document Because this document will be used in the course review and approval process, you should be *as specific as possible*, listing concrete activities, specific theories, names of scholars, titles of textbooks etc.

CivilEng/EarthSc 3530

Course subject & number

General Expectations of All Themes

GOAL 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations.

Please briefly identify the ways in which this course represents an advanced study of the focal theme. In this context, "advanced" refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities. *(50-500 words)*

INTRODUCTION: The proposed course focuses on the interaction of humans and their environment through the study of recent disasters caused by extreme events. The study of extreme events is not only very complex but multidisciplinary in nature, involving fields such as: public health, economics, engineering, urban planning, public policy, law, politics, climate studies, seismology, hazard mitigation, etc. The course is entitled "Learning from disasters: extreme events and their impact on infrastructure, engineering and society" and through the study of case histories concentrates on advanced topics of sustainability, including vulnerability, preparedness, robustness, flexibility, and resilience.

SIGNIFICANCE: During the 2017 hurricane season alone, three storms were responsible for over 4000 deaths and $265 billion in damages in the U.S. Southeast and Caribbean. Climate change projections indicate that extreme events such as droughts, wild fires, floods, hurricanes and typhoons are increasing in number, and importantly also in severity. Hence, it is extremely important from a sustainability perspective, to understand the hazards resulting from extreme events on our societies and the specific vulnerabilities of our various communities, in order to develop measures that improve disaster preparedness, emergency response and resiliency.

COURSE FORMAT: Using major disasters caused by extreme events as context, students will research the nature and effects of specific extreme events, and present in-depth studies of the disasters' emergency response and recovery. For each disaster, students' individual studies will examine the impact of federal and local legislation, wealth/poverty, sociopolitical conditions, climate and geography, and the interconnection of these impacts as well as their larger societal implications; they will also study and discuss the impacts that policies and engineering design methods/concepts have on disaster damages, as well as their effects on recovery. The course is structured as a graduate seminar, in which students are first introduced to a topic through one or more case histories of disasters caused by an extreme event, where the instructor was a member of the reconnaissance mission (e.g., NSF sponsored mission to Puerto Rico after hurricane Maria, ASCE missions to Nepal and Japan after major earthquakes) and provides first-hand account of the conditions immediately after the event. Students are then assigned to groups where they work individually on an assigned specific topic belonging to a theme (see example in syllabus). Students prepare a research report on their specific topic and work with their group on a thematic class presentation. In-class discussions follow the student presentations. At the end of the semester, the course culminates with instructor led discussions, where students evaluate the preparedness of the USA to extreme events, propose solutions, discuss the applicability of foreign approaches, etc.

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ELO 1.1 Engage in critical and logical thinking about the topic or idea of the theme. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. (50-700 words)

PRECONCEIVED IDEAS: Through the news, students are regularly exposed to disasters caused by extreme events such as tsunamis, hurricanes, wild fires, etc. Unfortunately, news reporters concentrate on aspects that are visually or emotionally appealing and rarely cover disasters more than a few weeks after an event. Long term impacts, as well as, topics related to preparedness and recovery, which are important from a sustainability perspective, are rarely considered newsworthy and thus not covered adequately by journalists. Additionally, because journalists are generally not specialized in covering extreme events, their news articles often contain substantial inaccuracies.

CRITICAL THINKING: Through their individual research, group work and in-class discussions, students will reevaluate preconceived ideas as they gain in-depth multidisciplinary knowledge about natural disasters and our environment, the consequences on man-made decisions, and the various actions that different societies have implemented to mitigate extreme events. For example, during the course student will discover country specific measures by which building codes have been incrementally modified to reduce loss of life, how laws have been enacted in some seismically vulnerable countries that mandate earthquake insurance prior to obtaining a home mortgage, how man-made decisions taken immediately after the 2011 Tohoku earthquake resulted in saving the Dai-Ni Nuclear Plant instead of the melt-down experienced by the Dai-Ichi Nuclear Plant a few miles away.

GOALS AND ELOs: The preparation of six individual research papers, group presentations by students, and discussions is best aligned with OSU's “Goal 1 Intellectual and Cognitive Skills” and is linked to the following GE and Sustainability Theme ELOs:
• GE 1.1 Locate and select information sources that are credible, relevant and appropriate to the context.
• GE 1.2 Demonstrate critical and logical thinking by analyzing and integrating information from multiple sources and disciplines.
• GE 3.3 Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world.
• GE 4.5 Work collaboratively with others to achieve shared goals.
• ELO 1.1: Engage in critical and logical thinking about extreme events.
• ELO 1.2: Engage in an advanced, in-depth, scholarly exploration of extreme events.
• ELO 2.1: Identify, describe, and synthesize approaches or experiences as they apply to extreme events.

ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

ACTIVITIES/ASSIGNMENTS: Students will research and prepare six individual research papers on a specific topic related to extreme events (as exemplified in the syllabus). Their research will be multidisciplinary and involve fields such as: public health, economics, engineering, urban planning, public policy, law, politics, climate studies, seismology, hazard mitigation, etc. In groups, students will also prepare thematic class presentations that will be followed by in-class discussions. The course is structured as a graduate seminar which culminates, during the last two weeks of the semester, in instructor led discussions, where students use what they have previously learned to evaluate and discuss the overall preparedness of our country to extreme events; during these last meetings, students are encouraged to use their research to critique constructively the structure of our emergency response system (FEMA, USACE, etc.), the effectiveness of programs such as the National Flood Insurance Programs), mitigation needs, and challenge damage expectations from historical global warming models. During these final meetings, students are highly encouraged to suggests solutions at the federal and local levels, propose mitigation measures, discuss their benefits, costs and/or need for taxation, and challenge each other opinions.

GOALS AND ELOs: The activities/assignments described above are best aligned with the goal: "Successful students will apply multidisciplinary approaches to the study of extreme events, including community preparedness, vulnerability, infrastructure robustness and resilience", and are linked to the following GE and Sustainability Theme ELOs:
• GE 1.2 Demonstrate critical and logical thinking by analyzing and integrating information from multiple sources and disciplines.
• GE 1.3 Read, listen, compose and speak in a variety of genres and modalities for a range of purposes and audiences.
• GE 2.2 Use methods of research, inquiry, creativity and discovery across disparate disciplines to generate and respond to socially and ethically important topics.
• GE 3.3 Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world.
• ELO 2.2: Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts
• ELO 3.1: Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world currently and in the future.

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GOAL 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

ELO 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

OUT-OF-CLASSROOM EXPERIENCE: The typical out-of-classroom experience that our students have about extreme events is through the news, as they report disasters such as tornadoes, droughts, wild fires, flash floods, dam/levee failures, tsunamis, and hurricanes. Unfortunately, journalists generally concentrate on aspects that are visually or emotionally appealing and rarely cover the topic beyond a few days or weeks. Furthermore, long term impacts, as well as, topics related to preparedness and recovery, which are important from a sustainability perspective are rarely covered by the news media adequately. Additionally, because journalists are generally not specialized in covering extreme events, news articles often contain substantial inaccuracies and/or report poorly supported estimates without quantifying and discussing the uncertainties of the supporting data.

RESEARCH AND SYNTHESIS: Collecting and analyzing data after a natural disaster is resource intensive and time consuming (as shown by the example, below); hence, governmental agencies reports, scholarly articles and comprehensive academic studies, often appear months or years after a major extreme event. During the course, students are encouraged to review authoritative/scholarly sources and compare them with early news reports and announcements by government officials. EXAMPLE: the death toll in Puerto Rico from hurricane Maria in 2017 was originally reported by the government at 13, two weeks later the official number was revised to 16, and revised again two months later to 64. Independent investigations reported the likely number of deaths between 499 (CNN) and 1,052 (NY Times); meanwhile, universities developed statistical models which predicted between 793 and 8,498 deaths. Ten months after hurricane Maria a comprehensive study by researchers from George Washington University indicated 2,975 as the most-likely number of deaths in Puerto Rico, i.e., a number that is very different from governmental and news sources.

IN-CLASS EXPERIENCE: Through in-class discussions students will gain in-depth multidisciplinary knowledge about extreme events, our relationship with the environment, and different approaches that societies have implemented to mitigate disasters. Students will be encouraged to reflect on what was reported in the news and use critical thinking when examining the reported data. During discussions, students will share points of view, and suggest solutions and mitigation measures individually as well as in groups. For example, during the course student will discover and discuss specific measures by which building codes have been modified after each major effort to reduce loss of life in certain communities, how laws were passed in certain seismically vulnerable countries that mandate earthquake insurance prior to obtaining a home mortgage, how man-made decisions taken immediately after the 2011 Tohoku earthquake resulted in saving the Dai-Ni Nuclear Plant instead of the melt-down experienced by the Dai-Ichi Nuclear Plant a few miles away.

GOALS AND ELOs: The activities/assignments described above are best aligned with OSU's "Goal 1 Intellectual and Cognitive Skills" and is linked to the following GE and Sustainability Theme ELOs:
- GE 1.1 Locate and select information sources that are credible, relevant and appropriate to the context.
- GE 1.2 Demonstrate critical and logical thinking by analyzing and integrating information from multiple sources and disciplines.
- GE 2.2 Use methods of research, inquiry, creativity and discovery across disparate disciplines to generate and respond to socially and ethically important topics.
- GE 3.3 Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world.
- GE 4.1 Describe and apply skills needed to maintain resiliency and personal well-being in contemporary society.
- ELO 1.2: Engage in an advanced, in-depth, scholarly exploration of extreme events.
- ELO 2.2: Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts
- ELO 3.1: Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world currently and in the future.

ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

ACTIVITIES/ASSIGNMENTS: The course is structured as a seminar which culminates, during the last two weeks of the semester, in instructor led discussions, where students use what they have previously learned in their research to evaluate and discuss the preparedness of our country to extreme events; students are encouraged to reflect on preconceived ideas (often based on news reports), self-assess their research reports based on information from peer presentations and in-class discussions, as well as critique constructively the government's disaster response, and prevention/mitigation programs. During these concluding meetings, students are highly encouraged to suggests solutions and/or mitigation measures, discuss their benefits, costs and/or need for taxation, share different points of view, and challenge each other opinions.

GOALS AND ELOs: The activities/assignments described above are best aligned with the goal: "Successful students will apply multidisciplinary approaches to the study of extreme events, including community preparedness, vulnerability, infrastructure robustness and resilience", and are linked to the following GE and Sustainability Theme ELOs:
- GE 1.1 Locate and select information sources that are credible, relevant and appropriate to the context.
- GE 1.2 Demonstrate critical and logical thinking by analyzing and integrating information from multiple sources and disciplines.
- GE 2.2 Use methods of research, inquiry, creativity and discovery across disparate disciplines to generate and respond to socially and ethically important topics.
- GE 3.3 Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world.
- GE 4.1 Describe and apply skills needed to maintain resiliency and personal well-being in contemporary society.
- ELO 1.2: Engage in an advanced, in-depth, scholarly exploration of extreme events.
- ELO 2.2: Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts
- ELO 3.1: Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world currently and in the future.

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Specific Expectations of Courses in Sustainability

GOAL 1: Students analyze and explain how social and natural systems function, interact, and evolve over time; how human wellbeing depends on these interactions; how actions have impacts on subsequent generations and societies globally; and how human values, behaviors, and institutions impact multi-faceted, potential solutions across time.

1.1 Describe elements of the fundamental dependence of humans on Earth and environmental systems and on the resilience of these systems. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

INTRODUCTION: Disasters caused by extreme events and the impact of anthropogenic changes to our environment are challenging communities worldwide. The proposed course addresses the interaction of humans and the environment through the study of recent disasters caused by extreme events; it focuses on various aspects of sustainability, including vulnerability, preparedness, robustness, flexibility, and resilience. The study of extreme events is not only very complex but multidisciplinary in nature, involving fields such as public health, economics, engineering, urban planning, public policy, law, politics, climate studies, seismology, and hazard mitigation.

Using case histories of hurricanes, wild fires, dam/levee failures, floods, earthquakes, and tsunamis, as context, students will research using academic and scholarly publications the nature and effects of specific extreme events, and present in-depth studies of the disasters' emergency response and recovery. For each disaster, students will examine the impact of local legislation, wealth/poverty, political decisions, laws, climate and geography, and the interconnection of these impacts as well as their larger societal implications. They will study the impacts that certain policies and engineering design methods/concepts had on damage, as well as their effects on recovery.

The course will introduce and incorporate the Sustainability Six Dimensions Framework, i.e.:
1) Systems: coupled human-natural systems, integrating environmental, economic & social factors, systems thinking, resilience;
2) Environment: environmental, earth, and natural resource systems; knowledge of planetary/natural systems, e.g., climate, aquatics, soils, forests, wildlife, geology, ecology, agriculture; understanding of how these systems impact human well-being (e.g., health, economy, social justice, future generations)
3) Economic-political: economic and political factors of sustainability (economy/consumption/ production; laws/policy/governance/institutions; business/strategy/management; costs/benefits/tradeoffs)
4) Social-cultural: social/cultural factors of sustainability (justice, equity, values, ethics, history, religion, the arts, citizenship, power, behavior and decision making, cultural critique...)
5) Technology & design: engineering; technological innovation; systems design; human-machine interface; manufacturing processes; life cycle; product design (design of technology and infrastructure to promote sustainability and human well-being)
6) Well-being: human health, safety, risk, sustainable livelihoods, social welfare and well-being

ACTIVITIES/ASSIGNMENTS: The format of the course will be that of a traditional seminar type course, where students are first introduced into the topic by the instructor, then research specific topics (individually and in groups), write six papers, make group presentations, and finally have in-class discussions moderated by the instructor. Examples of topics discussed in class will include:
• The impact of the 1920's Jones Act on the Puerto Rico's recovery after hurricane Maria in 2017 (the Jones Act is a federal law that requires all goods transported by water between U.S. ports to be carried on U.S.-flag ships, constructed in the United States, owned by U.S. citizens, and crewed by U.S. citizens and U.S. permanent residents).
• Impact of urban planning on the fires that followed the 1995 Kobe Earthquake in Japan.
• Medical threats from infectious diseases in developing countries (e.g., after the 2010 Haiti and 2015 Nepal earthquakes and the 2020 super typhoon Goni in Philippines).
• FEMA's response after the hurricane Katrina in 2005 and the long term mitigation measures around New Orleans implemented by the US Army Corps of Engineers.

GOALS AND ELOs: The preparation of six individual research papers and group presentations by students is best aligned with "Goal 3: Students analyze and explain how social and natural systems function, interact, and evolve over time; how human wellbeing depends on these interactions; how actions have impacts on subsequent generations and societies globally; and how human values, behaviors, and institutions impact multi-faceted, potential solutions across time." and is linked to the following Sustainability Theme ELOs:
• ELO 1.2: Engage in an advanced, in-depth, scholarly exploration of extreme events.
• ELO 3.1: Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world currently and in the future.
• ELO 3.2: Devise informed and meaningful responses to problems and arguments in the area of sustainability based on the interpretation of appropriate evidence and an explicit statement of values.

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1.2 Describe, analyze and critique the roles and impacts of human activity and technology on both human society and the natural world, in the past, currently, and in the future. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

INTRODUCTION: Human activities, such as the burning of fossil fuels, have resulted in global warming, and as a result, we have seen an increase in the number and severity of extreme events such as droughts, wild fires, flash floods, hurricanes and typhoons. Anthropogenic changes to our environment (e.g., the channeling of the Mississippi River and the construction of levees in New Orleans) to protect communities also result in significant man-made hazards from extreme events and long term challenges to human societies. The effect of extreme events on lifelines often present significant challenges in affected communities, as exemplified by the power grid destruction in Puerto Rico by hurricane Maria in 2017, and polar vortex winter storms that resulted in the Texas power crisis of February 2021.

ACTIVITIES/ASSIGNMENTS: Through individual research (reports), group presentations and in-class discussions, students will gain in-depth multidisciplinary knowledge about extreme events, human relation with the environment, and different approaches that leaders, engineers, urban planners and societies have implemented to mitigate disasters. For example, during the course student will discover and discuss specific measures by which building codes have been incrementally modified after each major effort to reduce loss of life in certain countries, how laws were passed in certain seismically vulnerable countries that mandate earthquake insurance prior to obtaining a home mortgage, how man-made decisions taken immediately after the 2011 Tohoku earthquake resulted in saving the Dai-Ni Nuclear Plant instead of the melt-down experienced by the Dai-Ichi Nuclear Plant a few miles away.

GOALS AND ELOs: The activities/assignments described above are best aligned with OSU's “Goal 1 Intellectual and Cognitive Skills” and is linked to the following Sustainability Theme ELOs:
• ELO 1.2: Engage in an advanced, in-depth, scholarly exploration of extreme events.
• ELO 2.2: Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts
• ELO 3.1: Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world currently and in the future.

1.3 Devise informed and meaningful responses to problems and arguments in the area of sustainability based on the interpretation of appropriate evidence and an explicit statement of values. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

ACTIVITIES/ASSIGNMENTS: The course is structured as a seminar which culminates, during the last two weeks of the semester, in instructor led discussions, where students use what they have previously learned to evaluate and discuss the preparedness of the USA to extreme events; students are encouraged to reflect on preconceived ideas (often based on news reports), self-assess their previous reports (e.g., based on information from peer’s presentations and in-class discussions), as well as critique constructively the government response structure and programs. During these concluding meetings, students are highly encouraged to share points of view, suggests local/federal solutions and/or mitigation measures, discuss their benefits, costs and/or need for taxation, and challenge each other opinions.

GOALS AND ELOs: The activities/assignments described above are best aligned with the goal: "Successful students will apply multidisciplinary approaches to the study of extreme events, including community preparedness, vulnerability, infrastructure robustness and resilience", and are linked to the following Sustainability Theme ELOs:
• ELO 2.2: Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts
• ELO 3.1: Describe, analyze and critique the roles and impacts of human activity on both human society and the natural world currently and in the future.
• ELO 3.2: Devise informed and meaningful responses to problems and arguments in the area of sustainability based on the interpretation of appropriate evidence and an explicit statement of values.

Interdisciplinary Team-Taught Course Inventory

Overview

The GE allows students to take a single, 4+ credit course to satisfy a particular GE Theme requirement if that course includes key practices that are recognized as integrative and high impact. Courses seeking one of these designations need to provide a completed Integrative Practices Inventory at the time of course submission. This will be evaluated with the rest of the course materials (syllabus, Theme Course submission document, etc). Approved Integrative Practices courses will need to participate in assessment both for their Theme category and for their integrative practice.

Please enter text in the boxes below to describe how your class will meet the expectations of Interdisciplinary Team-Taught courses. It may be helpful to consult the Description & Expectations document for this pedagogical practice or to consult your Director of Undergraduate Studies or appropriate support staff person as you complete this Inventory and submit your course.

Please use language that is clear and concise and that colleagues outside of your discipline will be able to follow. You are encouraged to refer specifically to the syllabus submitted for the course, since the reviewers will also have that document Because this document will be used in the course review and approval process, you should be *as specific as possible*, listing concrete activities, specific theories, names of scholars, titles of textbooks etc.

Accessibility

If you have a disability and have trouble accessing this document or need to receive it in another format, please reach out to Meg Daly at daly.66@osu.edu or call 614-247-8412.

Pedagogical Practices for Interdisciplinary Team-Taught Courses

Course subject & number | CivilEng/EarthSc 3530

Performance expectations set at appropriately high levels (e.g. Students investigate large, complex problems from multiple disciplinary perspectives). Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Disasters caused by extreme events and the impact of anthropogenic changes to our environment are challenging communities worldwide. The proposed course addresses the interaction of humans and the environment through the study of recent disasters caused by extreme events; it focuses on various aspects of sustainability, including vulnerability, preparedness, robustness, flexibility, and resilience. The study of extreme events is not only very complex but multidisciplinary in nature, involving fields such as public health, economics, engineering, urban planning, public policy, law, politics, climate studies, seismology, and hazard mitigation.

Students will investigate the immediate effects and long-term impacts on people, infrastructure, and nature, resulting from extreme events, such as hurricanes, heat waves, flooding, earthquakes, landslides, volcanic eruptions, and tsunamis. The course is structured in a seminar type format, where students will first perform individual scholarly research about a specific case history (e.g., Hurricane Maria in Puerto Rico), then work with other students on a thematically organized presentation, and lastly participate in class discussions.

Through the study of case histories, students will gain in-depth multidisciplinary knowledge about extreme events, their relationship with our environment, and the different approaches that societies have implemented to mitigate disasters and their consequences. During class discussions, students will discuss specific case histories in terms of preparedness, vulnerability, effects, robustness, flexibility, and resilience, which are important from a sustainability perspective. Students will also examine the impact of legislation, wealth/poverty, political decisions, local characteristics, and the major impacts that various engineering design methods/concepts had on damage.

The case histories will include extreme weather events that had devastating environmental effects and long lasting economic as well as social consequences, e.g., hurricanes Katrina (2005), Irma (2017) and Harvey (2017), the 2011 Tohoku earthquake and tsunami in Japan, the 2010 and 2021 Haiti earthquakes, etc. The case histories will also include man-made disasters, such as dam and levee failures, and the melt-down of the Dai-Ichi nuclear plant in Japan in 2011. Students will also examine the effects of extreme events in developing countries, where limited resources often result in medical threats from infectious diseases due to lack of clean water and emergency medical services (e.g., 2010+2021 Haiti and 2015 Nepal earthquakes); similarly, how historical decisions in planning, engineering and/or urban development, as well as legislation play important roles that often magnify the destructive effects of extreme events (e.g., the levee construction/design methods and urban planning used in New Orleans, the urban planning in the center of Kobe in Japan, the Jones Act that restricts the boats and crews that could deliver emergency supplies to Puerto Rico). The sample assignment on Hurricane Maria in page 21 of the proposed syllabus exemplifies the scope and multidisciplinary nature of the course assignments.

Significant investment of time and effort by students over an extended period of time (e.g., engage the issue iteratively, analyzing with various lenses and seeking to construct an integrative synthesis). Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Using case histories of hurricanes, wild fires, dam/levee failures, floods, earthquakes, and tsunamis, as context, students will research using academic and scholarly publications the nature and effects of specific extreme events, and present in-depth studies of the disasters' emergency response and recovery. For each disaster, students will examine the impact of legislation, wealth/poverty, political decisions, climate and geography, and their interconnection, as well as their larger societal implications. Students will also study and discuss the impacts that public policies and engineering design methods/concepts have on disaster damages, as well as their effects on recovery.

The course is structured as a seminar, in which students are first introduced to a topic through one or more case histories of disasters caused by an extreme event, where the instructor was a member of the reconnaissance mission (e.g., NSF sponsored mission to Puerto Rico after hurricane Maria, ASCE missions to Nepal and Japan after major earthquakes) and provides students first-hand account of the conditions immediately after the event. Students are then assigned to groups where they work individually on an assigned specific topic belonging to a theme (see example on page 21 of the syllabus). Students prepare a research report on their specific topic and work with their group on a thematic class presentation. In-class discussions follow the student presentations. During the semester, students' research will be multidisciplinary and involve fields such as: public health, economics, engineering, urban planning, public policy, law, politics, climate studies, seismology, hazard mitigation, etc. At the end of the semester, the course culminates with instructor led discussions, where students integrate/synthesize the knowledge they gained during the semester as they evaluate the preparedness of the USA to extreme events, propose solutions, discuss the applicability of foreign approaches, etc.

Interactions with faculty and peers about substantive matters including regular, meaningful faculty mentoring and peer support about conducting interdisciplinary inquiry. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

The course centers on a number of specific case studies of natural hazards, each of which include inquiry into the fundamental scientific principles involved for each hazard, and feedbacks between societal, political, and engineering challenges. Using case histories of hurricanes, wild fires, dam/levee failures, floods, earthquakes, and tsunamis, as context, students will research using academic and scholarly publications the nature and effects of specific extreme events, and present in-depth studies of the disasters' emergency response and recovery. For each disaster, students will examine the impact of legislation, wealth/poverty, political decisions, laws, climate and geography, and the interconnection of these impacts as well as their larger societal implications. They will study the impacts that certain policies and engineering design methods/concepts had on damage, as well as their effects on recovery. Assignments include: individual reports, group presentations (requiring peer feedback) and in-class discussions (faculty and peer feedback).

The course is interdisciplinary and will be co-taught by dedicated faculty from the College of Engineering and the College of Arts and Sciences that will present material, mentor students, and direct in-class discussions. Guest speakers from industry, federal agencies, emergency response organizations, and other universities will make presentations, interact with students, and provide support on specific topics.

Students will get frequent, timely, and constructive feedback on their work, scaffolding multiple disciplinary perspectives and integrative synthesis to build over time. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Students will research and prepare six individual research papers (see format below) on specific topics related to extreme events (as exemplified in the syllabus). Research topics will be thematically organized into groups of students that will make in-class presentations (see format below), leading to discussions. Students will receive timely feedback on their research papers in Carmen, orally in during office hours, from peers during the preparation of group presentations, after presentation from instructors, and end of semester discussions.

FORMAT:
- Student papers: research papers will be multidisciplinary and involve fields such as: public health, economics, engineering, urban planning, public policy, law, politics, climate studies, seismology, hazard mitigation, etc.
- Group assignments: students will prepare thematic class presentations that will be followed by in-class discussions. T
- Synthesis: the course culminates, during the last two weeks of the semester, in instructor led discussions, where students use what they have previously learned to evaluate and discuss the overall preparedness of our country to extreme events; during these last meetings, students are encouraged to use their research to critique constructively the structure of our emergency response system (FEMA, USACE, etc.), the effectiveness of programs such as the National Flood Insurance Programs), mitigation needs, and challenge damage expectations from historical global warming models. During these final meetings, students are highly encouraged to suggests solutions at the federal and local levels, propose mitigation measures, discuss their benefits, costs and/or need for taxation, and challenge each other opinions.

Periodic, structured opportunities to reflect and integrate learning (e. g. students should work to integrate their insights and construct a more comprehensive perspective on the issue). Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Through in-class discussions students will gain in-depth multidisciplinary knowledge about extreme events, our relationship with the environment, and different approaches that societies have implemented to mitigate disasters. Students will be encouraged to reflect on what was reported in the news and use critical thinking when examining the reported data. During discussions, students will share points of view, and suggest solutions and mitigation measures individually as well as in groups. For example, during the course students will discover and discuss specific measures by which building codes have been modified after each major effort to reduce loss of life in certain communities, how laws were passed in certain seismically vulnerable countries that mandate earthquake insurance prior to obtaining a home mortgage, how man-made decisions taken immediately after the 2011 Tohoku earthquake resulted in saving the Dai-Ni Nuclear Plant instead of the melt-down experienced by the Dai-Ichi Nuclear Plant a few miles away.

Because journalists are generally not specialized in covering extreme events, and have access to very limited information after an event, their news articles often contain substantial inaccuracies. Through their research students will learn that collecting and analyzing data after a natural disaster is resource intensive and time consuming (as shown by the example, below); hence, governmental agencies reports, scholarly articles and comprehensive academic studies, often appear months or years after a major extreme event. During the course, students will be encouraged to review authoritative/scholarly sources and compare them with early news reports and announcements by government officials.

EXAMPLE: the death toll in Puerto Rico from hurricane Maria in 2017 was originally reported by the government at 13, two weeks later the official number was revised to 16, and revised again two months later to 64. Independent investigations reported the likely number of deaths between 499 (CNN) and 1,052 (NY Times); meanwhile, universities developed statistical models which predicted between 793 and 8,498 deaths. Ten months after hurricane Maria a comprehensive study by researchers from George Washington University indicated 2,975 as the most-likely number of deaths.

Opportunities to discover relevance of learning through real-world applications and the integration of course content to contemporary global issues and contexts. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Through the news, students are regularly exposed to disasters caused by extreme events such as tsunamis, hurricanes, volcanoes, wild fires, etc. Unfortunately, news reporters have limited data, concentrate on aspects that are visually or emotionally appealing and rarely cover disasters more than a few weeks after an event. Long term impacts, as well as, topics related to disasters' preparedness and recovery, which are important from a sustainability perspective, are rarely considered newsworthy and thus not covered adequately by journalists. Additionally, because journalists are generally not specialized in covering extreme events, their news articles often contain substantial inaccuracies.

Through their individual research, group work and in-class discussions, students will reevaluate preconceived ideas as they gain in-depth multidisciplinary knowledge about natural disasters and our environment, the consequences on man-made decisions, and the various actions that different societies have implemented to mitigate extreme events. For example, during the proposed course students will discover country specific measures by which building codes have been incrementally modified to reduce loss of life, how laws have been enacted in some seismically vulnerable countries that mandate earthquake insurance prior to obtaining a home mortgage, how man-made decisions taken immediately after the 2011 Tohoku earthquake resulted in saving the Dai-Ni Nuclear Plant instead of the melt-down experienced by the Dai-Ichi Nuclear Plant a few miles away.

Students will research and prepare six individual research papers on a specific topic related to extreme events (as exemplified in the syllabus). Their research will be multidisciplinary and involve fields such as: public health, economics, engineering, urban planning, public policy, law, politics, climate studies, seismology, hazard mitigation, etc. In groups, students will also prepare thematic class presentations that will be followed by in-class discussions. The course is structured as a graduate seminar which culminates, during the last two weeks of the semester, in instructor led discussions, where students use what they have previously learned to evaluate and discuss the overall preparedness of our country to extreme events; during these last meetings, students are encouraged to use their research to critique constructively the structure of our emergency response system (FEMA, USACE, etc.), the effectiveness of programs such as the National Flood Insurance Programs), mitigation needs, and challenge damage expectations from historical global warming models. During these final meetings, students are highly encouraged to suggests solutions at the federal and local levels, propose mitigation measures, discuss their benefits, costs and/or need for taxation, and challenge each other opinions.

Public Demonstration of competence, such as a significant public communication of their integrative analysis of the issue. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Public demonstration of competence will be achieved by students through submission of in-depth reports (six in total), group presentations and in-class discussions. The course is structured in a seminar type format, where students will first perform individual scholarly research about a specific case history, submit an in-depth report, work with other students on a thematically organized presentation, present their findings to the class, and lastly participate in class discussions.

The course main goals are:

1: Students will recognize and explain the multifaceted impacts that disasters resulting from extreme events have on people, communities, infrastructure, society, and nature.
2: Students will apply multidisciplinary approaches from science and engineering to preparedness and hazard mitigation associated with of extreme events, including community preparedness, vulnerability, infrastructure robustness and resilience.
3: Students will analyze and explain how social and natural systems function, interact, and evolve over time; how human wellbeing and sustainability depends on these interactions; how actions have impacts on subsequent generations and societies globally; and how human values, behaviors, and institutions impact multi-faceted, viable solutions across time.

Students will achieved the stated goals through the study of case histories, more specifically, students will research and gain in-depth multidisciplinary knowledge about extreme events, their relation with our environment, and the different approaches that societies have implemented to mitigate disasters and their consequences.

Experiences with diversity wherein students demonstrate intercultural competence and empathy with people and worldview frameworks that may differ from their own. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

To provide a worldview perspective of how extreme events affect different communities around the planet, students will examine case histories of extreme events that had devastating effects not only in the USA (e.g., 2005 Hurricane Katrina in New Orleans and 2017 Hurricane Maria in Puerto Rico), but also in foreign countries (e.g., 2010 & 2021 Haiti Earthquakes, 2011 Tohoku Earthquake/Tsunami, and the 2015 Nepal Earthquake). To exemplify the multidisciplinary nature of student reports, below is a list of topics for the assignment on Puerto Rico's Recovery from the 2017 Hurricane Maria:

1: Infrastructure topics
- Power generation and electric distribution (electric grid, hydroelectric dams, renewable sources, etc.)
- Water treatment and distribution of drinkable water.
- Transportation (airports, bridges, freeways, traffic lights, etc.)
- Short vs. long-term building repairs (e.g., blue roofs), differences between residential and commercial building repairs, etc.
- Emergency and long-term repairs of hospitals and other public buildings; impact on services

2: Effects of federal legislation and political setting
- Impact of the "1920 Jones Act" legislation
- Political representation in Washington (impact of US territory vs. state)
- FEMA's funding, warehouses and asset allocation
- Distribution of federal funds between Texas, Florida and Puerto Rico after the 2017 hurricanes (Harvey, Irma and Maria)

3: Economic topics
- Destruction of sources of income (e.g., tourism before vs. after Maria)
- Effect on manufacturing (e.g., pharmaceutical industry) both in Puerto Rico and on the mainland
- Impact of laws such as the "1920 Jones Act" on recovery in Puerto Rico
- Impact of public debt, fiscal policies and corresponding austerity measures of Puerto Rico's government during the decade prior to Maria

4: Public health/wellbeing
- Impact of damaged schools, hospitals, pharmacies on Puerto Ricans
- Estimated vs total death toll, and suicide rate
- Environmental impacts from mold and fungi on Puerto Ricans living in damaged buildings
- Impact on the island of residents' migration to the continental USA

Explicit and intentional efforts to promote inclusivity and a sense of belonging and safety for students, e.g. universal design principles, culturally responsive pedagogy, structured development of cultural self-awareness. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Extreme events such as hurricanes, heat waves, flooding, earthquakes, landslides, volcanic eruptions, and tsunamis, affect disproportionately poor and underserved communities in the USA and around the world. In assignments and during class discussions, students will examine the impact of wealth/poverty, government systems, political decisions, local geologic/environmental characteristics, and the major impacts that various engineering design methods/concepts have on impacts from extreme events.

The case histories will not only include extreme weather events that had devastating environmental effects and long lasting economic as well as social consequences in the USA (e.g., 2005 Hurricane Katrina in New Orleans and 2017 Hurricane Maria in Puerto Rico), but importantly, students will also study the effects of extreme events in developing countries, where limited resources often result in medical threats from infectious diseases due to lack of clean water and emergency medical services (e.g., 2010 & 2021 Haiti Earthquakes and the 2015 Nepal Earthquake).

Using case histories, students will examine how historical decisions in planning, engineering and/or urban development, as well as legislation, aid, culture and poverty/wealth, play important roles that often magnify the recovery from extreme events and/or their destructive effects (e.g., the levee construction/design methods and urban planning used in New Orleans, the urban planning in the center of Kobe in Japan, the Jones Act that restricts the boats and crews that could deliver emergency supplies to Puerto Rico).

Clear plans to promote this course to a diverse student body and increase enrollment of typically underserved populations of students. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. *(50-500 words)*

Historically, extreme events affect disproportionately poor and underserved communities for a multitude of socioeconomic reasons including: (a) having limited property and flood insurance coverage, (b) living in more vulnerable, older and poorly maintained residential structures, (c) neighborhoods located in less affluent flood-prone urban areas, (d) losses/damages that are undercounted by emergency agencies such as FEMA, and thus have lesser access to federal emergency/recovery funding, etc.

In the lead instructor's experience, Latinx students are very aware of the devastating effects that Hurricane Maria had in Puerto Rico; similarly, African-American students know well the terrible pain inflicted in New Orleans by Hurricane Katrina, as well as, in Haiti by the 2010 and 2021 earthquakes... The lead instructor has taught similar courses at both OSU and UCLA and has found the topic of the proposed course to be of significant interest to African-American, Desi and Latinx students, resulting in high enrollments compared to other engineering courses.

Because extreme events have devastating immediate effects and long-term socioeconomic consequences on their communities, the interest of students from underserved populations, align especially well with the goals of the course, and these students tend to be some of the most motivated and outspoken students in the course; hence, wanting to learn about preparedness, vulnerability, and mitigation techniques, as well as, sharing anecdotal information. Although, the course subject is of special interest to students from underserved populations, if approved, the instructors will notify its availability to relevant OSU student chapters such as SHPE (Society of Hispanic Professional Engineers) in order to increase enrollment.

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15 November 2021

Dear Daniel,

Cc: Steven Lower, Ashley Griffith, Derek Sawyer

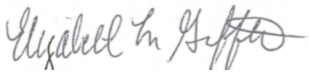
I am writing to express our support for a course proposal for a jointly-offered integrative and high impact 4 credit, online, Interdisciplinary Team-Taught (Civil Engineering/Earth Science) course in the Sustainability Theme of the new GE on the topic of "Learning from disasters: Extreme events and their impact on infrastructure, engineering and society". My understanding is this course will be team-taught by you (Civil Engineering), Derek Sawyer (SES), and Ashley Griffith (SES), and that the course is intended to be targeted at the 2000-level. The course topics and learning objectives are complementary to our Natural Hazards (EARTHSC 1151) course which has been approved in the new GE as a Foundations course in Natural Sciences. Specifically, EARTHSC 1151 focuses on understanding fundamental Earth processes responsible for hazards. Course objectives for EARTHSC 1151 are listed below:

1) Introduce the basic concepts of the Earth Sciences, using natural hazards as examples.
2) Develop an understanding of Earth processes, and an appreciation of the rates and scales at which those processes work.
3) Examine the details of geologic hazards (earthquakes, volcanic eruptions, landslides, tsunamis, flooding, hurricanes, climate change, and meteorite impacts).
4) To examine the influences of geologic hazards on humans, and how humans attempt to mitigate those influences.
5) To understand geologic hazards in Ohio.
6) To apply the scientific method to collect and interpret earth science data.

In contrast, the proposed 2000-level Interdisciplinary Team-Taught course will expand these topics to an advanced study of the engineering and policy dimensions of natural hazards.

Once the proposed course is approved in the new GE, we also intend to propose a new certificate in Natural Hazards which includes both EARTHSC 1151 and the proposed course as core courses, grouped with upper-level electives in Earth Sciences and Civil Engineering. We hope to submit that proposal early in the 2022-2023 academic year. This certificate will complement other popular certificates already offered in the School of Earth Sciences.

Sincerely,



Elizabeth M. Griffith
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