Environmental Geosciences: Earth Processes and Risks (EESC 1168)

Spring 2026 Syllabus

Instructor: Shreya Kanakiya
Instructor Office Hours: Monday 3-4.30 PM at Devlin 220 (or by appointment)
Instructor Email: shreya.kanakiya@bc.edu
TA: Heather Donnelly
TA Office Hours: Tuesday 11-12 PM and 1-2 PM at Devlin 329 (or by appointment)
TA Email: donnelhe@bc.edu
Class Schedule: Mon-Wed-Fri 10.00-10.50 AM
Class Location: 245 Beacon Street Room 107
Required Textbook: The following textbook will be used in this course - Natural Disasters (1st Edition), 2022, Stephen Marshak, Robert Rauber, and Neil Johnson. The textbook will be available through the Boston College Bookstore. Additional readings will be uploaded to Canvas.
Bring to Class: Please bring a laptop or other device to class to participate in hands-on online activities.

Welcome to Environmental Geoscience: Earth Processes and Risks

Earth processes shape several aspects of our environment and how humans interact with it. In this course, we will undertake an interdisciplinary study of the dynamic processes operating on and within the Earth and how those processes can impact humans. We will explore the nature of various natural hazards, including earthquakes, volcanic eruptions, landslides, flooding, severe weather, and climate change, and the risk they pose to society. Emphasis will be placed on understanding current hazard monitoring and prediction strategies, data, and science-based risk assessment, and associated uncertainty. We will also discuss case studies of various mitigation practices.

Expected Learning Outcomes

This course is a part of Boston College's natural sciences core curriculum. The intended audience includes non-science majors, environmental studies minors and majors, and first- or second-year environmental geoscience majors. This course is divided into five parts: (1) Introduction, (2) Internal processes & risks, (3) Surficial processes & risks, (4) Atmospheric processes & risks, (5) Informed decision-making and risk communication.

Throughout the course, you will be tasked with using scientific evidence to inform environmental policy and management decisions. By the end of this course, you will be able to:

- **Analyze the Anatomy of Risk:** Define and explain the fundamental elements of risk—hazard, exposure, and vulnerability—and the physical mechanisms that drive common natural disasters.
- **Evaluate Scientific Communication:** Critically interpret news and popular science media regarding natural disasters to distinguish between evidence-based facts and common misconceptions.
- **Assess Mitigation Strategies:** Describe and compare modern monitoring methods and engineering/policy efforts used to mitigate the impact of various natural hazards.
- **Collaborate on Building Community Resilience:** Engage in professional discourse to synthesize data and develop multi-disciplinary strategies for reducing societal vulnerability to environmental risks. Engage in efforts for effective risk communication that translate complex scientific data into actionable information for the public and help them make informed decisions.

Course Schedule

Week	Topic	Assignments
Part 1: Introduction		
Week 1 (Jan 12)	Hazards vs risk. Natural hazards vs Natural disasters. Energy sources of natural disasters	
Week 2 (Jan 19)	Earth's structure and plate tectonics. Plate boundaries and hazards.	Quiz #1 Introductory Concepts (In class on Fri Jan 23)
Part 2: Internal Processes and Risks		
Week 3 (Jan 26)	Faults and Earthquakes. Seismic waves, earthquake characteristics, and ground motion.	
Week 4 (Feb 2)	Earthquake prediction, forecasts, and mitigation.	Quiz #2 Internal Processes and Risks I (In class on Fri Feb 6)
Week 5 (Feb 9)	Tsunami generation, movement, and mitigation.	Mid-term projects assigned
Week 6 (Feb 16)	Generation of magma, volcanoes in various tectonic environments, types of volcanoes, and eruption products.	
Week 7 (Feb 23)	Volcanic hazards and mitigation.	Quiz #3 Internal Processes and Risks II (In class on Fri Feb 27)
Week 8 (Mar 2)	Spring Break	
Part 3: Surficial Processes and Risks		
Week 9 (Mar 9)	Development of slope instabilities. Types of downslope movement, landslide hazards, and mitigation.	Mid-term project due (Submit on canvas before Fri Mar 13 11.59 PM)
Week 10 (Mar 16)	Stream and flood processes, coastal erosion.	
Week 11 (Mar 23)	Wildfire processes and behaviors. Wildfire management and mitigation.	Quiz #4 Surficial Processes and Risks (In class on Fri, Mar 27)
Part 4: Atmospheric Processes and Risks		
Week 12 (Mar 30)	Basic elements of weather. Thunderstorms and tornadoes.	
Week 13 (Apr 6)	Hurricane formation, classification, and movement. Storm damage. Hurricane prediction and planning. Extratropical cyclones and Nor'easters.	
Week 14 (Apr 13)	Earth's climate history. Climate Change impacts and mitigation. Asteroid and Comet Impacts.	Quiz #5 Atmospheric Processes and Risks (In class on Fri, Apr 17)
Part 5: Informed decision-making and Risk Communication		
Week 15 (Apr 20)	Overview of various risk assessment approaches. Downward counterfactual, Probabilistic approaches, Role of Machine learning. Risk Communication.	

Continued on next page

Course Schedule – continued from previous page

Week	Topic	Assignments Due
Week 16 (Apr 27)	Course Review.	Quiz #6 Informed Decision Making and Risk Communication (In class on Mon Apr 27)
Finals		Final Examination (Wed May 6 at 9 AM - Room TBD)

Office hours

Three scheduled office hours per week (Instructor office hours on Monday 3-4.30 PM at Devlin 220 and TA office hours on Tuesday 11-12 PM and 1-2 PM at Devlin 329) or by appointment. Other appointments may be held via Zoom or in person. Office hours are an opportunity for you to get to know me and for me to get to know you. While you are welcome to drop by directly during office hours, to ensure that all of you get an opportunity to talk, I highly encourage you to reserve a slot via Calendly a day in advance (https://calendly.com/kanakiya-bc/eesc1168instructorofficehours). If you could briefly mention what you would like to discuss, that would also help me come more prepared. Note that the time slots on Calendly are not meant to limit your time, but rather to ensure that everyone who wants to attend office hours has an opportunity to speak. We can always find additional time outside of office hours to discuss more. Come with questions about the class, getting involved in research, career-related questions, or anything else you feel like chatting about. My goal is to help you succeed at BC and beyond. I am here to support you in any way I can.

Grading

The final grades will be determined at the end of the semester based on the aggregate grades for each of the assessment criteria below. The quizzes and final exam will be in multiple-choice and/or short-answer format. Participation in 75% of the class activities and readings will lead to full credit for the homework and class participation. A rubric will be uploaded on Canvas for the mid-term project. Course grades will be assigned on the below scale.

Assessment Criteria	
Assessments	**Percent of final grade**
Quizzes (10% each, one lowest grade will be dropped)	50%
Mid-Term Project	15%
Homework & Class Participation	10%
Final Exam	25%

Grading Scale	
Grade values	**Grade**
94 to 100%	A
90 to <94%	A-
87 to <90%	B+
83 to <87%	B
80 to <83%	B-
77 to <80%	C+
73 to <77%	C
70 to <73%	C-
67 to <70%	D+
63 to <67%	D
60 to <63%	D-
< 60%	F

College & Classroom Policies

Attendance

Most of this course involves interactive discussion of materials, hands-on data analysis, and group work. It is therefore expected that students attend all classes. If you must miss a class, please inform the Instructor or TA by email as soon as possible and arrange to obtain notes and information from a classmate. You will still be held responsible for the content, materials, and discussion that you missed. If any extenuating circumstances will prevent you from attending class for an extended period (e.g., severe illness), please contact the Instructor as soon as possible to work out a plan. If any circumstances prevent me from attending a class, I will inform you in advance via email or through a colleague on the day.

Academic Integrity

All students are required to read and abide by the Boston College Academic Integrity Policy (https://www.bc.edu/content/bc-web/academics/sites/university-catalog/policies-procedures/academic-integrity.html). Academic integrity is expected at all times. If you are not clear on how the policy applies to activities and assignments specific to this course, please be sure to ask for clarification.

Academic Honesty

It is expected that all assignments, quizzes, and exams submitted for academic credit will be the student's own work. While collaboration is encouraged in regular class activities, no collaboration or use of auxiliary materials is allowed during the quizzes or final exams. All exams must be completed independently without any aids. Use of AI for quizzes and exams is strictly prohibited since a central goal of this course is to help you become independent and critical thinkers.

Classroom Conduct

I want this class to be inclusive for all students and to create an environment where everyone can freely ask questions, discuss their ideas, even if they are conflicting, and help each other learn. We are on this journey together, and an environment of mutual respect will create a positive learning experience for everyone involved. All students are expected to familiarize themselves and abide by the Boston College Student Code of Conduct (https://www.bc.edu/bc-web/offices/studentaffairs/sites/dean-of-students/policies-expectations.html).

Accomodations

I want to ensure that this class is accessible to all students. If you are a student with documented disability seeking reasonable accommodations and have already registered with Connors Family Learning Center (learning disabilities and ADHD) or Disability Services (all other disabilities) and have your letter of accommodations, please meet with me early in the course to discuss, plan, and implement your accommodations in the course. If you have or think you have a disability but are not registered, the Connors Family Learning Center (https://www.bc.edu/bc-web/academics/sites/connors-family-learning-center.html) and Disability Services (https://www.bc.edu/bc-web/offices/studentaffairs/sites/dean-of-students/student-support/disability-services.html) websites provide information on the registration process. Advance notice and appropriate documentation are required for accommodations.

Class Recording Policy

Boston College seeks to protect the integrity of what transpires in the classroom among students and professors, any course materials prepared by the professor, and the privacy of students and faculty. With this in mind, you are prohibited from recording (audio or video) any lectures, seminars, or other classroom activities without the express permission of the Instructor and peers, including transcriptions created with the help of Gen AI tools. Authorized recordings and all other course materials (including any materials posted on Canvas) may only be used for the purposes of an individual's (or group's) study in the course, and may not be shared with any wider audience on or off campus unless the Instructor has explicitly given such permission.

Late Work

If there is ever a need to submit work late, please inform the Instructor 48 hrs before the work is due and obtain approval. Work submitted late without notifying and receiving approval from the Instructor will count against the final grade. If there are genuine extenuating circumstances that prevent you from coming to class for any in-class graded work, talk to the Instructor about the possibility of a make-up assignment.

Technology in the Classroom

Feel free to use laptops/ tablets to take notes in class if you prefer. All cell phones must be silenced and put away during class. If you suspect an emergency and need to take a phone call, feel free to step out of the classroom to take the call. Many class activities will require the use of a laptop. Please bring a laptop/ tablet along for all classes. Use of technology other than for everyday course-related work is not permitted during class.

Support for Mental Health and Wellness

Life at college can get very complicated. Students sometimes feel overwhelmed, lost, experience anxiety or depression, struggle with relationship difficulties, or diminished self-esteem. However, many of these issues can be effectively addressed with a little help. University Counseling Services (UCS) helps students cope with difficult emotions and life stressors. UCS is staffed by experienced, professional psychologists and counselors who are attuned to the needs of college students. The services are free and completely confidential. Find out more at the UCS website (https://www.bc.edu/bc-web/offices/studentaffairs/sites/health-wellness/counseling.html) or by calling (617) 552-3310.

Disclaimer

The syllabus and schedule are meant to be comprehensive. However, if adjustments are needed as we progress through the course, I will inform you of any changes made and provide an up-to-date syllabus on Canvas. Furthermore, in the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within the timeframe. I will provide an updated syllabus should such a need arise, which will supersede this version.