EESC 6720-695: Landslides

Spring 2024 Course Prospectus

Penn
Master of Science in
Applied Geosciences

INSTRUCTOR

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COURSE DESCRIPTION

Landslides are important geomorphic agents in mountainous terrain, mobilizing sediment and playing a key role in controlling relief and elevation. The work of landslides is often characterized by their magnitude-frequency, which also has direct implications for people, property, and infrastructure in mountainous terrain, and for the approaches taken to minimize the risk from landslides. This course will introduce students to a conceptual understanding of landslides at a range of spatial scales, including the mechanics of the processes governing landslides from trigger to deposition. Methods of slope monitoring and the varied approaches to landslide risk mitigation and management will be explored, with a range of geotechnical and environmental applications. This course includes a virtual lab visit and hands-on assignments to demonstrate simple techniques used to understand landslide processes and applications of GIS technology to explore slope monitoring and failure prediction. By the end of this course, you should be able to:

1. Demonstrate knowledge and understanding of the mechanisms that control landslide movement; the methods for landslide management; and the risk presented by landslides.
2. Apply an understanding of landslide mechanisms to evaluate slope failure under different conditions.
3. Critically assess the different approaches taken to manage and mitigate landslide hazards.
4. Synthesize and evaluate a range of research publications related to key developments and current challenges in landslide research.

COURSE FORMAT & WORKLOAD

This is an online, asynchronous course and Canvas is your virtual classroom. Plan to spend time there on a schedule each week that allows you to stay on top of course expectations, engage with classmates and your instructor, and submit your work. You will hear directly from your instructor through email, Canvas Announcements, and weekly videos posted to Canvas on a regular basis during the course week. You can reach your instructor via email and you can also arrange to meet via Zoom.

Each week will cover a different topic, as outlined in the course schedule. Each week will include a journal article to read and discuss, a lecture video to watch (with a follow-up participation task), and you will be working on a practical assignment. Throughout the semester there will also be some virtual lab visits and we will conclude the semester with a small research project (3 weeks) in the form of a literature review on a topic of your choice related to landslides.

A summary of the workload and the requirements for different tasks are outlined in the table below.

Table 1: Approximate course workload.

Course Component	**Hours**	**Total hours**
Journal article reading	2 hrs per week (x10 wks)	20 hrs
Journal article discussion boards	2 hrs per week (x10 wks)	20 hrs
Lecture videos	1.5 hrs per week (x10 wks)	15 hrs
Weekly participation tasks	30 mins per week (x10 wks)	5 hrs
Assignments	5 hrs per assignment (x5)	25 hrs
Virtual lab visit (including lab report)	1 hr (virtual lab) + 2 hrs (report)	3 hrs
Research project	25 hrs	25 hrs
Total		**113 hours**

TECHNOLOGY REQUIREMENTS

Please note that some of the assignments require the use of large datasets and the Penn library virtual lab (vLab) to access software – you will need to be working on a laptop or PC to operate these; netbooks, tablets, and mobile devices will not work for these tasks.

GRADING

Final grades are based on a combination of the components outlined above. The breakdown is as follows:

Journal Article Discussions:	30 %
Weekly Participation Tasks:	10 %
Assignments:	30 %
Lab Report:	5 %
Research Project:	25 %

COURSE SCHEDULE

Table 2: Schedule of weekly topics and assignments (subject to minor changes).

Week	Week beginning	Topic(s)	Journal article	Assignment
1	Jan 15th **The semester begins on Thurs, Jan 18th*	Introduction to Landslides: Global impacts, patterns of occurrence, and current research	Froude & Petley, 2018	N/A
2	Jan 22nd	How slopes fail	Samia et al., 2017	Assignment 1: Shear box experiment
3	Jan 29th	Landslides in different materials	Larsen et al., 2010	
4	Feb 5th	Landslide triggers	Meunier et al., 2007	Assignment 2: Landslide mapping
5	Feb 12th	Landslides without a clear trigger	Petley et al., 2005 & Rosser et al., 2007	
6	Feb 19th	Virtual lab visit	N/A	Lab Report
7	Feb 26th	Landslide runout	Guthrie et al., 2012	Assignment 3: Rockfall runout
8	Mar 11th	Slope monitoring: In-situ	Eberhardt, 2012	
9	Mar 18th	Slope monitoring: Remote	Lato et al., 2014	Assignment 4: Change detection
10	Mar 25th	Societal impacts	Choi & Cheung, 2013	
11	Apr 1st	Landslide management	Sparkes et al., 2017	Assignment 5: Transport networks
12	Apr 8th	Research Projects *Final papers & presentation due at end of week 14*		
13	Apr 15th			
14	Apr 22nd			