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MEMORANDUM

ATTENTION Senate
FROM Jeff Derksen,
Chair of Senate Graduate Studies
Committee (SGSC)
RE: New Course Proposal

DATE September 19, 2019

For information:

Acting under delegated authority at its meeting of September 10, 2019, SGSC approved the following new course, effective **Summer 2020**:

Faculty of Environment

School of Resource and Environmental Management

- 1) New course: REM 627 Avalanche Risk Management

OFFICE OF THE DEAN

To: Dr. Jeff Derksen, Dean of Graduate Studies / Chair of SGSC

From: Dr. Dongya Yang, Associate Dean /Chair, Faculty of Environment Graduate Studies Committee

Date: Aug. 18, 2019

Re: New Graduate Course REM 627

The Faculty of Environment Graduate Studies Committee has approved the requests from REM to create a new course REM 627: Avalanche Risk Management.

Attached, please find the memo from REM, and all the supporting documents.

Should you have any questions, please feel free to contact.



Dongya Yang, Ph.D.
Associate Dean, Research and Graduate Studies
Professor of Bioarchaeology

TO: Dongya, Yang, Associate Dean, Faculty of Environment
FROM: Sean Markey, REM GSC Chair
RE: New Graduate Course
DATE: August 18, 2019

Dear Dongya,

Attached, please find the materials for REM 627, Avalanche Risk Management.

Thank you for presenting to the Faculty Graduate Committee and beyond.

Best,



Sean Markey
REM GSC Chair

New Graduate Course Proposal

Attach a separate document if more space is required.

Course Subject [eg. PSYC]REM	Number [eg. 810]627	Units [eg. 4]5
Course title [max. 100 characters including spaces and punctuation] Avalanche Risk Management		
Short title [for enrollment/transcript - max. 30 characters] Avalanche Risk Management		
Course description for SFU Calendar * Interdisciplinary introduction to snow avalanches and the management of the associated risks. Embedded in an overall risk management framework, the course discusses the physics of avalanche formation, identification and characterization of avalanche terrain, the fundamentals of hazard assessment, and mitigation approaches in different contexts with practical examples from in Canada.		
Rationale for introduction of this course Aims to provide graduate students interested in pursuing a career in avalanche risk management or avalanche research a comprehensive overview of both the physical processes involved in avalanche formation and the human dimensions of avalanche hazard assessment and risk mitigation		
Term of initial offering Summer 2020	Course delivery [eg. 3 hrs/week for 13 weeks] 4 hrs/week for 13 weeks	
Frequency of offerings/year 1/year	Estimated enrollment/offering 20	
Equivalent courses [These are previously approved courses that replicate the content of this course to such an extent that students should not receive credit for both courses.]		
Prerequisite and/or Corequisite **		
Criminal record check required? ☐ Yes ***	Additional course fees? ☐ Yes ☒ No	
Campus where course will be taught ☒ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus		
Course Components ☐ Lecture ☒ Seminar ☐ Lab ☐ Research ☐ Practicum ☐ Independent ☐ _____		
Grading Basis ☒ Letter grades ☐ Satisfactory or Unsatisfactory ☐ In Progress/Complete		
Repeat for credit? **** ☐ Yes ☒ No	Total repeats allowed? _____	Capstone course? ☐ Yes ☒ No

* Course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description.

** If a course is only available to students in a particular program, that should be stated in the prerequisite.

*** If yes, then add this requirement as a prerequisite.

**** This applies to a Special Topics or Directed Readings course.

Required course? ☐ Yes ☒ No	Final exam required? ☐ Yes ☒ No	Repeat within a term? ☐ Yes ☐ No
Combined with an undergrad course? ☐ Yes ☒ No If yes, identify which undergraduate course and what the additional course requirements are for graduate students:		

RESOURCES

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Faculty member(s) who will normally teach this course Pascal Haegeli
Additional faculty members, space, and/or specialized equipment required in order to offer this course None

CONTACT PERSON

Department / School / Program REM	Contact name Pascal Haegeli	Contact email pascal_haegeli@sfu.ca
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DEPARTMENTAL APPROVAL

Remember to also include the course outline.

Non-departmentalized faculties need not sign

Department Graduate Program Committee Sean Markey	Signature 	Date July 29, 2019
Department Chair Sean Cox	Signature Sean Markey, Acting	Date July 29, 2019

OVERLAP CHECK

Overlap check done? ☒ YES

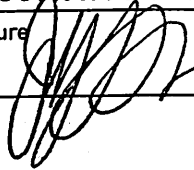
The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content.

FACULTY APPROVAL

This approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/Department commits to providing the required Library funds and any other necessary resources.

Faculty Graduate Studies Committee (FGSC) Dongya Yang	Signature 	Date Aug 1, 2019
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SENATE GRADUATE STUDIES COMMITTEE APPROVAL

Senate Graduate Studies Committee (SGSC) Jeff Derksen	Signature 	Date SEP 19 2019
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ADMINISTRATIVE SECTION (for DGS office only)

Course Attribute: _____
 Course Attribute Value: _____
 Instruction Mode: _____
 Attendance Type: _____

Library Review **AUG 29 2019**

If different from regular units:

Academic Progress Units: _____

Financial Aid Progress Units: _____

Avalanche Risk Management

Spring Semester (2020)

Last revisions: Sept. 13, 2019

Instructor:

Dr. Pascal Haegeli
University Research Chair in Avalanche Risk Management
Office: TASC1 8239
Phone: 778-782-3579
Email: pascal_haegeli@sfu.ca

Course overview

Mountains play a central role in Canadian culture, support substantial populations of residents and temporary visitors, and are the home unique and critical ecosystems. However, the dynamic nature of the mountain landscape means that life in mountains is inherently exposed to a wide range of natural hazards. Snow avalanches claim about 14 lives in Canada every year, more than any other natural hazard in Canada. Most victims are backcountry recreationists, but avalanches also threaten villages, utility lines, resource operations and cause traffic hazard and economic loss by blocking critical transportation corridors. The objective of this course is to provide students with a comprehensive, interdisciplinary overview that covers both the physical processes involved in avalanche formation and the human dimensions of avalanche hazard assessment and risk mitigation.

Using the avalanche risk management framework of the Canadian Avalanche Association as the overarching guide, this course is taking an applied and problem-focused approach to the topic. The content of this course can roughly be grouped into four main topic themes:

- 1) **Avalanche formation**, where we discuss the physical processes that contributing to the formation of the snowpack and the layer structure necessary for the formation of avalanches, the mechanical properties of snow and the fracture mechanical processes that lead to avalanche release;
- 2) **Avalanche terrain**, where we look at how to recognize and characterize terrain affected by avalanche hazard;
- 3) **Hazard and risk assessment**, where we examine how avalanche hazard is assessed and discuss how human factors can affect the assessment process and contribute to avalanche risk; and
- 4) **Mitigation**, where we look at how the risk of avalanches is reduced to an acceptable level in different avalanche safety applications.

Throughout the course, we will use examples from avalanche safety operations in Canada to illustrate the concepts discussed. In-class exercises and assignments are used to gain practical experience in the assessment and evaluation methods presented in class.

Broad learning outcomes

Once you have completed this course, you will be able to:

- 1) Describe the organizational landscape and key stakeholders in avalanche safety in Canada
- 2) Explain the physical factor contributing to the formation of the snowpack and the layer structure necessary for the formation of avalanches.
- 3) Explain the mechanical properties of snow and our current understanding of the fracture mechanical processes that lead to avalanche release.
- 4) Recognize avalanche terrain and explain the principles for assessing its severity in different avalanche safety applications.
- 5) Explain the process of assessing avalanche hazard and risk and point out similarities and differences among different avalanche safety applications.
- 6) Explain common mitigation practices in different avalanche safety applications.
- 7) Apply course concepts to suggest solutions to a current avalanche safety challenge.

Course website

Detailed background material for this course (lecture notes, readings, and assignments) will be posted on CANVAS.

Required readings and materials

The required readings for this course primarily consist of online reports and journal articles, which will be uploaded to the course website on CANVAS. The syllabus and website differentiate between required readings, whose content can explicitly be tested in quizzes, and optional reading, which may be useful for assignments and offer a more in-depth perspective on a topic.

General references on avalanche risk management

- Canadian Avalanche Association. (2015). Technical aspects of snow avalanche risk management—Resources and guidelines for avalanche practitioners in Canada (C. Campbell, S. Conger, B. Gould, P. Haegeli, J. B. Jamieson, & G. Statham Eds.). Revelstoke, BC.
Available online from <https://www.avalancheassociation.ca/page/GuidelinesStandards>
- McClung, D. M., & Schaerer, P. A. (2006). *The Avalanche Handbook* (3rd ed.). Seattle, WA: The Mountaineers.
Available from SFU Bennett Library with call number QC 929 A8 A9 2006
- Tremper, B. (2008). *Staying alive in avalanche terrain* (2nd ed.). Seattle, WA: The Mountaineers.
Not available from SFU Library
- Jamieson, B.J. (ed.) (2019). *Planning Methods for Assessing and Mitigating Snow Avalanche Risk*, Revelstoke BC: Canadian Avalanche Association.
- Rudolph-Miklau, F., Sauermoser, S., & Mears, A. (2015). *The Technical Avalanche Protection Handbook*: John Wiley & Sons.
Available electronically from SFU Library

Class format

This course consists of

- Traditional lectures presenting the core material of the course
- Guest lectures from avalanche safety practitioners to provide direct insight into the work of avalanche workers
- In-class exercises where we apply some of the models we discussed to real-world problems

Expectations

- I expect you to attend lectures, participate in the in-class exercises and take notes. I will post Powerpoint slides on CANVAS, but they will not include all relevant materials and their content will not be sufficient for passing the exams.
- I allow laptop computer or tablets for notetaking in class and some of the in-class exercises require the use of a computer. However, checking email, social media or other non-class related websites on your laptop or smart phone during class is distracting to you, me and other students. This will affect your participation grade!
- Plagiarism will not be tolerated.
- Late assignments will be penalized with 1 grade step per day or portion of day (e.g., A+ becomes A). Deferred grades are only given under exceptional circumstances and a doctor's note is required.
- The dates and times of the midterm and final exam will be set at the beginning of the course. You must be aware of these times and agree to attend. Extra exams outside of these times will only be considered under exceptional circumstances and a doctor's note is required.

Course evaluation

The course grade will be determined as follows

1. In-class quizzes: 20%
2. Main assignment (runout model application): 20%
3. Group project: 40%
4. Literature review/presentation on special topic: 20%