

## **ERTH 5215/IPIS 5505: Natural Hazards in Canada: Risk and Impact**

Canada is the second largest country by area in the world, so it enjoys a wide range of landscapes across the nation. These unique landscapes offer a diverse setting within the country. However, with this diverse setting comes a wide range of natural hazards with potentially many different impacts. The Calgary Flood of 2013 caused damages estimated at above \$5 billion. On January 27<sup>th</sup>, 1700, an estimated **M9** earthquake offshore of Vancouver Island caused an unknown amount of destruction to local First Nations settlements in British Columbia and even resulted in a tsunami in Japan. A solar flare in 1989 caused a widespread blackout to the province of Quebec. In 2016, a wildfire originating near Fort McMurray and encompassing the town causing severe damage at a cost estimated to be \$9.9 billion.

These natural hazards are caused by geological, solar, and meteorological process that many of us may experience for time to time. The aim of this course is to identify the processes causing these hazards, estimate their frequency and impacts, and understand the best mitigation and response strategies. Learning directly from the a wide range of experts at Natural Resources Canada and other Canadian Governmental departments, students will gain an understanding of the current work in preparing, monitoring, and responding to natural hazards. During the course, students will be given the opportunity to work directly with governmental representatives. At the end of this course, students will be able to identify the best practices for mitigating and responding to the risk posed by natural hazards in Canada.

### **Course Learning Outcomes:**

Identify Natural Hazards in Canada, and for each one:

- Explain what causes it.
- Describe the characteristics of the hazard.
- Analyze the potential impact on society and infrastructure.
- Identify the mitigation strategies applied to minimize its impact.
- Identify the role of the different stakeholders involved.

### **Prerequisites:**

Graduate student in Earth Sciences or Infrastructure Protection and International Security programs or permission of the department.

### **Important Information:**

**Professor:** Stephen Crane ([stephencrane@cmail.carleton.ca](mailto:stephencrane@cmail.carleton.ca)),

**Lectures:** 2 hours, once a week, Tuesdays, 18:05-19:55, HP 3120. These are scheduled to be in-person, but may move to a virtual setting. They may be recorded and uploaded to Mediaspace depending on the lecturer.

**Discussions:** 1 hour, once a week, Tuesdays, 20:05-20:55. Participation in the discussions will be assessed by the moderator. These are scheduled to be in-person, but may move to a virtual setting.

**Assignments:** Weekly reading summaries and weekly 1-2 question assignments will be graded throughout the term. An additional assignment will be due during the term.

**Natural Disaster Report:** Due on the last day of classes (December 10<sup>th</sup>).

**Lecture Schedule (Tentative):**

Date	Lecture #	Topic
<i>Week 1: Sept 13</i>	1	Introduction
<i>Week 2: Sept 20</i>	2	Natural Hazard Considerations
<i>Week 3: Sept 27</i>	3	Seismic Hazards
<i>Week 4: Oct 4</i>	4	Volcanoes
<i>Week 5: Oct 11</i>	5	Mass Movements: Landslides & Snow Avalanches
<i>Week 6: Oct 18</i>	6	Tsunamis & Impact Hazards
<b>Reading Week: October 25<sup>th</sup></b>		
<i>Week 8: Nov 1</i>	7	Climate Change
<i>Week 9: Nov 8</i>	8	Floods
<i>Week 10: Nov 15</i>	9	Severe weather: hurricanes, tornadoes, thunderstorms, ice storms
<i>Week 11: Nov 22</i>	10	Wildfires
<i>Week 12: Nov 29</i>	11	Space Weather
<i>Week 13: Dec 6</i>	12	Science-Policy Integration

**Course Evaluation:**

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<b>Assignments</b>	1. Briefing Note	10%
	2. Weekly reading summaries	20%
	3. Weekly assignments	25%
<b>Lecture Attendance</b>	Weekly, Tuesdays 18:05-19:55	5%
<b>Discussion Participation</b>	Weekly, Tuesdays 20:05-20:55	5%
<b>Natural Disaster Report</b>	Due December 9 <sup>th</sup>	35%
<b>Total</b>		<b>100%</b>

**Briefing Note (10% of final grade):** 1-2 page briefing intended for a Minister or Senior Government Official. Due September 27<sup>th</sup>, 18:05.

**Weekly Reading Summaries (20% of final grade):** 1 page summary of the mandatory reading for each week. Due Tuesdays 18:05.

**Weekly Assignments (25% of final grade):** 1-2 questions. Due Tuesdays 18:05.

**Natural Disaster Report (35%):** 20-30 page report on a Natural Disaster affecting Canada. Due December 9<sup>th</sup>.

## **Expectations:**

For the duration of the term students are expected to:

- Complete the assigned readings on time;
- Attend all scheduled class time;
- Actively participate in class discussions;
- Treat fellow students cordially;
- Respect due dates, or notify the professor to make arrangements before the due date

Students are further asked to:

- Not send text messages or use social media during class times;
- Not disrespect fellow students or use ad hominem attacks;
- Not dominate the conversation; if you've spoken a lot, give others a chance.

## COVID-19

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are [a number of actions you can take](#) to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

**Feeling sick?** Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's [symptom reporting protocols](#).

**Masks:** Carleton has paused the [COVID-19 Mask Policy](#), but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

**Vaccines:** Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in [cuScreen](#) as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the [University's COVID-19 website](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact [covidinfo@carleton.ca](mailto:covidinfo@carleton.ca).

## Academic Integrity:

The following is excerpted from <https://carleton.ca/secretariat/wp-content/uploads/Academic-Integrity-Policy.pdf>, the University policy document on Academic Integrity:

The following list describes conduct that violates standards of academic integrity, which may lead to the imposition of sanctions pursuant to this Policy. It is important to note that this is neither a comprehensive nor a mutually exclusive list and should not be viewed as exhaustive.

**1. Plagiarism** Plagiarism is presenting, whether intentionally or not, the ideas, expression of ideas, or work of others as one's own. Plagiarism includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source. Examples of plagiarism include, but are not limited to:

- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;

- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own
- failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

**2. Unauthorized Resubmission of Work.** A student shall not submit substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the second submission occurs.

**3. Unauthorized Co-operation or Collaboration.** Students shall not co-operate or collaborate on academic work when the instructor has indicated that the work is to be completed on an individual basis. Failure to follow the instructor's directions in this regard is a violation of the standards of academic integrity. Unless otherwise indicated, students shall not co-operate or collaborate in the completion of a test or examination.

**4. Misrepresentation.** Students shall not submit or present false assignments, research, credentials, or other documents or misrepresent material facts for any academic purpose.

**5. Impersonation.** It is a violation of the standards of academic integrity to impersonate another person or enter into an arrangement with another to be impersonated by any means for the purposes of gaining academic advantage including in the taking of examinations, tests, or the carrying out of laboratory or other assignments.

Please see <https://carleton.ca/secretariat/wp-content/uploads/Academic-Integrity-Policy.pdf> for further details.

### **Requests for Academic Accommodation**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

#### **Pregnancy obligation**

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: [carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

#### **Religious obligation**

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: [carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

### **Academic Accommodations for Students with Disabilities**

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. [carleton.ca/pmc](http://carleton.ca/pmc)

### **Survivors of Sexual Violence**

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: [carleton.ca/sexual-violence-support](http://carleton.ca/sexual-violence-support)

### **Accommodation for Student Activities**

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: [students.carleton.ca/course-outline](http://students.carleton.ca/course-outline)