

**AP/DEMS 4707 A Managing Risks to Critical Infrastructure**  
**Fall Term 2025**

## Course Information

Course Instructor: Course Director, Adjunct  
Professor – David Baumken ABCP, BAS (Hon),  
M.DEM

(address as ‘Professor’ or ‘Professor  
Baumken’)

E-mail: [Dbaumken@yorku.ca](mailto:Dbaumken@yorku.ca)

Phone:

Office Hours & Location:

Course Time & Days: Tuesday 2:30pm  
5:15pm

Class Location: CFA 312

Course eClass site:

## Tutorials, Labs and TA Contact Information

## Land Acknowledgment

York University recognizes that many Indigenous Nations have longstanding relationships with the territories upon which York University campuses are located that precede the establishment of York University. York University acknowledges its presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, and the Huron-Wendat. It is now home to many First Nation, Inuit, and Métis communities. We acknowledge the current treaty holders, the Mississaugas of the Credit First Nation. This territory is subject of the Dish with One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region ([LA&PS Land Acknowledgement](#)).

## Course Description

Students of the Managing Risks to Critical Infrastructure course will research threats, vulnerabilities and risks (all hazards) to critical infrastructures from the perspective of managing risks to ensure for reliability through appropriate protection and resiliency measures including laws and regulations. Examine and assess the various levels of government responsibilities, the effectiveness of regulations and legislation, and private sector entities due diligence in ensuring for reliability through effective risk management strategies and practices.

Critical infrastructure refers to processes, systems, facilities, technologies, networks, assets and services essential to the health, safety, security and economic wellbeing of nations. Critical infrastructure can be stand-alone or interconnected and interdependent. Disruptions of critical

infrastructure could result in catastrophic damage, loss of life, adverse economic and societal effects, and significant harm to public confidence. The course focuses on Canada but also examines how other countries define and manage their critical infrastructure.

## Course Learning Objectives

Students will:

- Develop an evaluative level of comprehension of the strategies, methods, protection and mitigation measures for enhancing resiliency in managing all hazard risks to critical infrastructure through the professor's lectures, directed reading, research and written assignments.
- Demonstrate through research and written assignments, and class contribution an understanding of the complexities of inter-connectedness of critical infrastructure inter-dependencies and the cascading effects and complicating factors to vulnerable critical infrastructure.
- Demonstrate through directed reading research and written assignments, and class contribution an understanding of critical infrastructure regulations/laws evaluating the effectiveness (strengths, weaknesses and gaps) essential to critical infrastructure reliability for the health, safety and security of society and the economy.

## Course Expectations

Weekly research and readings will be posted on Wednesdays (or earlier) for students to complete in preparation for the next class. In person attendance is of utmost importance to actively participate in class discussions/debates and group project work as/if applicable. Class attendance will be taken each week.

## Course Organization

*\*the following course subject matter (not in sequential order) is of the topics that will be covered in assessing current, past and potential contingency events impacting critical infrastructure.*

### **Roles and responsibilities of government (federal, provincial, municipal)**

- Examination of the 10 Canadian critical infrastructure sectors and the relationships with Provincial CI Programs, other nations including but not limited to the United States sectors and their inter-relationships.
- Overarching objective of the National Strategy (mandate of Canadian Federal Government's Sector Networks).
- Ministerial responsibilities for CI and oversight on private sector CI owners and operators
- Regulations – enforceable standards and guidelines (not enforceable) for the protection and reliability of critical infrastructure goods and services. Private sector CI owners and operators (practices) due diligence for protecting assets, ensuring for reliability and resiliency.

## **Legislation/regulations for the privacy, protection of personal information, and access of information**

- Access to, protection of, personal Information and commercial data (Emergency Management Act, National CI Strategy, PEPIDA, PIPPA).
  - Assessment of vulnerabilities, risks that should be managed. Strength, weakness and gaps in regulations compliance monitoring, reporting and penalties.
  - Cyber data breaches, Examination of the rights and expectations for privacy of personal information from the perspective of citizens/customers.
- Information sharing (government, law enforcement/intelligence agencies and private sector CI owners and operators). Need to know and importance of needing to share actionable information from credible sources in a timely manner.

## **Critical thinking**

- Theoretical principals in relation to managing threats, vulnerabilities and risks to critical infrastructure

## **Reliability**

- Examine regulatory agencies and CI's commitment (strengths and weaknesses), challenges and strategies to achieve reliability targets.
- Examine CI best practices, Standards and Guidelines (comparison of Canadian versus US and also examine accountability including but not limited to US GAO)
- Normal Accident Theory in relation to CI Failures due to complexity, interconnectedness, Highly Reliable Organizations (High Reliability Theory)

## **Resiliency**

- Properties of resilience (robustness, redundancy, resourcefulness, rapidity and organizational learning/lessons learned). Dimensions of resilience (technical, organizational, social and economic).
- Euro-Atlantic Resilience Centre.
- Measuring Resilience. Resiliency of critical infrastructure can be evidenced by but is not limited to:
  - Reduced failure probabilities –The reduced likelihood of damage and failures to critical infrastructure, systems, assets, and nodes;
  - Reduced consequences from failures – Minimal injuries, deaths, infrastructure and property damage, negative economic and societal impact or consequences;
  - Reduced recovery time – The time required to restore to normal levels of service or functionality.

## **Dependencies and inter-dependencies.**

- Critical Infrastructure (CI) Interconnectedness, complexities and cascading consequences of US trade war with Canada and failures resulting from disaster events (multiple case studies and independent research)
- Challenges and importance of identifying and documenting inter-dependencies.

- Strategies for managing tolerance for loss, complicating factors that compound situations (cascading effect of another CI's contingency/failure).

## **Risks Types, Sources, Strategies, Analysis, Evaluation and Assessment**

### **Risk Management and Risk Assessment.**

- Lessons Learned. Importance of examining past events to prepare for and mitigate consequences of future events. (NATO's Joint Analysis and Lessons Learned Centre)
- Examination of risk assessment methodologies and theoretical protection measures.
- Risk management effective practices (including examination of legislation/standards and guidelines).
- Whistle Blowing (protection for whistle blowers, importance for managing risks), supported by a case study.

### **Sources of threat and risk information**

- All hazards approach, examination of credible sources of expert information.
- Information types including but not limited to - Situational Awareness, Information Sharing and Analysis, Incident Analysis and Warnings (centers), CERTS, Government Operations Centers, threats, risks, vulnerability, expert best practices information sources.
- Credible sources (who, what, when). CI Gateway.
- Expert organizations including but not limited to USGAO,

### **Risk and vulnerability reduction, theories and effective (best) practices**

- Reducing vulnerabilities (reducing inter-dependencies, enhancing resiliency), mitigating and even eliminating risks. Importance of redundancy
- Hardening assets (cross reference high impact low frequency type events in terms of associated costs utilizing examples including severe solar storm effects on vulnerable CI assets of the electrical GRID and satellites)
- Supply chain
- Inter-dependencies
- Outsourcing

### **Threats, vulnerabilities and risks to critical infrastructures**

- Insider threat
- Examination of catastrophic loss of CI's due to severe weather events, cyber-attacks, animal rights and environmental extremists.
- Severe solar storms, geomagnetic disturbances, geomagnetic induced current impact on vulnerable CI's, risk management practices including but not limited to asset hardening, monitoring.

### **Cyber-Attacks**

- Examination of the vulnerabilities and risks of supervisory control and data acquisition (SCADA) systems and industrial control systems (ICS).

- Cyber warfare, cyber espionage, cyber vandalism (war fare, criminal acts) state and non-state use of actors, societal and economic consequences, perception of risk conventional weapons compared to cyber
- CI's as targets of cyber warfare. Examination of Humanitarian Laws applicability to cyber warfare by nation states on critical infrastructure (examination of the Tallinn Manual, the International Committee of the Red Cross and the Geneva Convention).
- Managing the consequences of cyber-attacks on CI's from Russia, Iran, North Korea will be covered using case studies as well as US and Israel's use of cyber weapons.

### **High Impact Low Frequency (HILF) events**

- Planning, preparedness and response for HILF events. Risk evaluation to support cost alternatives for hardening vulnerable assets (focus on potential of Severe Space Weather (Solar Storms) and Pandemics).

### **Managing the unimaginable, unpredictable.**

- Examination of popular Black Swan theories known versus the unknown, randomness and the influence of experience in preparing for future catastrophic events.

### **Targeting of critical infrastructures (cyber and physical)**

- CI as a target of nation state military attacks including Russia's war on Ukraine. Weaker nation states cyber superiority of advanced cyber-attack capabilities.
- Analysis of recent, on-going events. Immediate impact, cascading consequences of critical inter-dependencies (NotPetya, Colonial Pipelines, Ukraine Power System)
- Potential mitigation strategies

### **Highly Reliable Organizations**

- Principals and characteristics of 'highly reliable' critical infrastructures.

### **Managing Climate Change Risks to Critical Infrastructure**

- Focus is on 'forward looking' 50+ years climate change adaption measures, vulnerability assessments and resiliency planning, to the effects of the changing climate on Canadian and US transmission and distribution electricity systems.
- The various climate hazards and expected time horizons are assessed in identifying vulnerabilities and risks of assets, components, equipment and system operations that can lead to damage, destruction, failure, and the exacerbation of the aging process.
- Existing asset design and construction criteria, methods and associated standards when coupled with projections of increased severity of climate hazards could exacerbate the aging of assets and potentially exceed failure thresholds.
- National Climate Change mitigation targets and strategies (environmental damage, regulatory challenges, missing the targets)

### **Environment**

- Role in relation to critical infrastructure (State of the Urban Forest in the Greater Toronto Area — is the environment critical infrastructure?) Research Ontario’s climate change plan/policy in relation to CI’s and impact on consumers.

## Instructor Office Hours and Communication Guidelines

Contact through email, or in person before or after class

## Required Course Materials

[Include required course learning material(s) and restrictions that would prevent students from using second-hand copies or prior editions. Also include expected costs and where required course materials are available (e.g., YorkU Bookstore).]

Course Learning Materials	Cost	Availability
	<b>Total \$</b>	

## Optional Course Materials

[Include optional course learning material(s) and restrictions that would prevent students from using second-hand copies or prior editions. Also include expected costs and where optional course materials are available (e.g., YorkU Bookstore).]

### Optional Course Reading Material

- Recommended reading (not required however the following books are excellent CI cyber threat resources)
  - Sandworm by Andy Greenburg (A new era of cyber war and the hunt for the Kremlin’s most dangerous hackers)
 Or

- The Perfect Weapon by David E. Sanger (War, Sabotage and Fear in the Cyber Age)

Course Learning Material	Cost	Availability

## Technical Requirements

Several platforms will be used in this course (e.g., eClass, Zoom, etc.) where students will interact with the course materials, the course director, as well as with each other.

Here are some useful links for computing information, resources, and help:

- [Student Guide to eClass](#)
- [Zoom@YorkU Best Practices](#)
- [Zoom@YorkU User Reference Guide](#)
- [eLearning Getting Started \(LA&PS eServices\)](#)
- [Student Guide to Remote and Online Learning](#)

To determine Internet connection and speed, there are online tests, such as [Speedtest](#), that can be run. If you need technical assistance, please consult the [University Information Technology \(UIT\) Student Services](#) web page or write to [askit@yorku.ca](mailto:askit@yorku.ca).

## Course Evaluations

### Course Evaluation Chart

Assessment	Due Date	Weight %	Course Learning Outcome
Research and writing assignment	November 18, 2025	30%	See learning objectives

Assessment	Due Date	Weight %	Course Learning Outcome
Course Director's observation and assessment of student weekly class contribution to discussions and debates.		20%	See learning objectives
<b>Final in class written assignment</b>	December 2, 2025	50%	See learning objectives
		<b>100%</b>	

## Assessment Descriptions

1. Research and writing assignment (personal/opinionated perspective) on a topic of the student choosing including short presentation 30% due November 18, 2025.  
*Suggested topics include but are not limited to some aspect of the societal and economic impact on one or more of the critical infrastructure sectors impacted by the United States and Canada's trade war through the lens of the interconnectedness, vulnerabilities and risks. The cascading consequences of a cyber-attack on a critical infrastructure. Consequences of a disaster event on a CI (fire, flood, severe weather event, (effects of the changing climate).*
2. Course directors assessment of student weekly class contribution to discussions and debates.
3. Students will write their answer to a question that will cover course subject matter.

## How to Submit Assessments

The research and writing assignment will be submitted through eclass course site. The final assignment will be in class.



## Late Work Policy

Request for late submissions of the first assignment must be granted by the course director prior to the due date November 18, 2025

## Missed Tests and Exams

TBD

## How to Use Citations in this Course

The first assignment must be cited using a recognized university standard of your choosing such as APA, MLA, Chicago/Turabian

Resources to help with citations:

- [I need to cite and reference, Learning Commons](#)
- [Drop-in Research Support](#), YorkU Libraries
- [Writing Centre](#)
- [SPARK Student Papers & Academic Research Kit](#)

## Grading

The grading scheme for this course conforms to the 9-point system used in undergraduate programs at York University. For a full description of the York grading system, visit the York University [Academic Calendar](#).

Grade	Grade Point	Percent Range	Description
A+	9	90-100	Exceptional
A	8	80-89	Excellent
B+	7	75-79	Very Good
B	6	70-74	Good
C+	5	65-69	Competent
C	4	60-64	Fairly Competent
D+	3	55-59	Passing
D	2	50-54	Marginally Passing

Grade	Grade Point	Percent Range	Description
E	1	40-49	Marginally Failing
F	0	0-39	Failing

## Course Schedule

### Important Dates

Explore the York University [Academic Calendar](#) to find a list of important dates, such as class start/end dates, drop deadlines, holidays and more.

**Weekly Course Schedule is posted to eclass site in advance of each class**

Week	Readings and Activities	Assessment Due Dates	Learning Outcomes
Week 1 Date Location			
Week 2 Date Location			
Week 3 Date Location			
Week 4 Date Location			
Week 5 Date Location			

Week	Readings and Activities	Assessment Due Dates	Learning Outcomes
Week 6 Date Location			
Week 7 Date Location			
Week 8 Date Location			
Week 9 Date Location			
Week 10 Date Location			
Week 11 Date Location			
Week 12 Date Location			

## Course Policies

Please review the course policies in this section. All students are expected to familiarize themselves with the following information:

- [Student Rights & Responsibilities](#)
- [Academic Accommodation for Students with Disabilities](#)

## Academic Integrity

Academic integrity is a fundamental and important value of York University. To maintain a fair and honest learning environment, you are responsible for understanding

and upholding academic integrity in all courses and academic activities. You are encouraged to connect with reliable [on-campus resources](#) that support your coursework and academic honesty. To better understand the serious consequences of breaching academic honesty policies, familiarize yourself with the [Senate Policy on Academic Conduct](#). You can learn more about upholding academic integrity in your courses by exploring [SPARK: Academic Integrity Module](#), [LA&PS Academic Honesty](#) and [Academic Integrity for Students](#).

## Generative Artificial Intelligence (GenAI)

Students are not permitted to use generative artificial intelligence (AI) in this course. Submitting any work created (in whole or part) through the use of generative AI tools will be considered a violation of York University's [Senate Policy on Academic Conduct](#). Using AI apps such as ChatGPT, GPT-3, DALL-E, translation software among others to complete academic work **without your instructor's knowledge or permission**, is considered to be a breach of academic honesty. For more information, please review [AI Technology & Academic Integrity: Information for Students](#).

If you're not sure whether using an AI app for your academic work is acceptable, it is recommended that you:

- Carefully review the guidelines for your assessments
- Check for any messages from your instructor on eClass
- Ask your instructor or TA if they are permitting the use of these tools

## Turnitin

To promote academic integrity in this course, students will normally be required to submit their written assignments to Turnitin (via the course's eClass site) for a review of textual similarities and the detection of possible plagiarism. In so doing, students will allow their material to be included as source documents in the Turnitin.com reference database, where they will be used only for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin service are described on the Turnitin.com website. York students may opt out of using Turnitin. If you wish to opt out, you should contact your instructor as soon as possible.

## Accessibility

York University is committed to creating a learning environment which provides equal opportunity to all members of its community. If you anticipate or experience any barriers to learning in this course, please discuss your concerns with your instructor as early as possible. For students with disabilities, contact [Student Accessibility Services](#)

to coordinate academic accommodations and services. Accommodations will be communicated to Course Directors through a Letter of Accommodation (LOA). Accommodations for tests/exams normally require three (3) weeks (or 21 days) before the scheduled test/exam to arrange.

## Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community and making reasonable and appropriate [accommodations to adherents for observances of days of religious significance](#). Should any of the dates specified in this syllabus for course assignments, tests, or deadlines conflict with a date of religious significance, please contact the instructor not less than two (2) weeks (or 14 days) prior to the date for which accommodation is sought. If the requested accommodation is for an exam or falls within the formal examination periods, you must complete and submit a [Religious Accommodation Agreement](#) at least three (3) weeks (or 21 days) before the start of the exam period.

## Intellectual Property

Course materials are designed for use as part of this particular course at York University and are the intellectual property of the instructor unless otherwise stated. Third-party copyrighted materials (such as book chapters, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian copyright law. Students may not publish, post on an Internet site, sell, or otherwise distribute any course materials or work without the instructor's express permission. Course materials should only be used by students enrolled in this course.

Copying this material for distribution (e.g., uploading material to a commercial third-party website) may lead to a charge of misconduct according to York's [Code of Student Rights and Responsibilities](#), the [Senate Policy on Academic Conduct](#), and/or legal consequences for copyright violations.

## Student Support and Resources

York University offers a wide range of student supports resources and services, including everything from writing workshops and peer mentorship to wellness support and career guidance. Explore the links below to access these on-campus resources:

- [Academic Advising](#) is available to provide students support and guidance in making academic decisions and goals.

- [Student Accessibility Services](#) are available for support and accessibility accommodation when required.
- [Student Counselling, Health & Wellbeing](#) offers workshops, resources, and counselling to support your academic success.
- [Peer-Assisted Study Sessions \(PASS\) Program](#) provides student study sessions for students to collaborate and enhance their understanding of course content in certain courses.
- [Student Numeracy Assistance Centre at Keele \(SNACK\)](#) supports students in courses involving math, stats, and Excel.
- [The Writing Centre](#) provides multiple avenues of writing-based support including drop-in sessions, one-to-one appointments, a Multilingual Studio, and an Accessibility Specialist.
- [Centre for Indigenous Student Services](#) offers a community space with academic, spiritual, cultural, and physical support, including writing and learning skills programs.
- [ESL Open Learning Centre \(OLC\)](#) supports students with building proficiency in reading, writing, and speaking English.
- [Learning Skills Services](#) provides tips for time management, effective study and learning habits, keeping up with coursework, and other learning-related supports.
- [Learning Commons](#) provides links to supports for time management, writing, study skills, preparing for exams, and other learning-related resources.
- [Roadmap to Student Success](#) provides students with timely and targeted resources to help them achieve academic, personal, and professional success.
- [Office of Student Community Relations \(OSCR\)](#) is responsible for administering the [Code of Student Rights & Responsibilities](#) and provides critical incident support.
- [Peer Mentorship](#) helps students transition through their first year by connecting them with upper-year students. The mentors can help find supports and resources. They also lead a community hub on campus.
- [goSAFE](#) is staffed by York students and can accompany York community members to and from any on-campus location, such as the Village Shuttle pick-up hub, parking lots, bus stops, or residences.

For a full list of academic, wellness, and campus resources visit [Student Support & Resources](#).