Department of Civil and Environmental Engineering

CIVE 5507/IPIS 5507: Blast Load Effects on Structures

Course Outline – Winter 2025

COURSE INSTRUCTOR	COURSE SCHEDULE
Christian Viau, Ph.D., P.Eng. Department of Civil and Env. Engineering Email: christian.viau@carleton.ca Office: 4535 Mackenzie Office Hours: Wednesday, 1:00 pm – 2:00 pm	Lectures: Wednesday, 2:35 pm – 5:25 pm

COURSE WEBSITE AND COMMUNICATION

All course information, assignments, and project files will be available through Brightspace. All students are responsible for ensuring that they are correctly registered through Brightspace and that they are receiving messages properly through their official university email address. Students are responsible for checking the Brightspace course management site and their official email account frequently. The announcement function in Brightspace will be used to send out any updates with important information related to the course.

COURSE DESCRIPTION AND OBJECTIVES

The primary objective of this course is to introduce students to the blast load (explosive) effects on infrastructures. It is expected that this course will bring into the mainstream blast hazards associated with explosions, be they accidental or man-made, and the methods available to mitigate their effects on civil engineering infrastructure. Among other things, the course will introduce the concepts of:

- Blast risk and vulnerability assessment.
- Blast load determination and design of structural components subjected to blast loading.
- Conducting simplified dynamic blast analysis.

PREREQUISITES

This course is intended for graduate-level students with a background (studying and/or practicing) in structural engineering. This course will also make references to Canadian and American design codes and standards; previous knowledge of these is strongly recommended. Students enrolled in one of the IPIS programs **must** have prior knowledge of structural steel and reinforced concrete design, typically obtained through the completion of an undergraduate engineering degree.

TEXTBOOK(S)/LEARNING MATERIALS AND THEIR COSTS

There are no assigned textbooks for the course, therefore, students are not required to purchase textbooks or other learning materials for this course. Class notes, handouts, and reference textbooks will provide students with sufficient information regarding course material.

COURSE DELIVERY AND PEDAGOGY

Lectures

Lectures will take place during the official lecture times. Incomplete lecture slides (in PDF) will be posted the day before each lecture. Annotated "full" lecture notes will be posted following the end of the lecture, however, attendance to the lectures is **HEAVILY** recommended as not everything will be jotted down on the posted notes.

Office Hours

Office hours are specifically allocated by the instructor for you to ask questions and receive clarifications regarding course content. To get the most out of them, you are asked to prepare your questions and works-in-progress prior to attending.

Term Project

A requirement for the passing of this course will be to complete a term project. Students will be tasked with a 5,000 word (+/-500 words) individual term paper on a blast-related research topic, case study, or model development of their choosing. Students will present their paper in a 15-minute presentation followed by a 5-minute question period. Each project must teach the class something novel and needs to demonstrate significant insight and understanding of the subject.

TENTATIVE COURSE OUTLINE (SUBJECT TO CHANGE)

Week	Lecture Date	Topic	Assignment	Project Deliverable
1	8-Jan	Course Introduction		
2	15-Jan	Introduction to Explosives		
3	22-Jan	Effects of Explosions	A1 posted	
4	29-Jan	Blast Load Effects on Structures		
5	05-Feb	Introduction to Structural Dynamics	A1 due, A2 posted	
6	12-Feb	SDOF Analysis for Structural Members		Term paper abstract due
		Winter Break		
7	26-Feb	Behaviour of Materials under Blast Loads Introduction to the CSA S850	A2 due	
8	05-Mar	Design of Reinforced Concrete Elements	A3 posted	
9	12-Mar	Design of Steel and Timber Elements	A4 posted	
10	19-Mar	*In-class activity*	A3 due	
11	26-Mar	Incorporating Blast Testing with Design		
12	02-Apr	Term Project Presentations	A4 due	
13	N/A	**No lecture**		Term paper due

COURSE WORK AND ASSESSMENTS

In-class activity 5%
Assignments..... 20%
Term Project 25%
Final Exam 50%

- *A final course grade of B- or better must be obtained to pass the course.*
- *All components of the course must be fulfilled; otherwise, students may receive an F as a final mark. This is also valid for students who are taking the course for the second time.*
- *A minimum grade of 60% on the final exam is required to pass the course.*

Assignments

There will be a total of 4 assignments posted and due on the following dates:

Assignments	Posted Date	Due Date (11:59 pm)
Assignment 1 (A1)	Jan. 22	Feb. 7
Assignment 2 (A2)	Feb. 5	Feb. 28
Assignment 3 (A3)	Mar. 5	Mar. 21
Assignment 4 (A4)	Mar. 12	Apr. 4

Unless otherwise noted, assignments are due on Friday and shall be submitted on Brightspace. It is each student's responsibility to ensure that their work is legible and neat, otherwise, points may be deducted. While it is permitted and recommended to discuss and work through the assignments with colleagues to enhance your learning, it is crucial that assignments are completed individually. Attempting assignments individually is the only way to have an opportunity to test your understanding and practice for the midterm and the final exam. Feedback will be provided directly on the assignment. **No assignment solutions will be posted**.

Term Project Deliverables

There will be a total of 3 project deliverables due on the following dates, to be submitted through Brightspace:

Deliverables	Due Date (11:59 pm)
Term paper abstract	Feb. 14
Presentation	Mar. 26
Term paper	Apr. 8

Final Exam

The final exam has not yet been scheduled. You will be notified of the date, time and location through the university once SES makes the exam schedule available. The final exam will be a 3-hr open-book exam.

Grade Appeals

All appeals of grades assigned in this course must be made within 7 calendar days of the grade being made available. Note that an appeal may result in a reduction or an increase in grade.

COURSE POLICIES

Email Policy

The professor is more than happy to answer questions related to administration via email. **For course content questions, please use the office hours**. Efforts will be made to reply to emails as soon as possible, but please expect a possible delay of up to 48 hours for a response. Emails will not be answered during weekends or holidays. Please use ***CIVE 5507*** in the subject header.

Missed Term Work

Students who claim extenuating circumstances defined in the Academic Consideration Policy, as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases. Students must also fill out and submit an Academic Consideration for Coursework Form. This must occur no later than three (3) days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. Consult Section 4.4 of the University Calendar.

If an absence or missed deadline is deemed justified:

Assignment: the weight will be transferred onto the remaining assignments.

Project deliverable: the weight will be transferred onto the final exam.

Final exam: Students who are unable to write the final examination because of extenuating circumstances, as defined in the Academic Consideration Policy, may apply for accommodation by contacting the Registrar's office. Consult the Section 4.3 of the University Calendar.

Academic Integrity and Plagiarism:

a) Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensure that a degree from Carleton University is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. Carleton University's Policy on Academic Integrity (http://www.carleton.ca/studentaffairs/academic-integrity) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. It is your responsibility to be familiar with these policies. Violations of the Academic Integrity Policy will result in the assignment of a penalty such as reduced grades, the assignment of an F in a course, a suspension or, expulsion.

b) One of the main objectives of the Academic Integrity Policy is to ensure that **the work you submit is your own**. As a result, it is important to write your own solutions when studying and preparing with other students and to avoid plagiarism in your submissions. The University Academic Integrity Policy defines plagiarism as "presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own." This 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 violations of the policy include, but are not limited to:

- any submission prepared in whole or in part, by someone else;

- any submission prepared in whole or in part, **using artificial intelligence (AI)**;
- using another's data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own; and
- failing to acknowledge sources of information through the use of proper citations when using another's work and/or failing to use quotations marks.

Copyright

The materials (including the course outline, slides, posted notes, videos, labs, projects, assignments, quizzes, exams, and solutions) created for this course are intended for personal use only. They may not be reproduced, redistributed, or transmitted in any form or by any means—electronic, mechanical, photocopying, recording, or otherwise—without written permission from the author(s), both during and after the semester. Students are not permitted to upload these copyrighted course materials to any online repositories.

Learning and Working Environment

The University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at equity@carleton.ca.

We will strive to create an environment of mutual respect for all through equity, diversity, and inclusion within this course. The space which we work in will be safe for everyone. Please be considerate of everyone's personal beliefs, choices, and opinions.

Engineering Academic Advising

The Engineering Academic Support Service assists undergraduate engineering students with course selection, registration, and learning support from first-year through to graduation. Academic Advisors Contact can be found here: https://carleton.ca/engineering-design/current-students/undergrad-academic-support/undergraduate-advisors/

Academic Accommodations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (https://students.carleton.ca/course-outline/).

PUBLIC HEALTH MEASURES

If you are feeling sick, please stay home. If you require assistance due to missing a lecture while recovering from an illness, please contact a colleague or the course instructor. **You will not be penalized for staying home if you are feeling unwell**. Remaining vigilant and not attending work or school when

sick or with symptoms is critically important for the wellbeing of your peers and Carleton University staff. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In the event that the course instructor falls ill prior to a scheduled lecture, an announcement will be made on Brightspace and the in-person lecture will be canceled. A recorded lecture will be posted on Brightspace shortly afterwards

STUDENT MENTAL HEALTH AND WELLNESS

University students may experience a range of mental health challenges that can significantly impact academic success and overall well-being. Carleton's Wellness Services Navigator is designed to help students connect with mental health and wellness resources. If a student needs to talk to someone from the department for more information and support with connecting to resources, they can contact the following faculty members:

ACSE: Prof. Elie Azar
Email: Elie.Azar@carleton.ca, Office: 3432 Mackenzie

CIVE: Prof. Heng Khoo
Email: heng.khoo@carleton.ca, Office: 3364 Mackenzie

ENVE: Prof. Shoeleh Shams
Email: shoelehshams@cunet.Carleton.ca, Office: 4242 Mackenzie

The following is a non-exhaustive list of available on- and off-campus resources:

1. **Carleton's Wellness Desk**: Located at 204A MacOdrum Library, is a space for students to learn about resources, connect with our Wellness Coordinator, and decompress during stressful times of the year. You can pop into the Wellness Desk any time during its hours of operation – no appointments necessary! https://wellness.carleton.ca/mental-health/wellness-desk/

2. **Carleton's Health and Counselling Services:** To book an appointment contact the main clinic by calling (613) 520-6674. If urgent, let the Patient Care Coordinator know or go in person to the main clinic (2500 Carleton Technology and Training Centre Building) and indicate that they are in crisis and need to speak to someone right away. https://carleton.ca/health/

3. **Residence Counselling and Wellness Service:** Counselling services specifically for students in residence. https://carleton.ca/health/residence-counselling/

4. **Therapy Dogs:** Carleton's therapy dogs are around campus with their owners (who are Carleton University staff and faculty) to comfort and provide support to help you thrive as a university student. https://carleton.ca/wellness/dogs/

5. Emergencies and Crisis and Emergency Numbers

6. **Good2Talk (1-866-925-5454):** Good2Talk is a free, confidential helpline providing professional counselling and information and referrals for mental health, addictions and well-being to post-secondary students in Ontario, 24/7/36 https://good2talk.ca/

7. **Empower Me:** Undergraduate students have access to free counselling services in the community through Empower Me, either in person, by telephone, video-counselling or e-counselling. **This free service is accessible 24/7, 365 days per year.** Call **1-844-741-6389 (toll free)** to make an appointment with a counsellor in the community. More information is available https://students.carleton.ca/services/empower-me-counselling-services/

8. **The Walk-In Counselling Clinic (off-campus community resource):** The walk-in Counselling Clinic have offices in various locations across Ottawa and the greater Champlain region that are open 7 days a week. Individuals will be assisted, with no appointment, on a first-come, first-serve basis during the Walk-in Counselling Clinic hours. The Walk-in Counselling Clinic **offers services in many languages** and is free and confidential. More information can be found at: https://walkincounselling.com/

9. **Distress Centre of Ottawa and Region**: Available 10am-11pm, 7 days/week, 365 days/year. **Distress Line:** 613-238-3311, **Crisis Line:** 613-722-6914 or 1-866-996-0991, **Text:** 343-306-5550. https://www.dcottawa.on.ca/

10. **Distress and Crisis Ontario, Available for chat 2 pm – 2 am EST.** https://www.dcontario.org/

11. **BounceBack Ontario (Toll-Free: 1-866-345-0224)** is a free skill-building program managed by the Canadian Mental Health Association (CMHA). It is designed to help adults and youth 15+ manage low mood, mild to moderate depression and anxiety, stress or worry. Delivered over the phone with a coach and through online videos, you will get access to tools that will support you on your path to mental wellness. https://bouncebackontario.ca/.