Carleton University
Department Of Civil & Environmental Engineering

CIVE 5609 Fundamentals of Fire Protection Engineering

Course Outline Winter 2023

Lectures: Monday 6:05-8:55pm
Location: Canal Building 2400
Professor: Hamish Pope
Email: Hamishpope@cmail.carleton.ca

Course description:
This course provides an introduction and analysis of the fire problem, including social, economic and environmental issues, as well as a description of the fire safety regulatory system and the governing building codes and standards. It covers the global fire safety system in a facility as well as active fire protection systems; detection, suppression, and smoke management. It also includes a description of the fire safety design process in both a prescriptive and a performance-based code environment.

Grading:
The course will be graded on the following basis:
Problem Sets: 50%
Final Exam: 50%

Any late assignments will be deducted 25% (even if late by one minute) and will receive a grade of zero if late by 24 hours or more.

Recommended books:
- Dougal Drysdale, An Introduction to Fire Dynamics, Wiley, 1999
- SFPE Handbook of Fire Protection Engineering, 3rd Edition, 2002
- Richard, L.P. Custer and Brian J. Meacham, Introduction to Performance-Based Fire Safety
- SFPE Engineering Guide to Performance-Based Fire Protection Design

Course Website and communication:
All course information and assignments 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.

Course Format:
This course will be delivered synchronously in person.

Topics:

1. Fire Protection Engineering and Performance-Based Designs

- Overview of fire safety engineering
- Fire safety system
- Regulatory system
- Performance-based designs

2. Heat Transfer

- Conduction
- Convection
- Radiation
- 3. Hazard, Risk and Failure Analysis

3. Fire Development

- Ignition, flame spread, burning rate
- Fire loads
- Plumes
- Compartment fires

4. Smoke movement and smoke management

- Smoke movement concepts
- Principles of smoke management
- Stairwell pressurization
- Zone smoke control
- Atrium systems

5. Fire resistance

- Thermal
- Structural
- Wood, concrete steel
- Modelling fire resistance

6. Fire Detection

- Smoke detectors
- Heat detectors
- IR/UV detectors
- Modelling detection time

7. Fire Suppression

- Overview of suppression systems
- Design of sprinkler systems

8. Life hazard

- Toxicity
- Dosage
- Skin burns

9. Evacuation

- Occupant characteristics
- Occupant response
- Occupant evacuation
- Modelling occupant evacuation

10. Probabilities

- Probabilities, event trees, success trees, network diagrams
- Reliability, uncertainty, redundancy

11. Fire risk analysis

- Risk binning
- Quantitative risk analysis
- Risk models

12. Economics of fire protection

- Costs and benefits
- Annual costs and benefits
- Economic evaluation of fire safety measures
- Decision analysis

Academic Integrity:

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. Any students who do not act with academic integrity will face severe consequences including immediate referral to Associate Dean of Student Affairs.

Email Policy:
You can send emails to the instructor's email. Effort 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 must come from official Carleton University email addresses. The instructor will not respond to emails from outside addresses.

Accommodations:
The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

COVID:

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.