COURSE DESCRIPTION AND OBJECTIVES

This course introduces students to basic concepts related to fire safety in buildings and the response of structures when exposed to fires. It covers the basics of fire development and smoke production and movement, compartment fire behaviour, pre-flashover and post-flashover fires, burning characteristics of building materials and furniture and the effect of fire retardants. The course will also introduce students to simple correlations and computer models used to predict compartment fire dynamics. Also discuss laboratory-scale fire experiments, standard fire tests used to evaluate building materials and building elements and the use of the performance-based approach for building fire safety design and the economic aspects of fire.

Prerequisites: Fourth-year status in Engineering. All other students interested in taking the course will need permission of the Department.

TOPICS

Fire Safety in Buildings
Overview; Fire Safety Objectives; Process of Fire Development; Conceptual Framework for Fire Safety; Fire Resistance; Controlling Fire Spread; Building Construction for Fire Safety

Fire and Heat
Overview; Fuels; Combustion; Fire Initiation; Burning Objects; t-squared Fires; Pre-flashover Design Fires; Heat Transfer

Room Fires
Overview; Pre-flashover fires; Flashover; Post-flashover Fires; Design Fires; Other Factors

Fire Severity
Overview; Fire Severity and Fire Resistance; Fire Severity; Standard Fire; Equivalent Fire Severity

Fire Resistance
Overview; Fire Resistance; Assessing Fire Resistance; Fire-resistance Tests; Approved Fire-resistance Ratings; Fire Resistance by Calculation; Fire Resistance of Assemblies

Design of Structures Exposed to Fire
Overview; Structural Design at Normal Temperatures; Structural Design in Fire Conditions; Material Properties in Fire; Design of Individual Members Exposed to Fire; Design of Structural Assemblies Exposed to Fire

Steel Structures
Overview; Behaviour of Steel Structures in Fire; Fire-resistance Ratings; Steel Temperatures; Protection Systems; Mechanical Properties of Steel at Elevated Temperature; Design of Steel Members Exposed to Fire; Design of Steel Buildings Exposed to Fire

Concrete Structures
Overview; Behaviour of Concrete Structures in Fire; Fire-resistance Ratings; Concrete and Reinforcing Temperatures; Mechanical Properties of Concrete at Elevated Temperatures; Design of Concrete Members Exposed to Fire; Composite Steel-Concrete Construction Exposed to Fire

Timber Structures
Overview; Description of Timber Construction; Fire-resistance Ratings; Wood Temperatures; Mechanical Properties of Wood; Design Concepts for Heavy Timber Exposed to Fire; Design of Heavy Timber Members Exposed to Fire; Behaviour of Timber Connections in Fire
COURSE INSTRUCTOR
Professor Ehab Zalok, Ph.D., P.Eng.
ehab.zalok@carleton.ca | Office: ME 2486 | Phone: +1 (613) 520-2600 x 7450
Office Hours: By appointment

COURSE DELIVERY
- Lectures: Three hours a week
- Problem analysis: 1 ½ hours a week
- Office hours consultation: Instructor & TAs: arrange meeting time by email
- Grading Details:
  o Midterm (30%): Feb 15th, 2023
  o Group Project (20%; Paper 10% + Presentation 10%)
  o Final Examination (50%)
  o Students who score less than 33% during the term (term work) will be assigned the grade F, and,
  o A minimum percentage of 33% in the final exam is required to pass the course, and,
  o A minimum of 50% of term work plus final exam is required to pass the course.
  o The final examination is for evaluation purposes only, and the paper will not be returned or made available to students after it is marked.

COURSE WEBSITE AND COMMUNICATION
Course information will be available through Brightspace. Students are responsible for ensuring that they are correctly registered and that they are receiving messages properly through their official university email address.

SUGGESTED TEXTBOOK

COURSE POLICIES
Appeal
All appeals for marks assigned in this course must be made within 3 days of the posting date.

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
Emails must come from official Carleton University email addresses or through Brightspace. Problem analysis questions: Direct those to the Teaching Assistants.

Extensions and Rewrites
In the interest of fairness for all students, requests for rewrites will only be granted for situations that are truly out of a student's control.

Academic Accommodation
Students with diverse learning styles and needs are welcome in this course. You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me 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: http://www2.carleton.ca/equity/

Religious obligation: write to me 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: http://www2.carleton.ca/equity/

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (L.D), 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).

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www2.carleton.ca/equity/.

*Modified: January 12, 2023*