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.

Professor: Hamish Pope; Email: Hamishpope@carleton.ca

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 WEBSITE AND COMMUNICATION
All course information and online quizzes will be available through CuLearn. All students are responsible for ensuring that they are correctly registered through CuLearn and that they are receiving messages properly through their official university email address. Students are responsible for checking the CuLearn course management site and their official email account frequently.

COURSE FORMAT
This course will be delivered asynchronously. Students will access materials and complete activities on their own time based on structure and guidance provided by the instructor. Meeting time will be used for office hours, group meetings, etc. Students are expected to be available during the meeting time.

COURSE WORK AND ASSESSMENT:
Lecture Material Summaries: 5%
Assignment: 15%
Group project: 30%
Final Exam: 50%

Lecture Summaries:
A collection of lecture videos and readings are be posted online for each course topic. A lecture material summary will be used to assess the level of understanding attained from all or part of the lecture materials for that topic. A list of due date for lecture material summaries are posted on CuLearn. The lecture summaries are to be a minimum of 200 words, and a maximum of 1 page. The summaries are equally weighted and graded as pass fail.

Any late lecture material summary will receive a grade of zero (even if late by one minute).

Assignment:
There will be one assignment tentatively due February 12th. Submission of the assignment will be done through a submission form on CuLearn.

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.

Group Project:
This course will consist of a group project that will have several deliverables throughout the course. Students will be able to self select their group members. More details on the group project can be found on CuLearn.

Final Exam:
The final exam has not yet been scheduled.

Students who score less than 33% during the term (term work) will be assigned the grade FND (Failure - No Deferral). A minimum percentage of 33% in the final exam is required to pass the course. A minimum of 50% of term work plus final exam is required to pass the course. The final examination is for evaluation purposes only, and the paper will not be returned or made available to students after it is marked.

Appeals:
All appeals of marks assigned in this course must be made within 7 days of the posting date.

REFERENCE TEXTBOOK:
This textbook was is the basis of much of the course material and is a useful reference. However, it is not required for the course.

There will also be required readings and other materials that will be posted on Culearn and/or Ares.

**COURSE POLICIES**

*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](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*  
Questions about course content should be asked on the CuLearn Discussion Board. Complex technical questions should be addressed during office hours, or by appointment. If you have other questions you can send them 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 or through CuLearn. The instructor will not respond to emails from outside addresses.

**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:** 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://www.carleton.ca/equity/accommodation/student_guide.htm](http://www.carleton.ca/equity/accommodation/student_guide.htm).  

**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://www.carleton.ca/equity/accommodation/student_guide.htm](http://www.carleton.ca/equity/accommodation/student_guide.htm).  

**Students with disabilities requiring academic 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](http://www.carleton.ca/pmc)) for the deadline to request accommodations for the formally-scheduled exam (if applicable). “

**Instructional Offences:** Please consult the university undergraduate calendar for definitions and penalties.