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.

Instructor Professor: Ehab Zalok, Ph.D., P.Eng.
ehab.zalok@carleton.ca - office: 3370 ME - Phone: +1 (613) 520-2600 ext. 7450).
Office hours: Thu 2:30 – 3:30 pm.

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

Light Frame Construction
Overview; Description; Fire Behaviours; Fire-resistance Ratings; Properties of Gypsum Plaster Board; Temperatures Within Light Frame Assemblies; Structural Behaviour; Design of Light Frame Structures in Fire; Construction Details; Lightweight Sandwich Panels
COURSE FORMAT

- Lectures: Three hours a week
- Problem analysis: One and half hours a week
- Office hours’ consultation:
  - Instructor Office hours: Thu 2:30 – 3:30 pm.
  - TAs: arrange meeting time by email:
    - Hamish (HamishPope@cmail.carleton.ca)
    - Dami (in charge of the project) (oluwadamilolaokunrou@icloud.carleton.ca)
- Grading:
  - Midterm (30%): Date/Time: Feb 28 6-9pm. Room MC5050
  - Group Project (Paper 20% + Presentation 10%)
  - Final Examination (40%)

Students who perform poorly during the term (term work less than 33%) 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.

REFERENCES:

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 in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by the deadlines published on the PMC website: [http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/](http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/)

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

NOTE TO JOB SEEKERS AND POTENTIAL GRADUATE STUDENTS
I can serve as a reference for you in your job search. The requirement for getting a reference letter is to achieve a grade of ’A+‘ in the course. Letters of reference will be sent directly to employers or under signed seal to you.

Modified: January 18, 2017