

**Carleton University  
Department of Civil & Environmental Engineering**

**Proposed Syllabus (Fall 2020)**

**CIVE5609/IPIS5504 Fundamentals of Fire Protection Engineering**

Lectures: Thursdays 6:05 – 8:55  
Location: Online  
Lecturer: Professor George Hadjisophocleous, PhD, P.Eng, FSFPE  
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### **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:

Assignments: 30%  
Online problems: 30%  
Final Exam: 40%

### **Recommended books**

- Dougal Drysdale, An Introduction to Fire Dynamics, Wiley, 1999
- SFPE Handbook of Fire Protection Engineering, 5th Edition, 2015
- Richard, L.P. Custer and Brian J. Meacham, Introduction to Performance-Based Fire Safety
- SFPE Engineering Guide to Performance-Based Fire Protection Design

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**Proposed Course Outline**

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**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. 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 Detection**

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

**6. Fire Suppression**

- Overview of suppression systems
- Design of sprinkler systems

**7. Egress**

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

#### **8. Fire resistance**

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

#### **9. Life hazard**

- Toxicity
- Dosage
- Skin burns

#### **10. Economics of fire protection**

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

#### **11. Hazard, Risk and Failure Analysis**

- Hazard and risk
- Probabilities, event trees, success trees, network diagrams
- Reliability, uncertainty, redundancy

#### **12. Fire risk analysis**

- Risk binning
- Quantitative risk analysis
- Risk models