

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
1125 Colonel By Drive, Ottawa, Ontario, K1S 5B6

3-Day Short Course
Introduction to Fire Dynamics
May 22 – 24, 2013

The Department of Civil and Environmental Engineering of Carleton University and CHM Fire Consultants Ltd are pleased to announce a 3-day Short Course on Introduction to Fire Dynamics, to be held at Carleton University on May 22 - 24, 2013.

Course description

Since the introduction of objective-based codes in Canada in 2005, there has been a continuous increase in the use of engineered solutions to fire safety problems. These solutions are based on fire safety engineering principles and especially on the application of fire dynamics. Participants of this course will learn how to apply general combustion, heat transfer and engineering principles to better understand fires and will be introduced to the main parameters that influence ignition, flame spread and burning rate. They will learn how to predict the rate of fire development, the time to flashover, and the conditions in a fire compartment during the pre-flashover and post-flashover stages of fire. They will also learn how to predict the impact of fires on structures and how this knowledge can be used for fire protection designs as well as for fire investigations. In addition, they will learn about the production of toxic gases and be able to determine the effect of fires and fire effluents on occupants and predict the time of onset of untenable conditions. Throughout the course example problems will be solved that apply heat transfer and fire dynamics principles to real scenarios.

Who should attend?

This course would be beneficial to all fire safety practitioners interested in gaining or reinforcing their knowledge of fire dynamics. In particular, the course will be of great benefit to fire protection engineers, fire investigators, building officials, code consultants, fire safety officers, building science practitioners, architects, fire prevention officers and students in fire safety programs.

Registration

To register, please complete the registration form shown on the last page.

Introduction to Fire Dynamics - Short Course Program

Time	Wednesday May 22, 2013
8:30	Registration
8:45	Welcome and Introductions, George Hadjisophocleous, Carleton University
9:00	<p>Combustion, Steve Craft, CHM Fire Consultants</p> <p>This lecture includes an introduction to flaming combustion in natural fires. Natural fires covered will include premixed, laminar diffusion and turbulent diffusion flames. The concepts of net heat of combustion and incomplete combustion will be covered along with the role of using the heat of combustion of oxygen in fire safety engineering applications.</p>
10:15	Break
10:45	<p>Heat transfer, George Hadjisophocleous, Carleton University</p> <p>Heat transfer is one of the most important factors that not only governs every aspect of fire from ignition to fire development and flashover, but also the impact of fires on structures and people. It is for this reason that heat transfer is used in modelling fires but also as a tool for fire investigations. This lecture will introduce the three modes of heat transfer, conduction convection and radiation, and discuss their roles during fires. Numerical examples will be considered to demonstrate how to solve basic fire related heat transfer problems.</p>
12:15	Lunch
1:15	<p>Ignition: Gases, Liquids and Solids, Jim Mehaffey, CHM Fire Consultants</p> <p>In this lecture, an introduction will be presented to the salient phenomena associated with the piloted ignition of flaming combustion. To this end, the flammability limits of gases, the flashpoints of liquids, and ignition temperatures and critical radiant heat fluxes of solids will be discussed in some detail. The auto-ignition of flaming combustion of gases, liquids and solids will also be considered as will the initiation of smouldering and spontaneous combustion in solids.</p>
2:45	Break
3:15	<p>Flame spread, George Hadjisophocleous, Carleton University</p> <p>Flame spread is defined as the process in which the perimeter of the fire grows, extending the burning region. This lecture will describe the different types of flame spread, including flame spread over liquids and solids under natural flow, wind aided or</p>

	opposed flow conditions. Examples will be solved to obtain flame spread speeds on solids for different conditions.
4:00	Burning rate, Steve Craft, CHM Fire Consultants <p>The burning rate of an object is of critical importance in designing for fire safety. This lecture will focus on the burning rates (open burning) for pool fires, pallet fires and upholstered furniture. Once the burning rate of an object is known, the heat release rate can be predicted which is a key component to the fire safe design of a building.</p>
5:00	Adjournment
Thursday May 23, 2013	
9:00	Fire plumes, Steve Craft, CHM Fire Consultants <p>Understanding the behaviour of a fire plume and its entrainment of air is of critical importance in fire safety design particularly in determining smoke extraction requirements in an atrium. This lecture will look at models used to predict the flame height and plume in terms of mass flow, temperature and velocity when the fire is burning in the open.</p>
10:30	Break
11:00	Products of Combustion, Jim Mehaffey, CHM Fire Consultants <p>The products of combustion (gases, soot and heat) generated during a fire depend sensitively on the availability of fresh air (oxygen). In this lecture, a simple methodology is presented for predicting the types and quantities of the products of combustion that are generated when typical combustibles burn in common fire scenarios. This knowledge will prove useful in fire safety assessments undertaken later in the Short Course.</p>
12:30	Lunch
1:30	Pre-flashover compartment fires, George Hadjisophocleous, Carleton University <p>The period from fire ignition to flashover is known as the pre-flashover fire stage. Understanding how the fire grows during this stage is very important because what happens before flashover has a major impact on life safety. Detection and automatic suppression systems are designed to activate before flashover and occupants should be warned of the fire and move away from the fire area during this stage. This lecture will describe the various phenomena taking place in a fire compartment and show how to calculate the conditions in the compartment from ignition to flashover.</p>
3:00	Break
3:30	Post-flashover Compartment Fires, Jim Mehaffey, CHM Fire Consultants <p>Flashover is the stage in a compartment fire when the fire rapidly progresses from being localised to being fully developed (all combustibles become involved in the fire). In this</p>

	lecture simple models are presented to predict the temperature as a function of time in post-flashover compartment fires. Also presented is a method for assessing whether the severity of a post-flashover fire exceeds the ability of fire-rated structural elements and/or fire-rated separations to perform their intended roles.
5:00	Adjournment
Friday May 24, 2013	
9:00	Impact of fires on occupants George Hadjisophocleous, Carleton University Life safety is one of the main objectives of any fire protection design. This lecture will describe some psychological and physiological effects of fires on people. It will cover tenability and egress, dosages of toxic products and demonstrate how to calculate the onset of hazardous conditions.
10:30	Break
11:00	Impact of fires on structures, Steve Craft, CHM Fire Consultants This lecture will focus on the effects of fire on structures. A detailed account of the mechanisms of heat transfer from the fire to the structure will be covered. The impact of the fire on different structures such as concrete, steel, and timber as well as light-frame assemblies will be explored.
12:30	Lunch
1:30	Moderated Panel Discussion, Jim Mehaffey, CHM Fire Consultants
3:00	Adjournment

The Instructors

Steve Craft, PhD, P.Eng., CHM Fire Consultants Ltd

Dr. Steve Craft is a principal at CHM Fire Consultants where he works on projects related to alternative solutions in building design, fire investigations and product acceptance. From 2006 to 2011, Dr. Craft was a research scientist at FPInnovations (Forintek) where he primarily worked in the area of performance of wood structures subjected to fire. He is also an Adjunct Professor in the Fire Safety Engineering Program at Carleton University where he teaches courses in Wood Engineering, Fire Dynamics and Wood Structures and Fire Safety. Dr. Craft chairs committees at CSA O86 on Design of Wood Structures for Fire Resistance and at ULC on Exterior Fire Tests. Dr. Craft is a Registered Professional Engineer in the Provinces of Ontario and Alberta.



Professor George Hadjisophocleous, PhD, P.Eng., Carleton University

Professor Hadjisophocleous has held the Industrial Research Chair in Fire Safety Engineering at Carleton University since 2001. His research areas include the performance of building elements such as timber and steel connections in fire, fires in tunnels, fire risk analysis, smoke movement, design fires and fire modelling. He holds a Ph.D. degree in Mechanical Engineering from the University of New Brunswick and he is the author of over 180 publications in the areas of fire research, fire risk assessment, performance-based codes and CFD modelling. Dr. Hadjisophocleous is a Fellow of SFPE, the Coordinator of CIB Commission W14 on Fire, a member of NFPA, IAFSS, and a Registered Professional Engineer in the Provinces of Ontario and British Columbia. He is also the President of CHM Fire Consultants, a fire consultancy company based in Ottawa, Ontario.



Jim Mehaffey, PhD, CHM Fire Consultants Ltd

Dr. Jim Mehaffey is currently a principal at CHM Fire Consultants. From 1980 to 1987, Dr. Mehaffey was a research scientist at the National Research Council where he developed models to predict the growth and severity of building fires. From 1988 to 2009, he was a research scientist with FPInnovations (Forintek) where he modelled the performance of wood-frame assemblies exposed to fire. From 1993 to 1997, he was seconded to the University of British Columbia where he was Director and Associate Professor in UBC's Fire Protection Engineering Program. He is currently an Adjunct Professor in the Department of Civil and Environmental Engineering at Carleton University. He has a Ph.D. in physics from the University of Toronto and is the author of over 80 scientific publications.





Canada's Capital University

A Short Course – Introduction to Fire Dynamics
Carleton University, May 22 - 24, 2013
Course Registration Form

Name: _____ Title: _____

Organization: _____

Address: _____

City: _____ Province/State _____ Postal code: _____

Phone number: (____) _____ Fax number: (____) _____

Email: _____

Regular registration fee: \$530.97 + HST (\$69.03) Total: \$600.00

Full-time student registration fee: \$132.74 + HST (\$17.26) Total: \$150.00

Course Dinner, May 23, 2013 (Optional): \$60.00

3-day parking permits (Optional): 3 days x \$10.00/day \$30.00

Total payment: \$ _____

Enclosed is a cheque for the registration fee

Please make cheques payable to Carleton University

Charge the registration fee to my credit card

MasterCard Visa

Name shown on card: _____

Card number: _____ Card Expiry date: _____

Card Security Value: _____ (Three digit number on the back of the card)

Signature: _____

Accommodation: Participants are responsible for making their own arrangements. For a list of hotels in the Ottawa area please go to www.ottawahotels.com.

Directions: For directions on how to get to Carleton University please go to: <http://www1.carleton.ca/campus/how-to-get-to-carleton-university/>. For a campus map please go to www.carleton.ca/cu/campus

All registrations should be sent to one of the following:

Mail: Fire Safety Engineering Short Course
Department of Civil and Environmental Engineering
Room 3432 ME, Carleton University
1125 Colonel By Drive, Ottawa, Ontario, K1S 5B6

Fax: (613) 520-3951

Email: Firesafetycourse@carleton.ca



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