

## **ENFP425 Enclosure Fire Modeling**

**Credits:** Three credits, two 75 minute lectures/problem solving sessions weekly

**Instructor:** Stanislav I. Stoliarov

**Textbook:** Karlsson B., Quintiere J. G., *Enclosure Fire Dynamics*, CRC Press LLC, 2000.

### **Specific course information:**

1. Catalog Description: An introduction to enclosure fire dynamics through the development of fire modeling algorithms and the application of computer-based fire modeling techniques. The objectives of the course are: to provide a basic understanding of enclosure fire dynamics with an emphasis on a system-level viewpoint (i.e., a global description of the coupling between combustion dynamics, smoke filling, vent flows and heat transfer); and to provide an introduction to the zone modeling approach.
2. Prerequisites: ENES232, ENFP300 and ENFP312.
3. Required Course.

### **Specific goals for the course:**

1. Upon completion of this course, students should be able to:
  - Demonstrate understanding of main stages of compartment fire
  - Identify different regimes of fire development and apply mass and energy conservation statements to compute changes in temperature, pressure and composition of gases in the compartment
  - Compute mass flows associated with fire plume and compartment vents and optimize performance of a smoke management system
  - Develop MATLAB programs that can be used to solve systems or ordinary differential equations describing evolution of fire in a compartment
2. This course focuses on two SOs:
  - SO2 – An ability to design and conduct experiments, as well as to analyze and interpret data.
  - SO11 – An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### **Brief list of topics:**

Fire growth: formation of a smoke layer and transition to flashover  
Mass and energy conservation and application in zone models  
Fuel-limited and oxygen-limited combustion regimes and species yields  
The concept of design fire  
Vent flows, natural ventilation theory, smoke transport in buildings  
Convective heat transfer, radiation exchanges between gray surfaces in enclosures, wall heat losses