DIM-OPT-422 Fire Numerical Simulation

SEMESTER: Spring

CREDITS: 3 ECTS (2 hrs. per week)

LANGUAGE: English

DEGREES: GITI, SAPIENS Program

Course overview

This course will allow participants to approach various simulation challenges in fire safety problems from a practical perspective. These challenges include smoke movement in large spaces (shopping malls, subway/train stations, tunnels, etc.), fire development in industrial buildings, etc. By the end of the course, students will have acquired the necessary tools and knowledge to address different simulation challenges in the field of fire safety.

Prerequisites

Basic knowledge of Fluid Mechanics, Heat Transfer.

Course contents

Theory/Laboratory (2 hours/15 sessions):

1.- Introduction to Fire Safety and Fire Numerical Modelling

- Heat Transfer
- Fluid Mechanics
- Combustion

2.- Computational Fluid Dynamics (I): Fire Dynamics Simulator (FDS)

- Introduction to turbulence models
- Combustion models
- Radiation models
- Advantages, disadvantages and limitations.
- Case of Study

3.- Computational Fluid Dynamics (II): Fire Dynamics Simulator (FDS)

- Geometry
- Meshes
- Boundary Conditions
- Outputs
- Case of Study

4.- Compartment Fires

- Description of compartment fires
- Case of study

5.- Large compartments: Smoke Control Systems

- Ventilation
- Case of Study

6.- Critical Infrastructures: Tunnel fire ventilation

- Introduction to tunnel ventilation
- Case of study

7.- Workshop. Development of the final project.

Textbook

SFPE Handbook of Fire Protection Engineering, 5th Edition, SFPE, 2016.

Quintiere, J.G, "Fundamentals of Fire Behaviour," John Wiley and Sons, 2011.

Drysdale, D.D. "An Introduction to Fire Dynamics," John Wiley and Sons, 3rd Edition, 2011.

Grading

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.

The overall grade is obtained as follows:

- Active participation in class: 5%.
  - Class attendance.
  - Participation in the different case studies.
- Final Project: Case study: 70%.
  - Development of a model.
  - Report, including the analysis of results.
  - Oral presentation.
- Final exam: 25%.

Extraordinary call:

- If you passed any part(s) in the ordinary call, the grades for those part(s) will be retained, and you will only need to retake the part(s) you failed.

- The calculation of the final grade will follow the same distribution as the ordinary exam, with the grade(s) of the failed part(s) updated accordingly.
- For students who failed the final exam, an extraordinary theoretical test will be required. If the final work was not satisfactory, the student must repeat it individually.