Course guide
295906 - EFOC - Fire Engineering

Last modified: 02/03/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: ELSA PASTOR FERRER

Others: Segon quadrimestre:
ELSA PASTOR FERRER - Grup: M1
PASCALE VACCA - Grup: M1

TEACHING METHODOLOGY

The course combines lectures, problem-solving sessions and practical classes, both in the laboratory (FlamesLab – CERTEC) and in the computer room. In addition, guest lectures by well-recognised professionals from the sector will be included, allowing students to gain first-hand insight into the professional practice of fire safety engineering and its real-world application.

LEARNING OBJECTIVES OF THE SUBJECT

This course introduces students to fire engineering or fire safety engineering, a specialised field with strong professional demand and a wide range of career opportunities in Catalonia and internationally. It provides a first direct entry point into the sector, facilitating contact with specialised companies and organisations and opening up real opportunities for curricular internships in the field of fire safety.

The course provides the fundamentals required to analyse and design fire safety solutions for buildings, industrial facilities and the wildland–urban interface. It covers the basics of combustion and fire dynamics, material behaviour, and ignition and flame spread mechanisms. Building on this knowledge, students work with fire simulation tools and software commonly used in professional practice and become familiar with the main active and passive fire protection systems. The course also lays the foundations for developing fire protection projects using both prescriptive and performance-based approaches and introduces basic concepts of fire investigation.

The course is transversal and open to students from all EEBE degree programmes, addressing a field that is largely absent from undergraduate curricula. It also provides an excellent preparation for students interested in further specialisation through the Erasmus Mundus International Master in Fire Safety Engineering (IMFSE), in which UPC–EEBE is a partner, and enables direct contact with the professional sector through CLUSIC and specialised companies. Fire safety engineering is an applied engineering field with real-world impact and strong employment prospects, offering a clearly distinctive specialisation.

STUDY LOAD

Type	Hours	Percentage
Hours large group	60,0	40.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

3. Introduction to Fire Engineering

Description:
Fire Engineering and related areas. Types of fire: industrial, buildings and wildland fires.

Full-or-part-time: 7h 30m
Theory classes: 7h 30m

3. Fundamentals on combustion and fire dynamics

Description:
Fuel types and classification. Physicochemistry of combustion. Heat of combustion. Flame temperature. Combustion products. Heat transfer. Pre-mixed flames. Diffusion flames. Ignition. Propagation. Burning rate.

Full-or-part-time: 25h
Theory classes: 25h

3. Tools for compartment fires simulation

Description:
Compartment fire dynamics. Types of models: empirical, quasi-physical, zone models, CFD models. Simulation exercises.

Full-or-part-time: 8h 45m
Theory classes: 8h 45m

4. Fire protection

Description:
Introduction to fire protection. Suppression: mechanisms and agents. Fire safety: active and passive fire protection. Fire emergency management.

Full-or-part-time: 42h 30m
Theory classes: 42h 30m

5. Bases for fire protection design measures and strategies

Description:
Prescriptive and performance-based design. Legislation. Design projects of supression, ventilation and evacuation systems.

Full-or-part-time: 37h 30m
Theory classes: 37h 30m

6. Fire investigation

Description:
Methodos for forensic analysis. Ignition sources. Fire patterns and vestiges. Professional activities involving fire investigation. Study cases.

Full-or-part-time: 28h 45m
Theory classes: 28h 45m

GRADING SYSTEM

BIBLIOGRAPHY

Basic:
- Drysdale, Dougal. An introduction to fire dynamics. 3rd. Chichester: Wiley, 2011. ISBN 9780470319031.
- Quintiere, James G. Fundamentals of fire phenomena. Chichester: John Wiley & Sons Ltd, 2006. ISBN 9780470091135.

Complementary:
- Society for fire Protection Engineers. SFPE Handbook of fire protection engineering [on line]. 5th ed. New York: Springer, 2015 [Consultation: 30/04/2020]. Available on: https://dx.doi.org/10.1007/978-1-4939-2565-0. ISBN 9781493925650.
- McAllister, Sara; Chen, Jyh-Yuan ; Fernandez-Pello, A. Carlos. Fundamentals of combustion processes [on line]. New York, [etc.]: Springer, 2011 [Consultation: 30/04/2020]. Available on: http://dx.doi.org/10.1007/978-1-4419-7943-8. ISBN 9781441979438.