

Course guide 310410 - 310410 - Evolution and Control of Building Fires

Last modified: 24/11/2023

Academic year: 2023	ECTS Credits: 5.0 Languages: Spanish
Degree:	MASTER'S DEGREE IN ADVANCED BUILDING CONSTRUCTION (Syllabus 2014). (Optional subject).
	737 - RMEE - Department of Strength of Materials and Structural Engineering. 732 - OE - Department of Management.
Teaching unit:	748 - FIS - Department of Physics.
Unit in charge:	Barcelona School of Building Construction

LE	C1	ſU	R	E	R	

Coordinating lecturer:	Lacasta Palacio, Ana Maria		
Others:	Marimon Carvajal, Frederic		
	Guixa Mora, Jaime		

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

6. Recognise the materials and construction techniques of each historical period and value its influence in the architecture design. 10. Use the physic principles in the thermic, luminic and acoustic scope.

Generical:

7. Provide to the student the capacity to apply the knowledge acquired in the resolution of complex problems in any sector of the building construction.

8. Analyse, evaluate and synthesise critically, new and difficult ideas of promotion, in academic and professional contexts, cientific advances, technologics, socials or culturals in the society of knowledge.

Transversal:

9. ENTREPRENEURSHIP AND INNOVATION: Knowing about and understanding how businesses are run and the sciences that govern their activity. Having the ability to understand labor laws and how planning, industrial and marketing strategies, quality and profits relate to each other.

11. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

12. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

Basic:

2. Possess and understand knowledge which provide a basis or opportunity to be original in the development and/or application of ideas, usually in a context of research.

3. The students must be able to apply the acquired knowledges and their ability of resolution of problems in new or little known environments inside more wide environments (or multidisciplinary) related with their study field.

4. The students must be able to integrate knowledges and front to the complexity to formulate opinions from an information which, being incomplete or limited, includes reflections about the social and ethical responsabilities linked to the application of their knowledges and opinions.

5. The students must be able to communicate their conclusions and the knowledges and ultimate reasons which support to specialised and non-specialised audiences in a clear mode and without ambiguities.

1. The students must possess the learning abilities which allow them to continue studying in a way which should be to a large extent self-directed and autonomous.



TEACHING METHODOLOGY

Theory and problem classes will be taught A practical work will be carried out in the fire laboratory. A computational simulation work will be carried out Group work will be encouraged.

LEARNING OBJECTIVES OF THE SUBJECT

- Acquisition of knowlege about he basics of generation and spread of fire.
- Acquisition of knowlege about the mechanisms of fire propagation in buildings.
- Learning about the behavior of materials when subjected to high temperatures.
- Acquisition of knowlege on the existing protection systems and to establish the most appropriate in each case.
- Knowing the fire simulation programs and understand the principles of operation.
- Acquisition of knowlege on the behavior of structures in fire

STUDY LOAD

Туре	Hours	Percentage	
Hours large group	15,0	12.00	
Self study	90,0	72.00	
Hours medium group	5,0	4.00	
Guided activities	10,0	8.00	
Hours small group	5,0	4.00	

Total learning time: 125 h

CONTENTS

Fires. Introduction

Description:

Emblematic fire examples. General evolution of worldwide standards against fire. Statistical analysis. Origin and most frequent causes of fires.

Full-or-part-time: 4h

Theory classes: 2h Self study : 2h

Physicochemical Fundamentals of Fire

Description:

Fundamentals of combustion. Thermal decomposition of materials. Fundamentals of Fluid Mechanics. Released energy and heat transport. Type of flames. Flammability Limits.

Full-or-part-time: 15h Theory classes: 1h

Practical classes: 2h Self study : 12h



Behavior of materials against fire

Description:

Fire reaction of material. Smoke generation and toxicity. Improvement of materials to fire reaction: flame retardants and smoke suppresors. Fire resistance. Characterization tests. Regulations.

Related activities:

Experimental study about the behaviour against the fire of the materials. This work will be done in the fire lab of the EPSEB.

Full-or-part-time: 22h Theory classes: 3h Practical classes: 2h Guided activities: 1h Self study : 16h

Fire evolution in buildings

Description:

Dynamics of fire. Smoke evolution. Stages of a fire. Fashover. Period of post-flashover and Backdraft. Propagation inside and outside spread through the acase. Computational simulations of fire propagation: zone models and field models.

Related activities:

Utilization of the FDS software for the simulation of the fire spreading on buildigns. This work will be done in the fire lab of the EPSEB.

Full-or-part-time: 30h

Theory classes: 4h Practical classes: 2h Laboratory classes: 2h Guided activities: 2h Self study : 20h

Human behavior under fire conditions

Description:

Effects of fire on people. Smoke and toxicity. Effect of temperature. Optical smoke density and visibility. Human behaviour under fire situations. Evacuation models.

Full-or-part-time: 16h

Theory classes: 2h Laboratory classes: 2h Self study : 12h

Security of buildings in case of fire

Description:

Passive protection systems. Sectorization. Active protection systems. Evacuation and accessibility. Requirements. Performancebased designs.

Related activities:

Clase práctica sobre gestión de incendios en edificios en construcción

Full-or-part-time: 16h Theory classes: 2h Practical classes: 2h Self study : 12h



Structural sequrity

Description:

High-temperature behavior of steel and concrete structures.

Full-or-part-time: 22h Theory classes: 4h Guided activities: 2h Self study : 16h

GRADING SYSTEM

The final mark will be obtained from the grades obtained in four works carried out throughout the course.

BIBLIOGRAPHY

Basic:

- Drysdale, Dougal. An introduction to fire dynamics. Chichester: Wiley, 2011. ISBN 9780470319031.
- Alvear, D.; Rein, G; Capote, J.A.; Torero, J.L.; Lázaro, M; Abreu, O.. Modelado y simulación computacional de incendios en la edificación. Madrid: Ediciones Díaz de Santos, 2007. ISBN 9788479788322.
- Fernández Núñez, Rafael. Protección contra incendios. Madrid: Cie Dossat 2000, 2004. ISBN 848965669X.
- Quintiere, James G. Principles of fire behavior. New York: Delmar Publishers, 1998. ISBN 9780827377325.