66235 - Combustion Science and Technology

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	3.0
Year	1
Semester	Half-yearly
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. The course includes theory sessions, of either 1 or 2 hours, and practice sessions of 1 hour. Supervised practical assignments will also be carried out, following the suggestions of the teachers. Students will also prepare an assignment on an specific aspect of combustion and will submit a report and make a presentation of it.

Materials will be provided to students in advance, probably through the virtual platform Moodle.

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Students are expected to participate actively in the class throughout the semester.

5.2.Learning tasks

The course includes the following learning tasks:

- Theory sessions (18 hours). They will include theoretical contents and examples of practical cases.
- Practice sessions (8 hours). Students will solve practical cases under the supervision of the teacher. Practical cases will be directly related to the theory sessions.
- Supervised assignments (10 hours). 2-3 activities proposed by the teachers done individually or in group.
- Autonomous work and study (26 hours). It is recommended to study since the beginning of the semester.
- Visits (4 hours). Visits are scheduled to facilities of interest.
- Tutorials (6 hours). The teacher solves student's doubts during office hours.
- Assessment (3 hours). Partial and final evaluation will be done along the course of both theory and practice. The course can be passed by means of a continuous assessment system, in which similar activities to those made along the course will be assessed. Anyway, the students will be able to do a final global exam of the course, in agreement with the regulations of the University of Zaragoza.

5.3.Syllabus

The course will address the following topics:

1. Introduction to combustion. Interest on studying combustion.
2. Thermochemistry of combustion: stoichiometry, formation enthalpies and heat of combustion. Adiabatic temperature flame.
3. Homogeneous chemical kinetics: elemental reactions, non-elemental reactions. Reactions of importance in combustion. Important mechanisms.
4. Flame types. Premixed flames. Diffusion flames. Flame theory. Flame stability. Gas turbine combustion. Otto combustion engines. Premixing burners. Diffusion burners.
5. Droplet evaporation. Diesel combustion engines.
6. Solid combustion. Combustion technologies and strategies.
7. Pollutant minimization. Practical case: emission minimization in Diesel engines.

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5.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

5.5.Bibliography and recommended resources

BC	Borghi, Roland. Combustion and flames : chemical and physical principles / Roland Borghi, Michel Destriau ; with the collaboration of Gérard De Soete ; translated from the french by Richard Turner Paris : Technip, 1998
BC	Chomiak, J. Combustion: A Study in Theory, Fact and Application / J. Chomiak. London : Gordon and Breach Publishers, 1990
BC	Combustion chemistry / Edityed by W.C. Gardiner, Jr. ; With contributions by A. Burcat...[et al.] New York [etc.] : Springer-Verlag, 1984
BC	Cox, Geoffrey. Combustion Fundamentals of Fire / G. Cox. London : Academic Press, 1995
BB	Drysdale, D. An Introduction to Fire Dynamics / D. Drysdale. Chinchester : John Wiley and Sons, 1985
BC	Jones, J.C.. Environmental and Safety Aspects of Combustion Technology / J.C. Jones. Bristol : Whittles Publishing, 1997
BC	Kee, R.J. Chemically reacting flows. Theory & practice / R.J. Kee, M.E. Coltrin, P. Glarborg. New York : Wiley, 2003
BB	Kuo, Kenneth Kuan-Yun. Principles of combustion / Kenneth K. Kuo . - 2nd ed. Hoboken, New Jersey : John Wiley & Sons, cop. 2005
BB	Lackner, Maximiliam. Combustion : from basics to applications / Maximiliam Lackner, Árpád B. Palotás, and Franz Winter Weinheim : Wiley-VCH, cop. 2013
BB	Turns, Stephen R.. An introduction to combustion : concepts and applications / Stephen R. Turns . - 2nd ed. Boston [etc.] : McGraw-Hill, 2000
BC	Warnatz, J. Combustion. Physical and Chemical Fundamentals, Modeling and Simulation, Experiments, and Pollutant Formation / J. Warnatz, U. Maas, Robert W.Dibble. Berlin-Heildelberg : Springer, 1996