66235 - Combustion Science and Technology

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	3.0
Course	1
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The course includes theory, of either 1 or 2 hours, and exercices sessions of 1 hour. Supervised practical works will also carried out, following the suggestions of the docents. Students will also perform a deeper study of an specific aspect of combustion and will deliver a report and make a presentation of it.

Materials will be provided to students in advance, probably through the moodle platform. Theory lectures will favour the active participation of students by means of different strategies.

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5.2.Learning activities

Activities planned for the course include:

Theory lectures (20 h), that will include pure theory and examples of practical cases.

Exercises sessions (10 h). Students will solve practical cases, under the supervision of the docent. Practical cases will be directly related to the theory lectures.

Supervised works (20 h), individual or grupal. 2-3 activities proposed by the responsibles of the course.
Individual study (10 h, personal. The student is suggested to study the topics considered in the course along with it.

Visits (5h). Visits are scheduled to facilities of interest on the topic.
Personal contact student-docent (7 h).
Evaluation (3 h). Partial and global evaluation will be done along the course of both theory and practice. The course can be superated by means of a continuous evaluation, in which similar activities to those made along the course will be assessed. Anyway, the students will be able to do a global exam of the course, in agreement with the regulations of the University of Zaragoza.

5.3.Program

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.

5.4.Planning and scheduling

In agreement with the schedule defined by the EINA (http://eina.unizar.es), the course will include:

20 h of theory lectures.

10 h of practical exercises and practical cases.

20 h of supervised student works, carried out individually or in group.
10 h of personal study.

5 h of visits.
7 h for resolution of doubts, in sessions bewteen the docent and the student. Responsibles of the course will announce in advance the timetables available for this activity.
3 h for evaluation activities.

5.5.Bibliography and recomended 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

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	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