Last update: 23-04-2019

220026 - DGTCM - Gas Dynamics and Heat and Mass Transfer

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

Teaching unit: 724 - MMT - Department of Heat Engines

Academic year: 2019

Degree: BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Carlos David Pérez Segarra

Others: Assensi Oliva Llena
Xavi Trias

Opening hours

Timetable: The specific timetable is personally agreed on with the student according to his/her availability.

Prior skills

Basic knowledge of previous courses: mathematics (specially differential and integral calculus), physics, mechanics of continuous media, fluid mechanics, thermodynamics.

Degree competences to which the subject contributes

Specific:

1. GrETA/GrEVA - An adequate understanding of the following, as applied to engineering: concepts and laws that govern the processes of energy transfer, the movement of fluids, the mechanisms of heat transfer and phase transition, and their role in analysis of the main aerospace propulsion systems.

Teaching methodology

The language use in the lectures is principally Catalan. Spanish is also used.

Learning objectives of the subject

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Study load

Total learning time: 150h	Hours large group:	46h	30.67%
	Hours medium group:	7h	4.67%
	Hours small group:	7h	4.67%
	Self study:	90h	60.00%

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Content

1. Introduction. Heat transfer by conduction in solids	Learning time: 40h Theory classes: 17h Practical classes: 3h Self study : 20h
Description:	

2. Heat transfer by radiation	Learning time: 22h Theory classes: 8h Practical classes: 2h Self study : 12h
Description:	

3. Convection phenomena. Gas dynamics.	Learning time: 38h Theory classes: 16h Practical classes: 2h Self study : 20h
Description:	

4. Combined problems	Learning time: 50h Theory classes: 5h Laboratory classes: 7h Self study : 38h
Description:	

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Planning of activities

THEORY SESSIONS	Hours: 65h Theory classes: 25h Self study: 40h

EXERCISES SESSIONS	Hours: 68h Theory classes: 14h Practical classes: 7h Laboratory classes: 7h Self study: 40h

PROJECT	Hours: 10h Self study: 10h

Qualification system

First mid-term exam accounts for 40% of the final mark.
Control tests account for 10% of the final mark.
Final exam accounts for 50% of the final mark.

There is the possibility of increasing the final mark of the exams by presenting and defending optional numerical simulation projects developed during the course and under the guidance of the lecturers. In that case, a minimum final mark of 4.5 is required.

The result of the first mid-term exam could be recovered/improved in the final exam. The mark obtained due to the recovering process will replace the initial mark if, and only if, this mark is higher that the initial mark.

Regulations for carrying out activities

The exams will consist of theory and problems. It is not allowed to use any extra material, except the one delivered by the lecturers. The use of mobile phones, smartwatches or similar devices, together with computers and programmable calculators, is also not allowed.

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Bibliography

Basic:

Incropera, F. P.; DeWitt, D. P. Fundamentos de transferencia de calor. 4ª ed. México: Prentice Hall, 1999. ISBN 9701701704.

Mills, A. F. Transferencia de calor. México: Irwin, 1995. ISBN 8480861940.

Lienhard IV, J. H.; Lienhard V, J. H. A heat transfer textbook [on line]. 3rd ed. Cambridge: Phlogiston Press, 2001 [Consultation: 06/03/2012]. Available on: <http://web.mit.edu/lienhard/www/ahtt.html>.

Shames, I. H. La mecánica de los fluidos. 3ª ed. Santafé de Bogotá: McGraw-Hill, 1995. ISBN 9586002462.

Anderson, J. D. Modern compressible flow: with historical perspective. 3rd ed. Boston: McGraw-Hill, 2003. ISBN 9780071241366.

Landau, L. D.; Lifshitz, E. M. Fluid mechanics. 2nd ed. Oxford: Elsevier Butterworth Heinemann, 1987. ISBN 0750627670.

Pantankar, S. V. Numerical heat transfer and fluid flow. New York: McGraw-Hill, 1980. ISBN 9780891165224.

Complementary:

Eckert, E. R. G.; Drake, R. M. Analysis of heat and mass transfer. Washington: Hemisphere, 1972. ISBN 0891165533.

Lakshminarayana, B. Fluid dynamics and heat transfer of turbomachinery. New York: John Wiley & Sons, 1996. ISBN 0471855464.

Cebeci, T. [et al.]. Computational fluid dynamics for engineers: from panel to navier-stokes methods with computer programs. New York: Springer, 2005. ISBN 3540244514.

Thompson, P. A. Compressible-fluid dynamics. New York: McGraw-Hill, 1972. ISBN 0070644055.

Shapiro, A. H. The dynamics and thermodynamics of compressible fluid flow. New York: Ronald Press Company, 1954.

Others resources:

Audiovisual material

Apunts realitzats pel professorat de l'assignatura