Last update: 23-04-2019

220263 - Fluid Systems Design

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics
Academic year: 2019
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Optional)
ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: Josep M Bergadà

Others: Robert Castilla
Gustavo Raush

Prior skills

Previous knowledge of Fluid Mechanics, Physics, Mathematics and Thermodynamics is required.

Degree competences to which the subject contributes

Specific:

1. Ability to learn and understand the dynamic phenomena and its formulation for their application in the development of each of the stages of conception, design, calculation and simulation of fluid dynamic.
2. Ability to learn and understand advanced fluid dynamic processes, power transmission and advanced manufacturing for application in industrial facilities based on the product and production volume elements, machines and vehicles.
3. Ability to learn and understand design tools like CAD / CAM / CAE, CFD numerical simulation and dynamic simulation for design and advanced computing facilities and fluid dynamic systems.
4. Ability to know the laws, regulations and directives in force whenever assessing the environmental implications, energy, social and ethical professional activity.
5. Ability to learn and understand the dynamic phenomena and its formulation for application in the development of each of the stages of conception, design and mechanical calculations.
6. Ability to learn and understand numerical simulation tools for the design, calculation and fabrication of components, systems and mechanical installations.

Teaching methodology

Theory and problems classes
computer sessions
Lab sessions

Learning objectives of the subject

1.-Students will learn how to deal with fluid mechanics problems involving compressible flow, chock waves, Prandtl Meyer waves and expansion waves.
2.-Fluid Mechanics problems involving compressible flow will be solved via using CFD, Computational Fluid Mechanics.
2.- Flow analysis based on PIV Particle Image Velocimetry technology, will be evaluated.

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Study load

Total learning time: 125h	Hours large group:	30h	24.00%
	Hours small group:	15h	12.00%
	Self study:	80h	64.00%

Content

(ENG) Bloc 1 - Fluxe compressible	Learning time: 41h Theory classes: 10h Laboratory classes: 5h Self study : 26h
(ENG) Bloc 2 - Computational Fluid Dynamics	Learning time: 42h Theory classes: 10h Laboratory classes: 5h Self study : 27h
(ENG) Bloc 3 - Tècniques experimental en fluidodinàmica - Particle Image Velocimetry	Learning time: 42h Theory classes: 10h Laboratory classes: 5h Self study : 27h

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Planning of activities

(ENG) TEORÍA	Hours: 30h Theory classes: 30h
(ENG) CLASSES PROBLEMES	Hours: 15h Laboratory classes: 15h
(ENG) APLICACIÓ NUMÈRICA DE FLUXE COMPRESSIBLE I	Hours: 13h Self study: 13h
(ENG) APLICACIÓ NUMÈRICA DE FLUXE COMPRESSIBLE II	Hours: 13h Self study: 13h
(ENG) CFD I	Hours: 13h Self study: 13h
(ENG) CFD II	Hours: 14h Self study: 14h
(ENG) PIV I	Hours: 13h Self study: 13h
(ENG) PIV II	Hours: 14h Self study: 14h

Qualification system

The qualification will be obtained based on the different assignments which will need to be performed during the subject.

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Bibliography

Basic:

Zucrow, M.J.; Hoffman, J.D. Gas dynamics, vol. 1. New York: John Wiley & Sons, 1976.

Bergadà Graño, J.M. Mecànica de fluidos: breve introducción teórica con problemas resueltos [on line]. Barcelona: Iniciativa Digital Politècnica, 2012 [Consultation: 06/07/2017]. Available on: <http://hdl.handle.net/2099.3/36611>. ISBN 9788476539422.

Raffel, Markus [et al.]. Particle image velocimetry: a practical guide. 2nd ed. Berlin [etc.]: Springer, 2007. ISBN 9783540723073.

Adrian, R.J.; Westerweel, J. Particle image velocimetry. Cambridge: Cambridge University Press, 2011. ISBN 9780521440080.

Westerweel, J. "Fundamentals of digital particle image velocimetry". Measurement science and technology [on line]. Vol. 8, núm. 12 (1997), p. 1379-1392 [Consultation: 01/04/2014]. Available on: <http://iopscience.iop.org/0957-0233/8/12/002>.

Melling, A. "Tracer particles and seeding for particle image velocimetry". Measurement science and technology [on line]. Vol. 8, núm. 12 (1997), p. 1406-1416 [Consultation: 01/04/2014]. Available on: <http://iopscience.iop.org/0957-0233/8/12/005>.

Keane, R.D.; Adrian, R.J. "Theory of cross-correlation analysis of PIV images". Applied scientific research. Vol. 49, núm. 3 (1992), p. 191-215.

Versteeg, H.K.; Malalasekera, W. An introduction to computational fluid dynamics: the finite volume method. 2nd ed. London: Pearson Education, 2007. ISBN 9780131274983.

Wilcox, David C. Turbulence modelling for CFD. 2nd ed. La Canada, Calif.: DCW Industries, 1998. ISBN 0963605151.