Last update: 23-04-2019

220132 - Fluid Mechanics II

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

Teaching unit: 729 - MF - Department of Fluid Mechanics

Academic year: 2019

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

ECTS credits: 3 Teaching languages: English

Teaching staff

Coordinator: Josep M Bergadà I Granyó

Teaching methodology

The course is develops through lectures including theoretical sessions imparted with the aid of powerpoint presentations and more applicative and more visual sessions with videos, stellar catalogues and simulations

Learning objectives of the subject

The initial idea is to learn how to solve fluid mechanics problems which due to its complex mathematical resolution cannot be solved in a first stage fluid mechanics subject. The information gathered will also be applicable to similar problems in different subjects.

As in many universities a very important part of a second level of fluid mechanics is related to gasdynamics, this is exactly what would be lectured next in the present subject. Many applications of gas-dynamics are to be found in industry and aeronautics.

The last part of this small subject will introduce some applications of computer fluid dynamics, related to the previous sub chapters. It is very important for the students to realize that some problems can just be solved via using some specific techniques.

Study load

Total learning time: 75h	Hours large group:	30h	40.00%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	45h	60.00%

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Content

Module 1: Numerical integration of differential equations obtained in fluid mechanics problems

Learning time: 25h

Theory classes: 10h
Self study : 15h

Description:
1. The students will need to solve real fluid mechanics problems via finding out the differential equations related and solving them using software's like Mapple or Matlab.

Related activities:
Via working in teams the students will solve real problems which will need the use of medium level mathematics and software's available. Each group will need to solve 2 or three real problems. The use of software and basic programming will be needed.

Module 2: Gasdynamics

Learning time: 35h

Theory classes: 15h
Self study : 20h

Description:
2. The bases of gas-dynamics will be established and will be linked with the design of valves, pipes, aeroplanes, rockets etc. Normal and oblique shock waves will be part of the information to be gathered.

Related activities:
Via working in teams the students will solve real problems which will need the use of medium level mathematics and software's available. Each group will need to solve 2 or three real problems. The use of software and basic programming will be needed.

Module 3: Introduction to computer fluid dynamics

Learning time: 15h

Theory classes: 5h
Self study : 10h

Description:
3. As it will be clearly stated in the previous two sections. There are many problems in fluid mechanics in which the differential equations governing the physics related are too complex to be solved using medium level mathematics; it is therefore needed to use a different approach. So far, and mostly due to the shortage of time some examples of integrating the Reynolds equation of lubrication will be covered.

Related activities:
Via working in teams the students will solve one real problem. The use of basic programming will be needed.

Regulations for carrying out activities

Students, in teams, will need to complete some assessments and present them in class. The qualification will be linked to the quality of the work performed.

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Bibliography

Basic:

Bergadà Granyó, Josep M. Mecánica de fluidos: breve introducción teórica con problemas resueltos [on line]. Barcelona: Iniciativa Digital Politècnica, 2012 [Consultation: 30/06/2016]. Available on: <uhttp://hdl.handle.net/2099.3/36611>. ISBN 9788476539422.

Bergadà Granyó, Josep M; Kumar, Sushil. Fluid power, mathematical design of several components. Hauppauge, New York: Nova Science Publishers, Inc, 2014. ISBN 9781629483160.

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

Complementary:

Anderson, John David. Modern compressible flow: with historical perspective. 3rd ed. Boston [etc.]: McGraw-Hill, cop. 2003. ISBN 9780071241366.

Emanuel, George. Gasdynamics, theory and applications. New York, N.Y: American Institute of Aeronautics and Astronautics, cop. 1986. ISBN 0930403126.

Liepmann, H. W.; Roshko, A. Elements of gasdynamics. Mineola [NY]: Dover Publications, 2001. ISBN 0486419630.