Course guide
240762 - 240762 - Fluid Mechanics

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGIES AND ECONOMIC ANALYSIS (Syllabus 2018). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: Valentin Ruiz, David

Others: Escaler Puigoriol, Francesc Xavier
Jou Santacreu, Esteban

TEACHING METHODOLOGY

The classes are developed in their theoretical aspects and practical exercises (problems) jointly and by the same teacher. (The time indication that has been made in the program includes the discussion and resolution of the exercises). Students must attend the group in which they are enrolled.
The practices are done in the laboratories of the Department (experimental) and in the computer rooms of the school.

LEARNING OBJECTIVES OF THE SUBJECT

Provide students with basic knowledge and skills in the field of fluid dynamics. The student should be able to describe fluids at rest, in motion, and the effects of fluids on boundaries calculating the most significant magnitudes.

STUDY LOAD

Type	Hours	Percentage
Hours large group	50,0	33.33
Hours small group	10,0	6.67
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Theme 1.-Basics concepts.

Description:
Introduction. Definition of fluid. Fluiddynamics properties. Hydro-static forces on surfaces. Field of speeds and accelerations. Flow description Flow classification.

Full-or-part-time: 30h
Theory classes: 10h
Laboratory classes: 2h
Self study : 18h

Theme 2.- Basic Equations of Fluid Mechanics

Description:
Introduction. Continuity equation. Momentum equation, Navier-Stokes, Euler. Energy equation. Flow of Couette and of Poiseuille. Lubrication theory. Laminar flow in circular pipes. Turbulent flow

Full-or-part-time: 30h
Theory classes: 10h
Laboratory classes: 2h
Self study : 18h

Theme 3.- Dimensional Analysis and Similitude

Description:
Introduction. Buckingham Pi theorem. Similitude and model development. Correlation of experimental data.

Full-or-part-time: 30h
Theory classes: 10h
Practical classes: 2h
Self study : 18h

Theme 4.- Integral Analysis

Description:
Introduction. Control volume. Reynolds Transport Theorem. Continuity equation. Momentum equation. Energy equation. Bernouilli Equation. Energy and piezometric lines.

Full-or-part-time: 30h
Theory classes: 10h
Laboratory classes: 2h
Self study : 18h

Theme 5.- Boundary layer.

Description:
Introduction. Structure, transition and separation of the boundary layer. Equations of the dynamic boundary layer on a flat plate. Equations of the thermal boundary layer on a flat plate.

Full-or-part-time: 30h
Theory classes: 10h
Laboratory classes: 2h
Self study : 18h

GRADING SYSTEM

The final grade will be the maximum of NF1, NF2, NF3 or NF4:
NF1 = 0.2A + 0.3B + 0.5C
NF2 = 0.2A + 0.8C
NF3 = 0.2A + 0.25B + 0.45C + 0.1AVC
NF4 = 0.2A + 0.7C + 0.1AVC
where: A: Note of laboratory sessions
B: Midterm exam
C: Final exam
AVC: Continuous assessment mark
The Continuous Assessment mark is one point of the final mark and will be assessed with various tests during class hours. In this way, participation and class attendance will be rewarded.
Reassessment: The grade for this test is directly the grade for the subject and replaces the previous grade if it is higher. The midterm exam does not remove subject matter.

EXAMINATION RULES.

For the resolution of the exams, the consultation of books or notes will not be allowed. However, it will be allowed to have the department form equations that will be posted on the digital campus. Non-official equation forms will be removed during the exam.
Continuous assessment consists of completing different questionnaires during class time.
Laboratory marks: Attendance at each of the first four practical sessions will represent half a point per session. The remaining 80% will be the mark obtained in the presentation of the practice nº5. Laboratory labs are automatically validated.

BIBLIOGRAPHY

Basic:
- White, F.M. Mecánica de fluidos [on line]. 6a ed. Madrid: McGraw-Hill, cop. 2008 [Consultation: 18/10/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4144. ISBN 9788448166038.

Complementary:
- Gerhart, Philip M; Gross, Richard J; Hochstein, John I. Fundamentos de mecánica de fluidos. 2a ed. Argentina [etc.]: Addison-Wesley Iberoamericana, cop. 1995. ISBN 0201601052.
- Virto Albert, Luis. Mecánica de fluidos : problemas resueltos. 2a ed. Barcelona: Edicions UPC, 1994. ISBN 8476534256.
- Streeter, Victor L; Wylie, E. Benjamin; Bedford, Keith W; Saldarriaga, Juan G. Mecánica de fluidos. 9a ed. México [etc.]: McGraw-Hill, cop. 2000. ISBN 9586009874.

RESOURCES

Audiovisual material:
- Guia de pràctiques. Available at Atenea
- Transparències de classe. Available at Atenea
- Col·lecció de test d'exàmens resolts. Available at Atenea