Course guide
240061 - 240061 - Fluid Mechanics

Last modified: 09/06/2023

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

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: ESTEBAN JOU SANTACREU

Others: ENRIQUE TRILLAS GAY - FRANCESC XAVIER ESCALER PUIGORIOL - ALEX PRESAS BATLLÓ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of basic principles of mechanical fluids and their application to solve engineering problems. Calculation of pipes, channels and systems of fluids.

Transversal:
2. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

TEACHING METHODOLOGY

In the subject's sessions theory and problems are combined . Theoretical concepts are developed in classes and these are complemented with laboratory sessions.

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: 23h
Theory classes: 6h
Laboratory classes: 2h
Self study : 15h

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: 27h
Theory classes: 8h
Practical classes: 2h
Laboratory classes: 2h
Self study : 15h

Theme 3.- Dimensional Analysis and Similitude

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

Full-or-part-time: 23h
Theory classes: 6h
Practical classes: 2h
Self study : 15h

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: 27h
Theory classes: 8h
Practical classes: 2h
Laboratory classes: 2h
Self study : 15h

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: 27h
Theory classes: 8h
Practical classes: 2h
Laboratory classes: 2h
Self study : 15h

Tema 6.- Fluid transport

Description:
Introduction.
Gravity transport: channels. Classification. Uniform current.
Transport with pumping systems. Pumps classification. Operating point.

Full-or-part-time: 23h
Theory classes: 4h
Practical classes: 2h
Laboratory classes: 2h
Self study : 15h

GRADING SYSTEM

The qualification method will be the highest of:
NF1 = 0.2A + 0.3B + 0.5C o NF2=0,2A+0,3B+0.45C+0.5AVC o NF3 = 0.2A + 0.8C
where:
A: Mark of laboratory sessions.
B: Mark of the partial exam.
C: Mark of the final exam.
AVC: Mark of the continuous avaluation=Nº tests performed/total tests

Reassessment: The mark of this test is directly subject mark and replace the previous mark.

EXAMINATION RULES.

Final Exam. The test consists of two problems and six theoretical questions.
Midterm Exam. The test consists of one problems and three theoretical questions.
Reassessment: The test consists of two problems and six theoretical questions.
Continuous assessment consists of completing short questionnaires (less than half an hour) during the classes before finishing each topic. About 12 tests are planned.

For the resolution of the test will not be allowed to consult books or notes. However, it will take the form of the department that will be posted on the digital campus and non programmable calculator. Forms that do not comply with the rules will be removed during the test.

Assessment practices: Attendance at each of first four practices and delivering a brief preliminary report represents half a point. The remaining 80% will be the mark obtained in the presentation of practice nº 5.
Practice mark are validated automatically.

BIBLIOGRAPHY

Basic:
- White, F.M. Mecanica 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. Fundamentos de mecánica de fluidos. 2a. Argentina: Addison-Wesley Iberoamericana, 1995. ISBN 0201601052.
- Streeter, Victor L. Mecánica de fluidos. 9a. México: McGraw-Hill, 2000. ISBN 9586009874.
- Virto Albert, Luis. Mecánica de fluidos : problemas resueltos. 2a. Barcelona: Edicions UPC, 1994. ISBN 8476534256.

RESOURCES

Audiovisual material:
- Transparències de classe
- Col·lecció de problemes d'examen resolts
- Col·lecció de test d'examen resolts
- Guions de pràctiques