29716 - Fluid Mechanics

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	434 - Bachelor's Degree in Mechanical Engineering 330 - Complementos de formación Máster/Doctorado
ECTS	6.0
Course	---
Period	Indeterminate
Subject Type	ENG/Complementos de Formación, Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

5.2.Learning activities

5.3.Program

1: Introduction

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Definition of fluid; continuum hypothesis. Physical properties of fluids. Forces of surface and volume. The stress tensor . Study techniques of fluid flow. Classification of fluid flow.

2: Kinematics

Eulerian and Lagrangian descriptions. Substantial derivative. Characteristics lines in a flow. The velocity gradient tensor.

3: Fluidostatics

Fundamental equation of fluidostatics. Pressure and its measurement. Forces and torques on submerged surfaces.

4: Fundamental Equations of Fluid Mechanics

Fluid volume and volume control. Reynolds Transport Theorems. Continuity equation. Momentum equation. Equation of angular momentum. Bernoulli equation. Equations of energy. Turbulence

5: Dimensional analysis and similarity

Principle of dimensional homogeneity. Vaschy theorem Pi-Buckingham. Important dimensionless numbers in fluid mechanics. Adimensionalization of the fundamental equations. Similitude and modelling.

6: Unidirectional viscous flow

Introduction and equations. Couette flow. Hagen-Poiseuille flow. Hagen-Poiseuille axisymmetric flow. Couette rotating flow

7: Viscous flow in Ducts

Friction Head-losses. Darcy-Weisbach equation. Darcy friction factor in laminar and turbulent regimes. Minor Head-losses. Three types of Pipe-flow problems.

8: Open channel flow

Introduction. The One-Dimensional approximation. Uniform Flow; the Chezy formula. Specific Energy. Froude Number and Critical Depth. The Hydraulic Jump. Flow Measurement and Control by Weirs.

9: Boundary layer. Drag and Lift Forces

Boundary Layer equations. Parameters of the viscous boundary layer. Flat plate laminar flow: solution of Blasius. Von Karman integral equation. Turbulent boundary layer. Detachment of the boundary layer. Drag and Lift Forces

5.4.Planning and scheduling

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5.5.Bibliography and recomended resources