AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Insegnamento FLUID DYNAMICS (MOD. 1) C.I.

GenCod A005143

Docente titolare Giulio AVANZINI

Docente responsabile dell'erogazione
MICHELE SCARAGGI

Insegnamento FLUID DYNAMICS (MOD. 1) C.I.

Insegnamento in inglese FLUID DYNAMICS (MOD. 1)C.I.

Settore disciplinare ING-IND/06

Corso di studi di riferimento
AEROSPACE ENGINEERING

Tipo corso di studi Laurea Magistrale

Crediti 6.0

Ripartizione oraria Ore Attività frontale: 54.0

Per immatricolati nel 2021/2022

Erogato nel 2021/2022

Anno di corso 1

Lingua

Percorso CURRICULUM AEROSPACE TECHNOLOGY

Sede Brindisi

Periodo Primo Semestre

Tipo esame Orale

Valutazione

Orario dell'insegnamento
https://easyroom.unisalento.it/Orario

BREVE DESCRIZIONE DEL CORSO	The course provides the fundamental understanding of the motion of a fluid. The conservation equations that describe the dynamics of a fluid are analyzed in the case of inviscid and viscous flows. During this process, a description of the main fluid properties is provided as well as the continuum assumption and the definition of Eulerian and Lagrangian frames of reference. The derived equations are used in order to describe the motion of fluid in canonical configurations such as the Poiseuille flow (flow between flat plates), the Couette flow (flow between flat plates in relative motion), and the Hagen-Poiseuille flow (flow inside a pipe). The forces exchanged between the fluid and an immersed body are analyzed by means of the potential flow theory and boundary layer theory. During this course, the Buckingham π theorem will be applied to canonical flows in order to derive a dimensionless description of the dynamics of the fluid. An outline about the main phenomena involving turbulence will also be provided.

PREREQUISITI	Knowledge of calculus (derivatives and integrals), algebra (basic vector and tensor operations), dynamics of a rigid body and thermodynamics

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OBIETTIVI FORMATIVI	Targeted fluid dynamics fundamentals: • main properties of a fluid, continuum vs particle description; • the basic equations that describe the static, kinematics and dynamics of a fluid; • the principal physical phenomena involved in the motion of a fluid; • the main interactions between a fluid and an immersed body.

METODI DIDATTICI	Every topic will be discussed and all the models derived on the blackboard.

MODALITA' D'ESAME	3h written exam

PROGRAMMA ESTESO	Hours Topic
	0.5 Introduction, content overview
	3.5 General overview on fluids: properties and relevant lenght/time scales
	5 Statics of fluids
	3 Kinematics of fluids
	8 Dynamics of fluids and conservation
	4 Bernoulli model
	3 Dynamics of vorticity
	4 Exact solutions of Navier-Stokes equation
	5 Potential flows
	4 Boudary layer
	4 Turbulence
	6 Dimensional analysis and Buckingham theorem
	4 Overview of numerical approaches. Overview of FEniCS

TESTI DI RIFERIMENTO	Any fluid dynamics textbook, such as Irving H. Shames, Mechanics of Fluids; Tannehill, Computational fluid mechanics and heat transfer; Introduction to FEniCS.