AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

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

GenCod A005143

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

Anno di corso 1

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

Lingua INGLESE

Settore disciplinare ING-IND/06

Percorso DESIGN

Corso di studi di riferimento AEROSPACE ENGINEERING

Docente MICHELE SCARAGGI

Tipo corso di studi Laurea Magistrale

Sede Brindisi

Crediti 6.0

Periodo Primo Semestre

Ripartizione oraria Ore Attività frontale: 54.0

Tipo esame Orale

Per immatricolati nel 2019/2020

Valutazione

Erogato nel 2019/2020

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 \pi 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

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

APPELLI D'ESAME

ALTRE INFORMAZIONI UTILI

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.