ME-344

Incompressible fluid mechanics

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Cursus	Sem.	Type
Mechanical engineering	BA5	Obl.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	3 weekly
Exercises	1 weekly
Number of positions	

Summary

Basic lecture in incompressible fluid mechanics

Content

Characteristic quantities of an incompressible flow, hydrostatic, viscous stress, dimensional analysis, Navier-Stoke equations, conservation of mass and momentum in integral and differential form, trajectories and streamlines, Bernoulli's equation, lift and drag of a solid body, theory of reduced scale models, inviscid flows, potential flows, unsteady flows, added mass, vorticity dynamics, introduction to boundary layer concept and of turbulence.

Keywords

Incompressible flows, Navier-Stokes equation, lift, drag

Learning Prerequisites

Recommended courses

- Mechanics of continuous media
- Fluid flow

Learning Outcomes

By the end of the course, the student must be able to:

- Explain and apply the concepts of mass, energy, and momentum balance, E1
- Define , describe and apply the basic flow equations, such as the Navier-Stokes equations, AH14
- Describe simplified governing equations, such as the Bernoulli or potential equations, their domain of validity and apply them in appropriate situations, AH15
- Describe flow in simple geometries, such as over a flat plate, in a tube, or around a sphere or airfoil, AH9
- Link flow behaviour with non-dimensional parameters (e.g. Reynolds and Mach numbers), AH2
- Identify similarity laws and their use for dimensioning an experimental testbed, AH23
- Work out / Determine analytically or numerically the potential flow around an airfoil, AH19
- Describe the physical differences between laminar and turbulent flows, AH4

Transversal skills

- Use a work methodology appropriate to the task.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.

Teaching methods

Lectures and sessions of exercises

Assessment methods

Written exam

Resources

Bibliography

Gerhart, Gerhart & Hochstein, Munson's Fluid Mechanics, Global Edition, 8th Edition
or previous versions including
Munson, Okiishi, Juebsch & Rothmayer, Fluid Mechanics, 7th Edition, SI Version

Ressources en bibliothèque

- Fluid Mechanics / Munson
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