Syllabus for

Academic year 2011/2012 >

MTF246 - Fluid mechanics

Syllabus adopted 2011-02-22 by Head of Programme (or corresponding)
Owner: TKDES
6,0 Credits
Grading: TH - Five, Four, Three, Not passed
Education cycle: First-cycle
Major subject: Mechanical Engineering
Department: 42 - APPLIED MECHANICS

Teaching language: Swedish

Credit distribution

Course module				Sp1	Sp2	Sp3	Sp4	Summer course	No Sp	Examination dates		
0107	Examination	4,5 c	Grading: TH				4,5 c			Tue 22/05-2012 am M,	Tue 10/01-2012 am M,	Fri 31/08-2012 am M
0207	Project	1,5 c	Grading: UG				1,5 c					

In programs
TKDES INDUSTRIAL DESIGN ENGINEERING, Year 2 (compulsory)

Examiner:
Docent Niklas Andersson

Replaces
MTF245 Fluid mechanics

Go to course homepage

Eligibility:
For single subject courses within Chalmers programmes the same eligibility requirements apply, as to the programme(s) that the course is part of.

Course specific prerequisites
Calculus in several variables

Aim
The aim of the course is to provide knowledge about how the governing equations of fluid mechanics can be used to understand, explain and influence a range of fluid mechanics problems related to industrial design engineering. Further on, the course will contribute to the articulation of the student's problem solving process.

Learning outcomes *(after completion of the course the student should be able to)*
* apply and explain the concepts of lift and drag and relate these to a number of elementary cases
* understand the origin of dimensionless numbers and explain how these influence the fluid mechanics of applications for which they have relevance
* derive and explain the origin of the fundamental equations of fluid mechanics, which govern a range of flow scenarios relevant for industrial design engineering
* understand and be able to formulate conservation laws for fluid flow cases that allow one dimensional approximations
* be able to characterize the properties of fluids in technical terms
* be able to derive and explain the relations that apply to important problems in hydrostatics
* understand fundamentals of fluid dynamics as related to vehicle aerodynamics
* explain the design parameters that are important for the performance of road vehicles and trains in respect to their aerodynamics
* apply knowledge about vehicle aerodynamics to improve a new vehicle design with respect to drag, comfort and safety.

Content
The course starts by characterizing a fluid and a number of related properties. Subsequently, several fundamental

concepts are introduced, such as pressure, streamlines, the Reynolds number, turbulent and laminar flow. As a next step, the fundamental conservation laws of fluid mechanics such as conservation of mass, momentum and energy are introduced both in simpler and more general fluid flow scenarios. A shorter treatment of dimensionless numbers and different measurement techniques are also given.

These theoretical underpinnings allow the introduction of fundamental concepts for aerodynamic design, such as lift and drag. These concepts are further manifested through a lab in which forces and pressure distributions on simple geometries are studied.

After this fundamental theory has been covered, the understanding of fluid flow around vehicles is studied more in depth, most notably by a completion of a design project. A key issue of this project will be to study changes in external design of the vehicle, and relate these to how the driving experience of the vehicle is influenced.

Organisation

18 hours of lectures and 12 hours of tutorials together with the lab (4 hours) constitute the fundamental theory of the course. Additionally, 6 hours of lectures and 4 hours of tutored aerodynamic vehicle design give the necessary knowledge for carrying out the design project.

Literature

Engineering Fluid Mechanics, C. T. Crowe, D. F. Elger, J. A. Roberson, R. F., ISBN 978-0-470-10886-4

Examination

Written exam covering the fundamental fluid mechanics theory, completion of the lab and of the design project.