Course syllabus

Strömningslära
Fluid Mechanics

VVRF10, 7,5 credits, G2 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED W
Date of Decision: 2023-03-27

General Information

Main field: Technology.
Compulsory for: W3
Language of instruction: The course will be given in English

Aim

The objective of the course is to give a thorough knowledge in fluid mechanics with application for problems within hydraulics and water supply using earlier knowledge in calculus, mechanics, physics, and hydrology.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- explain and use concepts like pressure and pressure forces, shear stress, density, viscosity, surface tension, laminar/turbulent flow, pressure head, velocity head, energy head, friction head losses, local head losses, drag force, pressure drag, uniform/non uniform flow, steady/unsteady flow, control volume, no-slip condition, pump curve.
- describe pressure and energy conditions in pipes using hydraulic grade lines and energy lines
- describe the flow in channels and rivers in terms of sub- and supercritical flow and presence of critical sections.
- describe methods to measure pressure, flow rates, and velocities

Competences and skills
For a passing grade the student must

- structure and solve static problems in fluid mechanics based on the pressure-density-height relationship
- structure and solve dynamic problems in fluid mechanics using the continuity equation, energy equation, momentum equation, Darcy-Weisbach's formula, and Manning's formula
- design dams, pipes, and channels
- analyze the flow in rivers and channels
- use terms within fluid mechanics both in speech and writing

Judgement and approach
For a passing grade the student must

- be able to critically evaluate problem solutions within fluid mechanics
- be able to qualitatively evaluate uncertainties and risks within sustainable use of fluid mechanics principles

Contents

Physical properties of fluids, especially water. Hydrostatics including pressure distribution in fluids, forces on plane and curved submerged surfaces, centre of pressure. Basic concepts in fluid mechanics, laminar and turbulent flow. The fundamental equations: the continuity equation, the energy equation, and the momentum equation. Flow around immersed bodies. Applications: pipe flow, pump systems, rivers and channels. Fluid measurement: pressure, velocity, and flow rate.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written examination. Extra examinations can be oral examination if the number of participating students are fewer than five.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: FMAA05, FMA430 FHL055, FAFA20, VVR111/VVRA01.
The number of participants is limited to: No
The course overlaps following course/s: VVR120, VVR145, VVR150

Reading list

- Hamill L., Understanding Hydraulics, 3rd ed., Palgrave, 2011 (main textbook).
- Malm J. and Larsson R., Examples for homework in fluid mechanics for environmental engineering students, Revised and improved version 2013.
- Berndtsson, R., Handouts in fluid mechanics for environmental engineering students. Revised version 2016.

Contact and other information

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