



DD2365 Advanced Computation in Fluid Mechanics 7.5 credits

Avancerade beräkningsmetoder i flödesmekanik

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

The official course syllabus is valid from spring semester 2027 as decided by the Director of First and Second Cycle Education. Decision date: 2026-10-21.

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

Specific prerequisites

- Knowledge and skills in programming corresponding to completed course DD1337/DD1310-DD1319/DD1321/DD1331/DD1333/DD100N/DD100V/ID1018/ID1022.
- Knowledge in one-variable analysis, 7.5 credits, corresponding to completed course SF1625/SF1673/SF1685.

- Knowledge in multivariable calculus, 7,5 hp, corresponding to completed course SF1626/SF1674/SF1686.
- Knowledge in linear algebra, 7.5 credits, corresponding to completed course SF1624/SF1672/SF1684.
- Knowledge in probability theory and statistics, 6 hp, corresponding to completed course SF1910-SF1925/SF1935 or completed exam element TEN1 in SF1910/SF1925/SF1935.

Intended learning outcomes

After passing the course, the student should be able to

- apply concepts and methods, as well as solve computational problems, within computational fluid dynamics, with a focus on the areas of viscous flow, unsteady flow, adaptive mesh refinement, and fluid-structure interaction
- plan, carry out, and present, both orally and in writing, a project related to a research problem or an engineering problem

in order to get theoretical and practical skills in computational fluid dynamics, and applying these skills to real-world fluid mechanics problems.

Course contents

Navier-Stoke's equations, Euler's equations, existence of exact solution, weak solution, finite element methods, energy estimates, perturbation growth, stability, duality, a posteriori error estimate and adaptivity.

Boundary conditions, separation, generation of drag and lift.

Examination

- PRO1 - Project, 4.0 credits, grading scale: P, F
- TEN1 - Examination, 3.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

TEN1 consists of a project report that is also presented orally.

Other requirements for final grade

Compulsory attendance in seminars including preparation of literature review.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.