SG2212 Computational Fluid Dynamics 7.5 credits

Strömningsmekaniska beräkningar

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

Establishment

Course syllabus for SG2212 valid from Autumn 2007

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

A course in computer science or programming (e.g. DD1342);
2. Background in either fluid dynamics or numerical methods, corresponding to one of the second level courses in numerical methods DN2220-DN2225, DN2250-DN2260, DN2266 or a course in fluid dynamics e.g. SG2214 or equivalent.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After reading this course the student should be:

- familiar with the differential equations for flow phenomena and numerical methods for their solution
- able to use and develop flow simulation software for the most important classes of flows in engineering and science.
- able to critically analyse different mathematical models and computational methods for flow simulations
- able undertake flow computations using current best practice for model and method selection, and assessment of the quality of results obtained.

Course contents

Short introduction with review of other numerical methods or the basic equations of fluid dynamics (the class will be divided in two groups). Conservation laws: the Navier-Stokes equations. Different levels of approximation, the Euler and Reynolds Averaged equations. Turbulence models. Basics of finite approximations for partial differential equations. Mathematical properties of hyperbolic systems. Numerical treatment of shocks. Finite volume and finite element methods. Boundary conditions. High-resolution methods. Grid generation. Practical algorithms for compressible and incompressible flow. Computer exercises with methods for the Euler equations in 1D and different approximations for 2D compressible and incompressible flows.

Course literature

To be announced at course start. In 05/06: Tannehill, John C, Computational Fluid Mechanics and Heat Transfer, Taylor & Francis, was used.

Examination

- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 4.5 credits, grading scale: P, 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.

Other requirements for final grade

One written examination (TEN1; 3 university credits). Homework and computer assignments (LAB1; 4,5 university credits).

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.