HÖGSKOLAN I GÄVLE

Applied Computational Fluid Dynamics 7.5cr

Tillämpad numerisk flödesmekanik 7,5hp

Set by Faculty of Engineering and Sustainable Development

Version	**Set at**	**Valid from**
	3/16/15	HT2015
	5/29/18	**HT2018**

Level	A1F
Education level	Second cycle
Course identifier	ETA324
Credits	7.5cr
Main field of study	Energy Systems
Subject group	Energy Technology
Disciplinary domain	Technology 100.0%

Learning outcomes

After completion of the course the student shall be able to
Knowledge and understanding
1. explain some of the important and basic terms of CFD (Computational Fluid Dynamics)
2. describe different methods for numerical solution of fluid flow problems and their applicability for different types of flow
3. describe the process from a mathematical description to numerical solution of a fluid mechanical problem, and under which conditions the system is soluble
4. describe the sources of errors in the process from mathematical description to numerical solution of a fluid mechanical problem and how these errors affect the solution

Skills and abilities
5. analyse a fluid flow case and suggest a strategy for the solution of it with respect to governing equations, possible simplifications and choice of appropriate numerical method
6. assess the suitability and applicability for various boundary conditions
7. design and dimension computational grids
8. identify and quantify sources of error and consider the quality and reliability of the calculation results

9. independently identify and formulate projects and plan and use appropriate methods to implement the same within a given timeframe
10. orally and in writing present their projects and discuss their conclusions and the knowledge and arguments that form the basis for these

Judgement and attitudes
11. show awareness of ethical aspects of research and development.

Course content

The course contains methods for numerical solution of incompressible fluid mechanical problems. The most common numerical solution methods for these types of systems of partial differential equations are treated. The course also discusses different types of turbulence models and how these affect the accuracy of the solution. Different types of computational grids and how these affect the accuracy are also treated. A review of the various steps to implement a CFD analysis. Implementation of two major projects (complete CFD analysis). Analyse and evaluate calculation results.

Teaching

Lectures, seminars, project work and laboratory work

Prerequisites

Introduction to Fluid Mechanics 7.5 cr, Introduction to Thermo Dynamics 7.5 cr, Heat Transfer 7.5 cr, or equivalent.

Examination

Written Examination, Project 1 and Project 2
0010 Written examination examines Learning outcomes 1-6, grades A-F.
0020 Project 1 examines Learning outcomes 1-6, grades A-F.
0030 Project 2 examines Learning outcomes 1-6, grades A-F.

Grade

A, B, C, D, E, Fx, F

Other regulations

The final course grade is based on a combination of the grades in the different parts of the examination. Grading criteria announced by the examiner or course coordinator at the start of the course.

Sustainable environment

A minor part of the course content deals with sustainable development.

Module

0010	Written examination	2.5cr	Grade: AF
0020	Project 1	2.5cr	Grade: AF
0030	Project 2	2.5cr	Grade: AF
0040	Laboration	1cr	Grade: UG