SG2221 Wave Motions and Hydrodynamic Stability 7.5 credits

Vågrörelser och hydrodynamisk stabilitet

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

Establishment

Course syllabus for SG2221 valid from Autumn 2007

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

To follow the course students (including master students) are required to have taken a course in fluid mechanics.
Compulsory courses of the main programmes at F or T. For F-students SG2223, for T-students SG1217 and for M- and P-students SG1220 are recommended. For M- and P-students 5B1304 is compulsory.

Language of instruction

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

Intended learning outcomes

After completing this course the student should manage to:

- describe the behaviour of surface gravity waves
- explain the concept of group velocity of a wave
- describe the main features of internal waves in continuously stratified fluids, such as in oceans and in the atmosphere
- discuss the non-linear behaviour of water waves
- identify the mechanisms behind instabilities in flows governed by thermal convection and heat exchange
- discuss effects of centrifugal and Coriolis forces in unstable rotating systems
- describe the instability nature and mechanisms in shear flows, i.e. wake, jet, boundary layer and channel flows
- discuss the influence of viscosity on stability
- explain why classic asymptotic stability analysis provides only a partial description of disturbance amplification in shear flows

Course contents

The student will acquire knowledge in fundamental concepts and phenomena in wave motions in fluids and in hydrodynamic instabilities. It will help you to understand the theory underlying some commonly observed flow phenomena, such as

- why the surface waves behind a boat have a limited spreading angle
- why the wake of a cylinder beats at a fixed frequency independently of the external disturbances
- why Tsunamis arise and how they behave when approaching the shore
- why the so spectacular Billow clouds in the atmosphere are formed

Course literature

- Acheson D. J., Elementary Fluid Dynamics, Oxford University Press, USA, 1990 (ISBN 0198596790) / Kundu P. K. and Cohen I M., Fluid Mechanics, Elsevier Academic Press, USA, 2004 (ISBN 0121782530)
- Your own lecture notes and other distributed course material

Examination

- INL1 - Calculation, 1.5 credits, grading scale: P, F

- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Experiment, 1.5 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

Combined oral and written examination (TEN1; 4,5 university credits)
Theoretical home assignment (INL1; 1,5 university credits)
Experimental wind tunnel lab (LAB1; 1,5 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.