



FSG3122 Vågrörelser och hydrodynamisk stabilitet 7,5 hp

Wave Motions and Hydrodynamic Stability

Fastställande

Kursplan för FSG3122 gäller från och med HT10

Betygsskala

G

Utbildningsnivå

Forskarnivå

Särskild behörighet

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

The student will acquire knowledge in fundamental concepts and phenomena in wave motions in fluids and 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

Kursinnehåll

After completing this course the student should be able 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 the oceans and in the atmosphere
- 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

Kursupplägg

The teaching is delivered by means of a mixture between traditional classroom teaching and seminar-based lectures where open discussions will be promoted by student-active-elements such as gobbets. Furthermore, table experiments will be shown during classes in order to demonstrate and clarify parts of the surveyed theory. In order to activate the students to develop practical skills one experimental and one numerical assignment are given in this course. Each lecture will begin with a few minutes review and discussion of last lecture's content. The total amount of lecture hours is 42h, which are delivered over 21 gatherings (i.e. 2h per lecture).

Kurslitteratur

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

Examination

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enskilda studenter.

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

The examination is composed of an alternating oral and written test. The test is usually performed in groups of two students and will last for about 45 minutes, including the presentation of the numerical assignment. A list of about 50 questions will be available from the course home page from where questions will be taken and asked at the individual test.

Övriga krav för slutbetyg

The following three items have to be approved in order to obtain a pass of the course (7.5c):

- One laboration with adherent preparation tasks and lab report (for graduate students the lab report has to be an extended version) **Experimental analysis of Tollmien-Schlichting waves over a flat plate**(1.5c)
- One home assignment with report (for graduate students some Matlab programming is required and the presentation at the oral exam has to be an extended version) **Numerical computation of flow instability for different configurations** (1.5c)
- Oral/written examination (4.5c)

All items are graded. For graduate students the highest grade is required to obtain a pass.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.