



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Termodynamik med strömningslära

Thermodynamics and Fluid Mechanics, Basic Course

MMVA01, 5 credits, G1 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED M

Date of Decision: 2023-04-11

General Information

Compulsory for: BI2

Elective for: I4

Language of instruction: The course will be given in Swedish

Aim

The purpose of the course is that the student should achieve basic knowledge and skills in technical (engineering) thermodynamics and fluid mechanics.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to define and/or clarify in short certain basic concepts, principles and phenomena in thermodynamics and fluid mechanics
- be able to describe shortly and generally formulate the basic relations considering properties of pure substances, mass and energy conservation, entropy generation and momentum balance, with a basic understanding of their limitations and applicability
- be able to account for and derive certain technical important relations, from basic relations, within the scope of the subject
- be able to shortly describe, clarify and analyse certain thermodynamic processes of technical importance

Competences and skills

For a passing grade the student must

- be able to demonstrate a good engineering handling practice of property tables and diagrams and to be able to solve, in a systematic manner, basic energy- and fluid-related problems
- be able to apply control volume analysis to the balances of mass, energy and linear momentum, for steady-flow conditions with homogeneous in- and outlets
- be able to accomplish a basic fluid mechanical analysis of single pipe systems at stationary incompressible flow conditions
- be able to produce communication on problem-solving, in written, that is well-structured and illustrative, with clear specification of sources, attention to limitations and accuracy, and which demonstrate understanding of the subject

Contents

Basic concepts of thermodynamics such as temperature, heat, work, energy, entropy, and the basic laws of thermodynamics (primarily the first and second), including applications; properties of pure substances; thermodynamic properties; property diagrams; basic thermodynamic relations. Basic concepts of fluid mechanics; the continuity equation; the Navier-Stokes equations; the extended Bernoulli equation (the energy equation); the linear momentum equation; dimensional analysis and similarity laws; flow around bodies; laminar och turbulent pipe flow.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: The examination consists of compulsory exercises, a theory test (60 min; thermodynamics, no means of assistance) and a written final test (5 hours), which contains a theory part (fluid mechanics, no means of assistance) and a problem-solving part (with aids of assistance, e.g. formula and table collections, lecture notes without solved examples). Optional home exercises may provide extra bonus points to add to the final written test result. The final grade is determined, from a total sum of points from the theory test and the final written examination, both approved and using a special formula.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: FMAA05 Calculus in One Variable; FAFA30 Physics: Electricity - Fluids; VSMA15 Mechanics, Basic Course.

The number of participants is limited to: No

Reading list

- Çengel, Y. A., Turner, R. H., Cimbala, J. M.: Fundamentals of Thermal-Fluid Sciences, Fifth Edition in SI Units. McGraw-Hill, 2016.
- Norberg, C., Thern, M.: Grundläggande strömningslära. Energivetenskaper, LTH, 2018. Printed by KFS AB; also available on course homepage (password).

Contact and other information

Examinator: Prof. Christoffer Norberg, christoffer.norberg@energy.lth.se

Course coordinator: Lei Wang, lei.wang@energy.lth.se

Course homepage: <https://www.energy.lth.se/english/education/>

Further information: Tutorials, 20 hours, group-wise.