



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Transportprocesser

Transport Phenomena, Basic Course

KETF01, 9 credits, G2 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED B/K

Date of Decision: 2023-04-18

General Information

Main field: Technology.

Compulsory for: B2, K2

Language of instruction: The course will be given in Swedish

Aim

The aim is to transfer the understanding of molecular processes based on a natural science perspective into an understanding of macroscopic processes. Applications are collected from the fields of chemical engineering, biotechnology and from ecological systems.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to explain the concepts of force and pressure in hydrostatic systems based on basic physics
- be able to define the concepts of momentum, heat and mass transfer
- be able to explain how transport of momentum, heat and mass can occur
- be able to identify the rate-determining step and to identify the driving force for the process.

Competences and skills

For a passing grade the student must

- be able to apply momentum transfer knowledge on applications within fluid dynamics by solving problems theoretically and practically
- be able to apply heat transfer knowledge on applications within heat engineering by

- solving problems theoretically and practically
- be able to apply mass transfer knowledge by solving problems theoretically
- be able to apply mass and heat transfer simultaneously on the air-water system by solving problems theoretically
- be able to use advanced calculation programs to solve problems within momentum, heat and mass transfer.

Contents

The course present fundamental momentum-, heat-, and mass transfer and applications from chemical and biotechnical systems.

The following fields are covered:

- Momentum transfer: basic fluid mechanics, rheology, pipe and pump systems, flow in boundary layers, flow around submerged bodies, sedimentation
- Heat transfer: basic heat engineering, heat exchangers, radiation, instationary heat transfer
- Mass transfer: basic mass transfer calculations, diffusion of gases and liquids, instationary mass transfer, analogies, mixing, mass exchangers, scrubbers
- Simultaneous mass and heat transfer: Mollier diagram, wet temperature, air conditioning, cooling tower.

In order to study systems of unit operations project exercises are included in the course. By solving a number of practical problems the skill to solve engineering problems is trained at the same time as the basic theories are demonstrated.

Examination details

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

Assessment: Project assignments, laboratory assignments and written examination. The grade is based on the written examination.

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.

Parts

Code: 0116. **Name:** Transport Phenomena.

Credits: 5,5. **Grading scale:** TH. **Assessment:** Written examination. **Contents:** Momentum transfer: basic fluid mechanics, rheology, Navier-Stoke equations, flow in boundary layers, flow around submerged bodies, sedimentation. Heat transfer: basic heat engineering, coefficients for heat transfer, heat exchangers, radiation, instationary heat transfer. Mass transfer: basic mass transfer calculations, diffusion of gases and liquids, instationary mass transfer, analogies, mixing, mass exchangers. System Air/Water

Code: 0216. **Name:** Laboratory Work in Transport Phenomena.

Credits: 2. **Grading scale:** UG. **Assessment:** Active participation in laboratory assignments. **Contents:** Practical problem-solving at the laboratory applied on momentum, heat and mass transfer.

Code: 0316. **Name:** Project Exercises in Transport Phenomena.

Credits: 1,5. **Grading scale:** UG. **Assessment:** Active participation in project assignments. **Contents:** The course includes project exercises from fluid mechanics, heat and mass transfer.

Admission

Assumed prior knowledge: KFKA05 Molecular Driving Forces 1: Thermodynamics.

The number of participants is limited to: No
The course overlaps following course/s: KAT090

Reading list

- Transportprocesser , Föreläsningar. Kemiteknik, LTH, 2022.
- Transportprocesser, Exempelsamling. Kemiteknik, LTH, 2022.
- Department of Chemical Engineering: Handbook. 2021.

Contact and other information

Course coordinator: Professor Bernt Nilsson, Bernt.Nilsson@chemeng.lth.se
Course homepage: <https://www.pl.lth.se/en/>