



LTH

FACULTY OF
ENGINEERING

Course syllabus

Tillämpade transportprocesser Applied Transport Phenomena

KETN10, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED B/K

Date of Decision: 2023-04-18

General Information

Language of instruction: The course will be given in English

Aim

In designing and optimizing important steps in chemical processes, such as reactors and separators, a thorough understanding of the behaviour and limitations of these steps are needed. The aim with this course is to deepen the students competency within the field of transport phenomena in chemical engineering, biotechnology and ecological systems.

A special focus is upon the analysis of transport of momentum, heat and mass in heterogenous systems, e.g. catalytical reactors and protein chromatography, and on the analysis of flow systems, mixing systems and the influence of flow fields on the transport of mass and heat, e.g. biotechnical reactors and mixing.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- explain how momentum, heat and mass is transported and how transport of these interact in heterogenous systems with reaction and separation
- explain how flow fields and transport of momentum affect the transport of heat and mass in flow systems and mixing systems

Competences and skills

For a passing grade the student must

- formulate mathematically advanced models for transport of momentum, heat and mass
- analyse engineering flow problems using theory and computational means
- analyse engineering mass transport problems using theory and computational means

Judgement and approach

For a passing grade the student must

- judge and evaluate how advanced theory on transport phenomena can be applied to engineering systems in general and the degree of usefulness on some selected systems

Contents

The course deals with transport of momentum, heat and mass in advanced applications in chemical engineering, biotechnology and ecological systems.

The following areas are treated:

- Mass transfer under ideal and non-ideal mixing and flow patterns. Special focus on the effect of flow patterns in mixing tanks and reactors.
- Transfer of mass and heat in applied heterogeneous systems. Special focus on gas/solid phase and liquid/solid phase and application within heterogeneous catalysis, adsorption and chromatography.
- Transfer of mass and momentum is studied on the micro-scale using calculation software. Special focus on the effect of flow patterns in chemical and biotechnical mixing systems and reactors.

The presented theory is visualised both through calculation in computer exercises and practically through minor laboratory demonstrations.

The student projects, focused on central concepts within the course are important in training student skills and for the student to acquire a professional approach to the subject.

Examination details

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

Assessment: Oral and written presentation of project assignments. 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.

Admission

Assumed prior knowledge: KETF01 Transport Phenomena, Basic Course, KETF10 Separation Processes, Basic Course and KETF25 Reaction Engineering or KETF40 Mass Transfer Processes in Environmental Engineering and VVRF10 Fluid Mechanics

The number of participants is limited to: No

Reading list

- Department of Chemical Engineering: Applied Transport Phenomena. 2015.

Contact and other information

Course coordinator: Bernt Nilsson, bernt.nilsson@chemeng.lth.se

Course homepage: <https://www.ple.lth.se/en/>