Course syllabus

Processintegration
Process Integration

KETN50, 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

Elective for: B4-pt, K4-p, W4-p
Language of instruction: The course will be given in English on demand

Aim

Energy and resource efficient processes are a prerequisite for a sustainable society. Efficiency of energy and material utilization can be achieved through optimization of existing processes in an industry, through process integration of energy and materials between different industries, and between industry and society. This contributes to a more sustainable use of limited resources, lower production costs and a reduced environmental impact. Advanced process design is the cornerstone of this work. The aim of the course is to give the student the tools needed to combine several unit operations in an industrial process and to study the dependence between unit operations and how the overall resource utilization is affected when key parameters are varied.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- Through technical design calculations, be able to evaluate the energy efficiency, raw material utilization and environmental impact of various processes.
- At the design stage, be able to optimize the integration of energy conversion processes with regard to energy efficiency and environmental impact, as well as discuss the strengths and weaknesses of the chosen design.

- Be able to use flowsheeting as a tool to describe how energy conversion processes, separation processes and reaction technology affect the design of different process steps, as well as how integration of these process steps into an optimized industrial process can be carried out.

Competences and skills
For a passing grade the student must

- Independently able to problematize and analyze various energy conversion processes in terms of efficiency and environmental impact for both fossil and renewable energy raw materials.
- In an engineering way, be able to design technical processes for industry and municipalities.
- Be able to write a technical report of good quality (both linguistically and subject-wise) in which a technical design and the reasons behind the design choices are described, and be able to orally give a concise account of the same.
- With flowsheeting, be able to make advanced models for materials and energy balances in chemical or biotechnical systems.
- Be able to use flowsheeting tools to analyze and optimize chemical and biotechnological processes.
- Show ability to cooperate in groups with different composition.

Judgement and approach
For a passing grade the student must

- Through flowsheeting calculations and written and oral communication, demonstrate familiarity with industrial problems and the ability to design various industrial processes in an engineering manner.
- Be able to assess and value how different ways of optimizing an industrial process (with regard to energy efficiency and environmental impact) affect the design.
- Be able to evaluate how different parameters affect industrial process capacity, energy efficiency, product quality and opportunities to integrate with other process steps.
- Be able to obtain relevant information from various sources and evaluate this in an independent manner.

Contents

The course is structured around a number of themes. The course deals with the design of industrial processes using flowsheeting programs. Energy and environmental aspects are highlighted through sections on energy sources, energy production, water and sewage management, and gas purification. In addition, optimization of industrial processes with regard to energy efficiency and environmental impact is included.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: The examination takes place through a written exam, a number of sub-projects, reported in writing and orally, and participation in mandatory course events. Final grading is based upon the written exam.

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: 0323. **Name:** Written Examination.
Credits: 4,5. **Grading scale:** TH. **Assessment:** Written exam

Code: 0423. **Name:** Projects and Mandatory Course Parts.
Credits: 3. **Grading scale:** UG. **Assessment:** Oral and written presentation of subproject, and active participation in mandatory course parts.

Admission

Admission requirements:

- KETF25 Reaction Engineering or KETF40 Mass Transfer Processes in Environmental Engineering

Assumed prior knowledge: Advanced Separation Processes
The number of participants is limited to: No
The course overlaps following course/s: KETN20

Reading list

- Alveteg: Handbook in Chemical Engineering. 2022.
- Smith: Chemical Process Design and Integration. John Wiley & Sons, 2016, ISBN: 978-1-119-99013-0.
- Kamal and Al-Malah: Apen Plus: Chemical engineering applications. John Wiley & Sons, 2016, ISBN: 978-1-119-29364-4.

Contact and other information

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