Course syllabus

Biokemisk reaktionsteknik
Biochemical Reaction Engineering

KETN30, 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

Main field: Biotechnology.
Language of instruction: The course will be given in English

Aim

Development of new biotechnical processes requires analysis of the microbial metabolism as well as the bioreactor. The aim of this course is to provide the student with understanding and skills to enable them to analyse a biotechnical process in a quantitative fashion. This will provide the basis for the design and scale-up of processes in biotechnology.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to describe the principles behind global metabolic networks analysis, and describe the application of metabolic network analysis in the design of genetically modified production organisms
- be able to describe the interaction between physical transport phenomena and the microbial metabolism in a bioreactor
- be able to identify critical factors in the scale-up of processes in biotechnology, and qualitatively compare different process options.

Competences and skills
For a passing grade the student must

- be able to quantitatively analyse experimental results on the macro-level, e.g. by making carbon- and degree of reduction balances

- be able to set up stoichiometric network models for metabolic networks
- be able to model microbial kinetics
- be able to execute reaction engineering calculations for the design of bioreactors, including size, stirrer effect, mass transfer capacity, and cooling requirements
- be able to make a reasonable choice of reactor, substrate, and production organism for a given biotechnical process

Contents

The course treats processes in biotechnology in a quantitative fashion on both the cellular and the reactor level. The following topics are covered: Metabolic reactions, stoichiometry, the C-mol concept, degree of reduction, thermodynamics in microbial systems, modelling of metabolic networks, reaction kinetics, design of biotechnical processes, mass transfer, and scale-up of biotechnical processes.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written examination. Assignments.

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: 0117. **Name:** Theory.
Credits: 7,5. **Grading scale:** TH. **Assessment:** Written examination
Code: 0217. **Name:** Calculation Assignment.
Credits: 0. **Grading scale:** UG. **Assessment:** Written report

Admission

Assumed prior knowledge: Basic biochemistry (e.g. KBKF15/KBKA10), Reaction engineering (e.g. KETF25 or KETF40/KTE170) and linear algebra (e.g. FMAA20)
The number of participants is limited to: No
The course overlaps following course/s: KTE071

Reading list

- John Villadsen, Jens Nielsen and Gunnar Lidén: Bioreaction Engineering Principles, 3rd ed. Springer, 2011, ISBN: 978-1-4419-9687-9.

Contact and other information

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