UNIVERSITY OF BORÅS

Bioprocess Design
Bioprocessdesign
15 credits

Ladok Code: A507TA
Version: 2.0
Established by: Committee for Education in Technology 2017-10-20
Valid from: Spring 2018

Education Cycle: Second cycle
Main Field of Study (Progressive Specialisation): Biotechnology (A1F)
Disciplinary Domain: Technology
Prerequisites: Meet the requirements for admission to the Masters programme in Resource Recovery.
Subject Area: Biotechnology
Grading Scale: Seven-degree grading scale (A-F)

Content
The course deals with the technical design and economical evaluation of the bioprocesses. An important part of the course is therefore a project conducted in a group, where students are assigned the task of developing a bioprocess for the production of a particular product. In order to succeed, the students must first make a proper literature review, followed by a preliminary process design. This provides the basis for the economical evaluation of the process. For this purpose, the students can use a modern software. The course also addresses various microbiological aspects and mass transport that affect the design and operation of a bioreactor. Estimation of operating and investment costs, as well as profitability assessment of the bioprocesses and more knowledge of various biological equipment are important parts of the course. Written reports and oral presentation are also included.

Learning Outcomes
After completion of the course, the student should be able to:
1 Knowledge and understanding
1.1 Explain different types of unit operations before and after the bioreactor,
1.2 Explain investment- and cost estimates of bioprocesses.

2 Skills and abilities
2.1 Be able to use knowledge about the growth of microorganisms, enzyme kinetics and mass transfer to perform a preliminary design of a bioreactor,
2.2 Show the ability to obtain relevant information from different sources for the design of a bioprocess,
2.3 Perform calculations and process design of a bioprocess using a commercial software program and perform material and energy balances,
2.4 Perform investment assessments for a bioprocess,
2.5. Show the ability to work in a project group and give an oral and written report of its results,
2.6 Present a bioprocess individually.

3 Valuation and approach
3.1 show the ability to critically review and discuss results from a biotechnology project, technically and economically, and evaluate different methods for achieving a given requirement specification.

Forms of Teaching
Teaching takes place in the form of lectures and exercises, as well as assignments with oral and written presentation.

The language of instruction is English.

Forms of Examination

The course is examined through the following examinations:

- Examination 7,5 hp. Seven-degree grading scale (A-F)
- Project 7,5 hp. Seven-degree grading scale (A-F)

Examinations for the regular course occasion can be divided into two or three parts as follows:
1. During the course, up to two part examinations can be carried out, corresponding to 70% of the total score.
2. At the end of the course, a final examination will be given which will be corresponding to the remaining 30%.

Examination at a re-examination: An oral examination that gives a total score.

The final grade of the course is calculated by combining the grade from the examination and the project.

Student rights and obligations at examination are in accordance with guidelines and rules for the University of Borås.

Literature and Other Teaching Materials

1. Michael L. Shuler, Fikret Kargi (2002) *Bioprocess Engineering*, Prentice Hall, ISBN 0130819085

2. Richard Turton, Joseph A. Shaeiwitz, Wallace B. Whiting (2003) *Analysis, Synthesis and Design of Chemical Processes*,Prentice Hall, ISBN 0130647926

3. Henry C. Vogel; Celeste L. Todaro (1997): *Fermentation and Biochemical engineering Handbook: Principles, process design, and equipment*, NOYES PUBLICATIONS, USA

4. Handsout via the University´s Learning Management System

5. Computer program: ASPEN Plus or SuperPro or equivalent.

Student Influence and Evaluation

The course is evaluated according to the rules for course evaluation at the University of Borås, were the students views are collected. Analysis of these views results in a course report that is published and shared with students of subsequent Introduction to life cycle assessment courses. The report also forms the base for developing the course. The person responsible for the course is responsible for this evaluation.

Miscellaneous

The course is part of the Masters program in Resource Recovery (KMREC).

The course is based on knowledge equivalent to a Bachelor of Science degree in Chemical Engineering of equivalent.

Students can retake an exam that they have already passed in order to improve their grade, provided that the exam takes place during the scheduled examination and re-examination sessions and that students without a passing grade on the exam in question have registered for the exam.