UNIVERSITY OF BORÅS

Bioprocess Design
Bioprocessdesign
15 credits

Ladok Code: A533TA
Version: 2.0
Established by: Committee for Education in Technology 2022-10-07
Valid from: Spring 2023

Education Cycle: Second cycle
Main Field of Study (Progressive Specialisation): Biotechnology (A1F)
Disciplinary Domain: Technology
Prerequisites: Fulfils the requirements for admission to the Master's Programme in Resource Recovery - Biotechnology and Bioeconomy
Subject Area: Biotechnology
Grading Scale: Seven-degree grading scale (A-F)

Content
The course deals with the design and economics of the biotechnological process system. Different kinds of biotechnology process equipment are an important part of the course. In addition to upstream and downstream processes, the design and scale-up of bioreactors are also addressed, where factors such as cell growth and mass transport are taken into account. The economics part of the course mainly concerns estimations of investment and operating costs as well as investment assessment. This provides a basis for being able to assess the economic conditions of the process. An important part of the course is a project that is carried out in groups where the students are tasked with developing a biotechnological process for the production of a certain bioproduct. To succeed, students must first conduct a proper literature review, which is followed by preliminary process design. In this work, students use modern software. The project is followed up on with written and oral reports.

Learning Outcomes
After completing the course, students will be able to:

1 Knowledge and understanding
1.1 Explain different types of process steps and unit operations before and after the bioreactor, i.e. upstream and downstream processes
1.2 Explain investment calculations and cost estimates of biotechnological processes

2 Skills and abilities
2.1 Carry out a preliminary design of a bioreactor by applying their knowledge of microorganism growth and mass transport phenomena
2.2 Obtain relevant information from various sources for the design of a bioprocess
2.3 Perform calculations regarding a bioprocess system using a commercial software program and calculate material and energy balances
2.4 Carry out investment assessments for a biotechnological process
2.5 Work in a project group and give an oral and written account of its results
2.6 Individually present various aspects of biotechnological processes orally and in writing

3 Evaluation ability and approach
3.1 Critically review and discuss results from a biotechnology project technically and economically and evaluate different methods to achieve a given requirement specification

Forms of Teaching
Teaching takes place in the form of lectures, exercises, and supervision in connection with the project, as well as through assignments with oral and written reports.

The language of instruction is English.

Forms of Examination

Examination
Learning outcomes 1.1, 1.2, 2.1, 2.4
Credits: 5.5
Grading scale: A-F

Individual submission and oral presentation 1
Learning outcomes: 2.6
Credits: 1.0
Grading scale: A-F

Individual submissions 2
Learning outcomes: 1.1, 1.2, 2.1, 2.2, 2.4, 2.6
Credits: 0.5
Grading scale: Pass/Fail

Individual submissions 3
Learning outcomes: 2.3
Credits: 0.5
Grading scale: Pass/Fail

Project, interim report 1
Learning outcomes: 2.2, 2.5
Credits: 1.5
Grading scale: A-F

Project, interim report 2
Learning outcomes: 2.3, 2.5
Credits: 2.5
Grading scale: A-F

Project, final report
Learning outcomes: 2.3, 2.4, 2.5, 3.1
Credits: 3.0
Grading scale: A-F

Project, oral presentation
Learning outcomes: 2.3, 2.4, 2.5, 3.1
Credits: 0.5
Grading scale: A-F

The examination is carried out halfway through the course as well as related re-take examination opportunities.

The final grade of the course is a weighting of the grades from all examination components weighted according to the components' credits. The student's rights and obligations regarding examination are in accordance with guidelines and regulations in place at the University of Borås.

If the student has received a decision/recommendation regarding special pedagogical support from the University of Borås due to disability or special needs, the examiner has the right to make accommodations when it comes to examination. The examiner must, based on the objectives of the course syllabus, determine whether the examination can be adapted in accordance with the decision/recommendation.

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

Literature and Other Teaching Materials

Michael L. Shuler, Fikret Kargi (2017) Bioprocess Engineering, basic concept, 3rd edition, Prentice Hall, ISBN 978013706270

Richard Turton, Joseph A. Shaeiwitz, Wallace B. Whiting (2018) Analysis, Synthesis and Design of Chemical Processes, 4th edition, Prentice Hall, ISBN 978013417740

Harrison, Roger G. et al. (2015) Bioseparations Science and Engineering, Oxford University Press, Incorporated. ProQuest Ebook Central

Handout via the university's learning platform

Computer program: SuperPro Designer or equivalent.

Student Influence and Evaluation

The course is evaluated in accordance with current guidelines for course evaluations at the University of Borås in which students' views are to be gathered. The course evaluation report is published and returned to participating and prospective students in accordance with the above-mentioned guidelines, and will be taken into consideration in the future development of courses and education programmes. Course coordinators are responsible for ensuring that the evaluations are conducted as described above.

Miscellaneous

The course is part of the Master’s Programme in Resource Recovery - Biotechnology and Bioeconomy (TAREB).