

Industrial Biotechnology

Programme course

6 credits

Industriell bioteknik

TFYA32

Valid from: 2017 Spring semester

Determined by

Board of Studies for Chemistry, Biology
and Biotechnology

Date determined

2017-01-25

Main field of study

Engineering Biology

Course level

Second cycle

Advancement level

A1X

Course offered for

- Chemical Biology, M Sc in Engineering
- Engineering Biology, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Basic biology, chemistry and mathematics as in the TB/KB curricula of 1-3 years, or equivalent

Intended learning outcomes

Fundamental understanding of industrial biotechnology with focus on products such as drugs, food, chemicals, renewable energy sources and instruments and process equipment. Understanding of metabolic and cell biological processes from engineering perspectives.

After the course the student shall be able to:

- 1) Describe the fundamental biological and engineering principles for production of proteins, metabolites and cells and devices and apparatuses.
- 2) Understand the principles for engineering design of key unit operations and other functional operations such as bioreactor cultivation and chromatographic separation of bioproducts and analytical instruments.
- 3) Carry out engineering computations and simulations of bioprocesses based on physical, chemical and biological fundamentals using basic mathematical equations and models.

Course content

The lectures cover fundamentals about industrial production using bioprocesses. This includes methods for cultivation in bioreactors and recovery of bioproducts using separation methods. Engineering modelling methods are used to calculate key process parameters. Content of lectures: Biochemistry and physiology of cell growth and metabolism. "The Cell Factory" concept. Bioreactor design for batch, fed-batch and chemostat. Purification and separation processes. Using dynamic models and differential equations based on balances and microbial kinetics. Design of unit operations for cultivation and bioseparation. Typical industrial bioprocesses are illuminated (e.g. production of antibiotics, biogas, industrial enzymes, therapeutic proteins, vaccines, mammalian cells, stem cells and environmental applications).

Teaching and working methods

Lectures and seminars. Simulation exercises.

Examination

PRA1	Written report	1.5 credits	U, G
TEN2	Written examination	4.5 credits	U, 3, 4, 5

A written examination tests the student's ability to solve process engineering problems and ability to describe fundamental concepts in industrial biotechnology. Laboratory exercise reports examine the understanding of biological, physical and chemical effects and transformations using simulations and other calculation methods.

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: Biotechnical production systems, Design project for bioprocesses and production systems, Biotechnology manufacturing technique, Pharmaceutical Development, Quality management.

Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent

Magnus Boman

Examiner

Carl-Fredrik Mandenius

Education components

Preliminary scheduled hours: 56 h

Recommended self-study hours: 104 h

Course literature

Mandenius CF, Industriell Bioteknik, Tryckakademin, Linköping

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.