Design of Biotechnical Process and Production Systems, Project Course

Programme course

6 credits

Projektkurs i design av biotekniska process- och produktionssystem

TFTB32

Valid from: 2017 Spring semester

Determined by
Board of Studies for Chemistry, Biology and Biotechnology

Date determined
2017-01-25

Offered for the last time
Spring semester 2023

Replaced by
TFTB52

Main field of study
Engineering Biology

Course level
Second cycle

Advancement level
A1X

Course offered for
- Chemical Biology
- 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
Industrial biotechnology course is a prerequisite. It is also a prerequisite to attend the following courses that are given in parallel with the course; Biotechnical production systems; Biotechnology manufacturing; Pharmaceutical Development; Quality Management.

Intended learning outcomes
Project course accomplishing engineering skills in analysis and design of industrial bioprocesses in evaluating production and process economical prerequisites. Understand how to use common process design tools.

Course content

Follows the specified assignment to the group. This may include total production systems. Raw material supply. Just-in-time principles. Quality systems. Reaction engineering. Unit operations up- and downstream. Process modelling and use of biomechatronic methodology. Process economical evaluation. In-process analysis aspects. Total Quality Management and Process analytical technology (PAT). Process validation.

The design shall contain at detailed description of the product and its production. Calculations and modelling of the process operations are a necessity in presenting how the process will behave when implemented. The volumes, batches, yields, material flows and operations shall be presented and scheduled. Process descriptions are presented in flow schedules “hour by hour”. Estimations are presented in diagrams and tables.

Economy and resources: The chosen process is calculated based on mass balances, raw materials, operations, investments, personnel etc. The calculations are used to present the financial framework of the process/production over the complete intended time span of the production. Estimations should be presented and explained in tables/diagrams and commented in general text.

Quality management: The needs for quality assessments and controls are presented in reference to the technical and regulatory demands that are integral to the production of the product category.

Teaching and working methods

The students should in groups of 4-5 persons implement the knowledge presented in the courses on Industrial biotechnology, Biotechnical production systems; Biotechnology manufacturing; Biotechnology and Pharmaceuticals; Quality Management and Engineering. The framework is a project assignment based on industrial design issues within biotech industry. The project model CDIO (Conceive, Design, Implement and Operate) is used. The assignments resemble the work performed by industrial consultancy teams to their customers or at R&D departments of large companies. The projects contain two phases, the first centers in on the conception of the aims and means for the design and the second on development of a process for production. The latter is referred to as the design phase intended to describe the process/production as it is implemented and operated.

The course runs over the entire spring semester.
CDIO principles are applied (especially planning, develop, implementing and testing of process solutions). Project groups (4-5 members) are organized and a specified engineering design assigment is allotted to each group which requires the development of group activities based on the curricula in parallel courses.

The course runs over the entire spring semester.

Please note that the courses TMMT03 and TFTB39 should be taken during the same semester as TFTB32.

Examination

PRA1	Project	6 credits	U, G

Grades are given as ’Fail’ or ’Pass.

Grades

Two-grade scale, U, G

Other information

Course language is Swedish and the bulk of the literature is in English.

Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent

Magnus Boman

Examiner

Gunnar Hörnsten

Education components

Preliminary scheduled hours: 44 h
Recommended self-study hours: 116 h

Course literature

Litteratur, checklistor mm från kurserna: Industriell bioteknik, Biotekniska produktionssystem , Bioteknisk tillverkningsteknik, Bioteknik och läkemedel, Offensiv kvalitetsutveckling. Litteratur från egna datasökningar mm i anslutning till projektuppdraget. Referenslitteratur till CDIO-projektet Biomechatronic Design in Biotechnology. Carl-Fredrik Mandenius och Mats Björkman. Wiley 2011. Basic Biotechnology. Colin Ratledge and Björn Kristiansen. 3d edition. Cambridge University Press 2006. Bioseparations Science and Engineering. Second Edition. Roger G. Harrison, Paul W. Todd, Scott R. Rudge, and Demetri P. Petrides. Oxford University Press 2015. In English: Literature from the following courses: Industrial biotechnology, Biotechnical production systems, Biotechnology manufacturing, Biotechnology and Pharmaceuticals, and Quality Management and Engineering Literature acquired through Searches in databases is essential in the development of the projects. Reference literature; Biomechatronic Design in Biotechnology. Carl-Fredrik Mandenius and Mats Björkman. Wiley 2011. Basic Biotechnology. Colin Ratledge and Björn Kristiansen. 3d edition. Cambridge University Press 2006. Bioseparations Science and Engineering. Second Edition. Roger G. Harrison, Paul W. Todd, Scott R. Rudge, and Demetri P. Petrides. Oxford University Press 2015.

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://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.