BB2485 Metabolic Engineering 7.5 credits

Metabolic Engineering

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for BB2485 valid from Spring 2019

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Biotechnology

Specific prerequisites

20 ECTS in biochemistry, microbiology and gene technology/molecular biology; 20 ECTS in chemistry; 20 ECTS in mathematics/numerical analysis/computer science

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completing the course, students should be able to:

- Quantitatively describe metabolic pathways for production of alcohols, organic acids, amino acids, monomers, and polymers.
- Characterize the above pathways, discuss their engineering requirements, and propose relevant metabolic engineering strategies.
- Perform metabolic pathway balancing in regard to redox, elemental, and ATP balance.
- Use metabolic control analysis to identify important steps in pathway control.
- Construct a mathematical representation of a metabolic network, and calculate the internal fluxes based on provided external measurements.
- Design metabolic engineering strategies for product formation using genome-scale metabolic models.

Describe the latest developments in genome-scale metabolic modelling.

Course contents

- Metabolic pathways for production of organic acids, amino acids, alcohols, monomers, and polymers.
- The underlying concept behind balancing the above pathways, based on elemental, redox and energy balance.
- Metabolic control analysis.
- Metabolic engineering strategies.
- Metabolic flux analysis (MFA).
- The concepts of genome-scale stoichiometric metabolic models.
- The use of genome-scale models for designing metabolic engineering strategies.
- The inclusion of thermodynamic constraints in genome-scale stoichiometric models.
- State-of-the-art genome-scale modelling, combining stoichiometry, proteomics and metabolomics.

Course literature

Course literature will be announced on the course homepage 4 weeks prior to course start. Previous versions of the course has used "Biofuels and Green chemicals" by Prof. Gen Larsson, as well as peer-reviewed scientific articles.

Examination

- PRO1 - Assignment in metabolic modelling, 2.5 credits, grading scale: P, F
- TEN1 - Written exam, 5.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH’s coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.