



# BB2480 Energy and Environment 7.5 credits

Energi och miljö

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

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

## Establishment

Course syllabus for BB2480 valid from Spring 2012

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Biotechnology

## Language of instruction

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

## Intended learning outcomes

**After completion of the course the student should:**

## **Knowledge and understanding**

- understand and describe how microorganisms can utilise biomass-based waste products as substrates for growth and production where the biomass primarily is lignocellulose
- be able to describe and understand how living cells can be selected, designed and operated in a way that leads to accumulation of high amounts of small organic molecules and in which way they are used in the treatment of waste
- understand how microbial cells generate energy and regenerate cofactors both aerobically and anaerobically and how this information can be used in the design of microorganisms where byproduct formation is minimised
- be able to describe the degradation pathways and thus understand the undesired effects of microbial activity in relation to commercially produced products such as food and beverages but also naturally occurring processes
- be able to describe the large scale bioprocesses used to produce small molecule products and the processes for treatment of waste
- know the basic concerns of establishment of a biorefinery, the means of how it operates and be able to give concrete examples
- have a deeper knowledge in one subject of the course

## **Skills and abilities**

- be able to set up and calculate intracellular metabolic fluxes, on the basis of knowledge of metabolism gained from the literature, and by programming in Matlab
- be able to design experiments and perform carbon and redox balances to evaluate product and byproduct formation of microorganisms under specific environmental conditions
- be able to communicate the contents of a set of peer reviewed scientific papers to an audience which does not have any prior knowledge of the subject
- be able to calculate appropriate sterilization times based on knowledge of microbial activity
- be able to describe the basic principles of Life Cycle Analysis/Assessment

## **Ability to judge and to adopt a standpoint**

- have an overview of waste biomass worldwide and be able to critically reflect on its benefits and drawbacks with regard to microbial production of selected substances and with respect to the needs of the society
- be able to evaluate the merits of different biofuels with respect to the efficiency of their biological production processes, the product quality in relation to their use and the degree of sustainability of the processes
- be able to reflect on common methods for treatment of polluted water and soil regarding the efficiency of the techniques
- be able to critically read and extract information from papers in peer reviewed journals and use this as theoretical support for reaching the course goals and to find, read and extract information from such papers to form a critical opinion on a given subject

## **Course contents**

## Disposition

Lectures and Seminars.

## Specific prerequisites

At least 150 credits from grades 1, 2 and 3 of which at least 100 credits from years 1 and 2, and bachelor's work must be completed. The 150 credits should include a minimum of 20 credits within the fields of Mathematics, Numerical Analysis and Computer Sciences, 5 of these must be within the fields of Numerical Analysis and Computer Sciences, 30 credits of Chemistry, possibly including courses in Chemical Measuring Techniques and 20 credits of Biotechnology or Molecular Biology.

## Course literature

Publications from peer reviewed journals

Compendium: Enfors: Food microbiology

## Examination

- SEM1 - Seminar, 2.5 credits, grading scale: P, F
- TEN1 - Examination, 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.

Participation at

- Lectures
- Seminars in industrial processes
- Seminars in flux analysis.

## Other requirements for final grade

- SEM1-Seminar in Flux analysis and Seminar in industrial processes, 2,5 credits. Mark: P/F
- TEN1-Written examination, 5 credits. Mark: A,B,C,D,E,FX,F

## 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.