



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 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Biotechnology

Specific prerequisites

Admission requirements for independent students:

A total of 20 university credits (hp) in biochemistry, microbiology and gene technology/molecular biology. 30 university credits (hp) chemistry, as well as 20 university credits (hp) in mathematics and computer science or corresponding. Documented proficiency in English corresponding to English B.

Admission requirements for programme students at KTH:

Language of instruction

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

Intended learning outcomes

General metabolism and physiology

- describe and understand how specific organisms in anaerobic industrial and environmental accumulate end products from a specific carbon source. Describe by using metabolic schemes how energy and cofactors are regenerated.
- understand and describe the basis for the carbon and nitrogen cycling in the nature from the point of the microorganisms and their energy metabolism
- describe the processes of biofilm formation and quorum sensing and show why these are important in industrial and environmental processing by giving and explaining relevant examples
- describe the mechanism of a chosen metabolic process into large detail

Fuels

- describe the processes for biofuel production that are technically developed today with respect to raw material, microorganism/metabolism and conversion process.
- speculate on benefits and drawbacks based on different sources of biomass presently used but also of alternative and future sources
- discuss the pro's and con's of the bioprocesses in relation to traditional fuels based on known facts on total yields and energy content but also side effects
- understand the CO₂ emission of the fuels and relate this to the carbon cycling
- know the basic outline of the different fuel generations and know of the present status with respect to the research in the field
- be able to make recommendations with respect to the creation of a sustainable society
- understand the principles of the microbiology of Archaea: methanogens

Sustainable production of chemicals and biomaterials

- know of common chemicals and materials that are produced by microbial processes and some of their characteristic properties.
- be able to outline the cell type used, the appropriate metabolism and the control of this.
- understand the basic outline of Life Cycle Analysis (LCA)

Food and beverages

- give examples of fermented food and understand the microbial background to the products
- describe into metabolic detail how fermented beverages are produced
- describe the basic principles to how food is spoiled and concepts how to avoid this
- calculate sterilisation times

- understand the concept of probiotics and give examples on particular products

Waste treatment

- describe the principles for soil sanitation and composting, discern possible problems and suggest measures to mitigate them
- describe the general principles which are used today to purify waste water with respect to both the aerobic and anaerobic process parts with emphasis is on carbon and nitrogen removal.
- know of the limitations and the degree of purification that can be achieved
- be able to relate the waste processes to emission of greenhouse gases

Microbial mining

- understand and describe the prerequisites to when microbial mining can be used in correlation to conventional mining techniques
- understand the metabolism of the organisms which can be used for the purpose and their preferred substrates and the coupling to chemical reactions in this process
- understand and describe the principles to how mining is performed in the large scale
- understand the principles of the microbiology of Archeae: extremophiles

Course contents

Disposition

Lectures, 5 credits

Literature study, 2,5 credits

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.

Other requirements for final grade

- One final examination
- Participation in mandatory seminars
- Give one seminar presentation

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.