



## Biofuels & Biological Treatments of Wastes

### Biobränsle och biologisk behandling av avfall

5 credits

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**Ladok Code:** 42K21B

**Version:** 1.0

**Established by:** Education Committee 2014-10-06

**Valid from:** Autumn 2014

**Education Cycle:** Second cycle

**Main Field of Study (Progressive Specialisation):** Resource Recovery (A1F)

**Disciplinary Domain:** Technology

**Prerequisites:** Meets the requirements for admission to the degree of Bachelor of Science in Engineering (or equivalent).

**Subject Area:** Energy Technology

**Grading Scale:** ECTS-credits

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#### Content

- Overview of world market for biofuels
- Bioethanol production
  - Different types of fermenter and their operation
  - Different types of processes depending on the raw materials
  - Environmental impact
- Biogas production
  - Microbiological decomposition into biogas
  - Design of anaerobic digestors for biogas production
  - The use of biogas as a vehicle fuel and for heating, as well as further processing to generate electricity
- Biodiesel from vegetable oil and from used cooking oil
- Integration of biological processes in traditionally non-biological industries

#### Learning Outcomes

After completing the course, students must be able:

##### 1 Knowledge and understanding

1.1 Describe different processes for the production of bioethanol, biogas and biodiesel and other biofuels,

##### 2. Skills and abilities

2.1 Calculate the dwell time and fermenter size required to produce a certain quantity of biogas or bioethanol,

2.2 Perform simple lab experiments in order to estimate a material's suitability for use as a substrate in a biogas plant or bioethanol fermenter,

### 3. Judgement and approach

3.1 Based on various types of raw materials, be able to compare the suitability of different biological processes and assess which process has the highest energy efficiency,

3.2 Discuss and take into account the various ethical aspects of ethanol production,

3.3 Evaluate results from simple lab experiments.

### Forms of Teaching

Teaching will consist of lectures, laboratory work and project work.

The language of instruction is English.

### Forms of Examination

The course will be examined through the following examination elements:

#### *Examination*

Learning outcomes:

Credits: 3.5

Grading scale: Seven-degree grading scale (A-F)

#### *Written Assignment*

Learning outcomes:

Credits: 0.5

Grading scale: Seven-degree grading scale (A-F)

#### *Lab Work*

Learning outcomes:

Credits: 1

Grading scale: Fail (U) or Pass (G)

A weighted average of the scores for the examination elements Exam and Submission task determines the course's final grade which is posted only after all elements have been approved.

Student rights and obligations at examination are in accordance with guidelines and rules for the University of Borås.

### Literature and Other Teaching Materials

Material handed out in the form of research publications, reports, etc.

### Student Influence and Evaluation

The Head of Academy and course coordinator are jointly responsible for ensuring that students are invited systematically and regularly to put forward their views on the course. The results of the evaluations ought to be reported back to the students and are to form the basis for the future structure of the course.

### Miscellaneous