



Anaerobic digestion

for the Production of Biogas and Biochemicals

(3 ECTS)

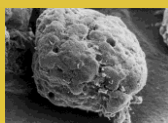
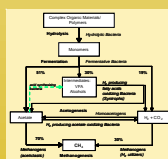


The **PhD course** will give insight into the fundamental laws and the technology of anaerobic digestion (AD) as a process for combining waste treatment with renewable energy production and resource recovery. It will give an overview of the microbiology of the process and its application for large-scale processes for the production of biogas and biochemicals.

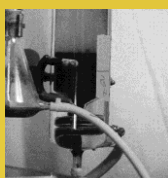


The course will deal with the following topics:

- Microbiology of anaerobic digestion for the production of biogas and biochemicals
- Mixed culture fermentation for biochemicals production
- Process parameters and modeling of AD
- Monitoring and control of the AD process
- Reactor design for anaerobic treatment of waste, wastewater and energy crops
- Current bottlenecks and further optimization of the AD process
- AD for resource recovery
- AD in the biorefinery context



In line with the nationally and internationally acknowledged “Aalborg University model”, which is an interdisciplinary, problem-oriented approach to research and education, the course will consist of a **combination of lectures and group work** in groups of 3-5 students.



During the **group work** you will design an optimized AD process for the production of biogas and/or biochemicals. The final design will depend on the expertise of the members of your group. The design of the full-scale plant should include the calculation of the in- and output and its CO₂ reduction potential for (a mixture of) different biomass resources found in a region of your choice. The teachers of the course act as consultants for the groups, so that each group can use the expertise of the teachers when needed.



The **lectures** will give you in parallel the necessary background information about the microbiology of anaerobic digestion processes and its implementation in large-scale plants for different biomass resources.

The course will take place at:

Section for Sustainable Biotechnology

Department of Chemistry, and Bioscience

Aalborg University Copenhagen, A.C. Meyers Vænge 15, 2450 Copenhagen SV, Denmark

For further information: Please visit our website www.sustainablebiotechnology.aau.dk or contact Associate Professor Hinrich UELLEND AHL, Phone: +45 9940 2585, Email: hu@bio.aau.dk

Course registration: To register please sign in for the course at <https://phd.moodle.aau.dk/course/index.php?categoryid=137>



PhD course

May 28 – June 1, 2018

Course schedule (3 ECTS)

Lectures will be given by the course teachers and external guest lecturers. The group work will end with a presentation of each group on Friday, June 1 and will be evaluated based on a written report to be delivered three weeks after the course period, not later than June 22 (Friday). The delivery of the written report is compulsory in order to pass the course. **If possible, bring a laptop!**

Preliminary course schedule:

	May 28 Monday	May 29 Tuesday	May 30 Wednesday	May 31 Thursday	June 1 Friday
09:00 h	<ul style="list-style-type: none"> • Welcome • AD for sustainable waste treatment and energy production • Presentation of the different PhD projects + discussion (Course participants) 	<ul style="list-style-type: none"> • Process parameters and modeling of AD • Reactor design for AD of waste, wastewater and energy crops 	<ul style="list-style-type: none"> • AD beyond biogas production • Biogas upgrading technologies 	Group work	Group work
Until 12:00 h	Introduction to group work	Group work	Group work		
13:00 h	<ul style="list-style-type: none"> • Anaerobic Microbiology for the production of biogas and biochemicals 	<ul style="list-style-type: none"> • Monitoring and control of the AD process • Current bottlenecks and optimization of the AD process 	<ul style="list-style-type: none"> • AD in the biorefinery context: Nutrient recovery • Mixed culture fermentation 	Group work	<ul style="list-style-type: none"> • Group presentations (Course participants)
Until 17:00 h	Group work	Group work	Group work		
17:30 h	Come together				

Course Teachers

From Section for Sustainable Biotechnology, Aalborg University Copenhagen:

Hinrich UELLEDAHL (hu@bio.aau.dk): Anaerobic digestion, Bioprocess control and optimization, Bioreactor design and configuration, Biomass pretreatment, Biorefinery concepts.

Peter WESTERMANN (pw@bio.aau.dk): Anaerobic microbiology, Anaerobic bacteria, Archaea, Biodiversity, Microbial physiology, Biological hydrogen production, Greenhouse gases.

Birgitte K. AHRING (bka@bio.aau.dk): Anaerobic and Fungal Microbiology, Anaerobic Digestion, Pretreatment and enzymatic hydrolysis, Thermophiles, 2nd generation bioethanol and bio/jet production, Biorefinery systems, Fractionation and fermentation for high-value bio/products (XOS, carbon fibers, plastics etc.), New fermentations and separations.

Cristiano VARRONE (cva@bio.aau.dk): Fermentation Technology, Mixed Microbial Cultures, Glycerol Biorefinery, Second Generation Biofuels and Green Chemicals, Process optimization

Invited speakers from academia and industry:

Jing LIU, Lund University, Bioprocess Control

Torben KVIST, Dansk Gasteknisk Center

Knud V. CHRISTENSEN, Syddansk Universitet