Master study course Renewable Energy Systems (M. Eng.)

Module – No.		855		Mandatory module
Module name		**Bioenergy Systems II - Biogas and Liquid Biofuels**		
Module coordinator		Prof. Dr.-Ing. Joachim Fischer		
Title		Bioenergy Systems II - Biogas and Liquid Biofuels		
Title of examination		Bioenergy Systems II - Biogas and Liquid Biofuels		
Semester		2		
Course type	Language	Lecture with excursion	English	
SWS/ ECTS/ Workload		4 V	5	150
Requirements for attendance		Successfully completed technical study course (e.g. Bachelor of Engineering)		

1. Content and objectives

Objective

This lecture deals with technologies for biogas generation and utilization and conversion processes for liquid biofuels.

Module content:

BIOGAS

- Microbiological fundamentals of anaerobic digestion
- Biogas substrates: handling and gas yields
- Components of biogas plants
- Plant layout
- Utilization of Biogas: decentralized heat and power generation
- Processing of biogas: biomethane and biogas liquefaction

LIQUID BIOFUELS

- First generation Biofuels: Processes for Biodiesel and Bioethanol production- technologies, raw materials and costs
- Application of first generation biofuels in combustion engines
- Second generation Biofuels: Cellulosic Ethanol and synthetic biofuels conversion technologies, technical challenges, costs
- Application of second generation biofuels in combustion engines
- Third generation Biofuels: biofuels from algae

On-line Lecture notes and training material will be available.

Recommended Literature:

John Love (Editor): Biofuels and Bioenergy , Wiley Blackwell 2017

Arthur Wellinger, Jerry D. Murphy: Biogas Handbook , Woodhead Publishing Series in Energy, 2013

Ram Sarup Singh, Ashok Pandey (Editors): Biofuels: Production and Future Perspectives, Taylor & Francis Inc, 2016

Learning goals:

After attending the lecture, students have a competent knowledge in modern technologies of biogas generation and biofuel production. They know various conversion pathways and application of biogas and biofuels in different markets. They can identify and apply the appropriate technology for different situations. In addition, they are able to assess critically the limitations of these bioenergy systems from a technical and economic viewpoint.

2. Method(s) of instruction

Lecture in combination with an excursion to a biogas plant

3. Requirements for attendance

No Course specific requirements. However, knowledge on bioenergy systems as addressed in the module Bioenergy Systems I is advantageous.

4. Usability of this module

The module is offered as mandatory module in the master study course „Renewable Energy Systems“ (M.Eng.)

5. Requirements for assessment

Participation in the integrated excursion is mandatory. - Assessment is performed either as written examination (90 minutes) or oral examination - Students need to pass the module examination, which encompasses all contents of the lecture.
6. ECTS credits
- 5 ECTS credits
7. Frequency of offer
- Annually in the autumn semester
8. Work load
150 h of total work load, therefrom - 80 h of presence at lectures - 40 h of self-study - 30 h preparation for examination
9. Duration of module
1 semester