

Environmental and Recycling Technology (M. Eng.)

Module – Number	736	Obligatory in specialization Environmental Technology (ET)		
Module name	Wastewater Engineering			
Module coordinator	Prof. Dr. Uta Breuer			
Title	Wastewater Engineering			
Title of examination	Wastewater Engineering			
Semester	2 nd			
Course type	Language	Lecture	English	
Credit hours/ ECTS/ Workload	4/0/0	5	150	
Formal Conditions	Bachelor of Engineering or Bachelor of Science degree			

1. Content and objectives

Content:

- I Introduction: History and technological changes for wastewater as a source of energy, nutrients, and potable water
- II Legal foundations, including more stringent discharge requirements related to nitrogen and phosphorus
- III Enhanced understanding of the fundamental microbiology and physiology of the microorganisms responsible for the removal of nitrogen and phosphorus and other constituents
- IV Bioprocess Engineering: aggregates, measurement, and regulation technology, plant design
- V Increased emphasis on the treatment of sludge and the management of biosolids
- VI Development of energy neutral or energy positive wastewater plants through more efficient use of chemical and heat energy in wastewater

Learning objectives:

Students acquire in-depth knowledge in wastewater technology and engineering with microbial and biochemical as well as engineering focus.

In addition to scientific and engineering knowledges which reflect the link between microbial performance and technical implementation, historical and up-to-date engineering processes are shown especially considering the economically and ecologically feasibility. In this way students are enabled, to recognize and evaluate application possibilities and limits of wastewater engineering.

Literature: For preparation and following-up the following textbooks are suitable:

1. Colin Ed. Ratledge and Björn Kristiansen, Basic Biotechnology, Cambridge University, 3rd ed. 2006, ISBN13: 9780521549585
2. Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, W. Matthew Sattley, David A. Stahl: Brock Biology of Microorganisms, Pearson Education, 15th ed. 2017, ISBN 978-0134261928
3. Metcalf & Eddy Inc., George Tchobanoglous, Franklin L. Burton, Ryujiro Tsuchihashi: Wastewater Engineering: Treatment and Resource Recovery, McGraw-Hill Education - Europe; 5. Edition 2013, ISBN-10: 9780073401188
4. Lattemann, S.; Kennedy, M. D.; Schippers, J.; Amy, G.: Global Desalination Situation. In. Elsevier, Amsterdam, 2016.
5. World Bank: High and Dry: Climate Change, Water, and the Economy. World Bank Group, Washington, DC, USA, 2016.

Further literature will be announced during the lectures.

2. Method(s) of instruction

Lecture

3. Requirements for attendance

Knowledge and abilities which are demonstrated in lectures as bioenergy or biogas (B.Eng. RET) as well as microbiology or bioengineering (B.Eng. URT) at the University of Applied Sciences Nordhausen. These prior knowledges could also be acquired by individual study or appropriate textbooks.

4. Usability of this module

This module is obligatory in the specialization ET and a compulsory module in the other specialization RT.

5. Requirements for assessment

Students need to pass a module examination, which encompasses all contents of the lecture.
Exam: Written exam with a duration of 90 min. Alternative forms of exam are possible.

6. ECTS Credits

Modules are assessed by a module examination which is credited by 5 credit points according to the ECTS (European Credit Transfer and Accumulation System).

7. Frequency of offer

The module is offered in the first academic year.

8. Workload

- course participation	= 50 h
- preparing and following-up of the lecture contents	= 55 h
- exam preparation	= 45 h
Total workload	150 h = 5 ECTS

9. Duration of module

The module is held within one semester.