

Environmental and Recycling Technology (M. Eng.)

Module – Number	747	Obligatory in the Qualification semester ERT		
Module name	Introduction in Environmental and Recycling Technology			
Module coordinator	Prof. Dr.-Ing. Michael Rutz			
Title	Introduction in Environmental and Recycling Technology			
Title of examination	Introduction in Environmental and Recycling Technology			
Semester	Qualification semester			
Course type	Language	Lecture	English	
Credit hours/ ECTS/ Workload	3/1/0	5	150	
Formal Conditions	Bachelor of Engineering or Bachelor of Science degree			

1. Content and objectives

Content:

Basics of environmental technology:

Dealing with the subject-specific and societal problems at an early stage draws attention to sustainable development, taking into account the applicable legal regulations as well as environmentally relevant aspects. At the same time, with the interdisciplinary transfer of knowledge, the natural and engineering basis of the environmental and recycling technology course is addressed. Problems and tasks of environmental technology are presented and an introduction to the circular economy / recycling is given.

Using selected waste streams as an example, the basic waste management problems and possible solutions are to be worked out.

Environmental technology: causes of environmental problems, environmental pollutants, introduction to environmental technologies

Circular Economy: Definition and History; Legal basis; Circular Economy Act in a European context; Concept of waste; Types of waste; Waste composition; Waste generation; Waste accounting and verification; DSD; Collection, handling and transport of waste; Corporate waste management; Overview of residual waste treatment (thermal and mechanical-biological treatment); Solution approaches for waste management in industrial, emerging and developing countries are presented.

Recycling: recycling term; selected examples of material recycling are presented.

Basics of process engineering:

Definition, areas of application, structure and tasks of the Process Engineering; Process Engineering and the environment; Professional requirements and perspectives; Apparatus, plant, process; Basic procedure; Process engineering systems; Flow diagrams; Working methods; Material and energy balances; Development of a new process
Theoretical basics - microprocesses using the example of mechanical process engineering: disperse systems; Rate of descent; Particle size; specific surface; Particle shape; Particle size distribution and its representation; Adhesive forces; Porous systems; Measurement method of particle size analysis; Sampling, sample division

Introduction to applied mechanical process engineering - macro processes using the example of mechanical Processing: Terms and definitions of mechanical separation processes; Crushing; Mechanical separation of solid mixtures; Mechanical liquid separation; Flow diagrams of process engineering plants

The module thus gives an overview of the topics of environmental technology, circular economy, recycling and process engineering. It conveys the necessary fundamentals and an understanding of the system for the advanced modules of the ERT course. It conveys the necessary basics and an understanding of the system for the advanced modules of the ERT course.

Learning objectives:

The students know the basics of environmental technology, circular economy, recycling and process engineering. They have a basic understanding of environmental and procedural processes. The students mainly develop technical and system skills. By focusing on the specific professional field at an early stage, they have increased their motivation to study.

Literature: For preparation and follow-up the following textbooks are recommended:

1. Worell, E.; Reuter, M. (ed.): Handbook of Recycling, Elsevier Inc. 2014.
ISBN: 9780123964595, eBook ISBN: 978012396506
2. Letcher, T.; Vallero, D.: Waste: a handbook of management; London, Academic Press 2019
3. Clark, H.: Handbook of recycling technology; New York, NY: Syrawood Publishing House 2019,
ISBN 9781682867518, 168286751X
4. Christensen, T.: Solid Waste Technology & Management, 1 & 2, Blackwell Publishing Ltd 2011.

ISBN:9781405175173 |Online ISBN:9780470666883 |DOI:10.1002/9780470666883

5. Wills, B., Napier-Munn, T. (Hrsg.): Mineral Processing Technology, Elsevier 2006
6. Fuerstenau, K.: Mineral Processing, SME 2003, ISBN:
7. Rhodes, M.: Introduction to Particle Technology, Wiley 1986
8. Kelly, E., Spottiswood, D.: Introduction to Mineral Processing, Wiley 1982
9. Svarovsky, L.: Solid-Liquid Separation, Butterworth-Heinemann 2000
10. Martens, H., Goldmann, D.: Recyclingtechnik, Springer 2016
11. Bilitewski, B.: Abfallwirtschaft: Handbuch für Praxis und Lehre, Springer, Berlin 2013
12. Kranert, M.: Einführung in die Abfallwirtschaft, Vieweg und Teubner-Verlag 2010
13. Förstner, U.: Umweltschutztechnik, Springer Verlag, Heidelberg 2008
14. Müller, W.: Mechanische Grundoperationen u. ihre Gesetzmäßigkeiten. Oldenbourg Wissenschaftsverlag 2008
15. Stuess, M.: Mechanische Verfahrenstechnik 1 und 2, Springer Verlag 2009
16. Schwister, K.: Taschenbuch der Verfahrenstechnik, Fachbuchverlag Leipzig 2001

2. Method(s) of introduction

Lectures using the Internet as a presentation and information medium as well as video recordings with the active involvement of the students (Whiteboard, Powerpoint).

In the integrated exercises for the lecture, exercises are presented on individual topics and dealt with or worked on and solved together (blackboard, Powerpoint, overhead projector).

3. Requirements for attendance

There are no formal requirements for participation.

4. Usability of this module

This module is obligatory in the qualification semester for Master Environmental and Recycling Technology

5. Requirements for assessment

Students need to pass the module examination, which encompasses all contents of the lecture.

Type of examination: written examination with a duration of 120 min. Alternative types of examination 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 scheduled for the first academic year.

8. Workload

Participation in the course = 50 h

Preparation and follow-up (of the lecture) = 55 h

Preparation for examination = 45 h

The entire workload encompasses 150 hours, which equals 5 ECTS credit points.

9. Duration of module

The module is held within one semester.