

## Environmental Technology: Waste (I002591)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits** 3.0                      **Study time** 90 h

**Course offerings and teaching methods in academic year 2023-2024**

A (semester 2)	English	Gent	excursion lecture
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**Lecturers in academic year 2023-2024**

Ronsse, Frederik	LA24	lecturer-in-charge
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**Offered in the following programmes in 2023-2024**

	crdts	offering
<a href="#">International Master of Science in Sustainable and Innovative Natural Resource Management</a>	3	A
<a href="#">Master of Science in Bioscience Engineering: Sustainable Urban Bioscience Engineering</a>	3	A
<a href="#">Master of Science in Environmental Science and Technology</a>	3	A
<a href="#">Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)</a>	3	A

**Teaching languages**

English

**Keywords**

Management of solid waste, material flows, recycling, reuse, thermal energy recovery, biological treatment processes of solid waste

**Position of the course**

The purpose of this course is to provide the students with the insight into the wide range of techniques to process solid wastes. Therein, emphasis is made – in decreasing order of importance – to reuse, materials reuse (recycling), energy recovery and disposal with respect to the aim of solid waste and material management. The technical and organizational aspects of waste prevention, transformation and disposal are dealt with from the environmental, legal and economical angle. The course aims to enable the students to formulate a well-reasoned answer to the waste and material reuse issues today's and tomorrow's society encounters.

**Contents**

1. Introduction
  - Material and waste flows, resource efficiency, linear versus circular economy
  - Waste and recycling policies: key concepts
2. Recycling and material reuse technology: physical unit processes
  - Densification and size reduction techniques
  - Sorting based on density, size, optical and IR properties, electromagnetic properties. Flotation and dewatering
  - Examples of some relevant recycling process designs for specific waste streams: packaging plastics and waste rubber, glass containers, e-waste, construction, demolition and wood waste.
3. Biological waste treatment processes
  - Composting
  - Anaerobic digestion

- Biodrying
- 4. Thermal processing and energy recovery
  - Incineration and required flue gas treatment
  - Incinerator designs for municipal solid waste, fluid bed combustion for RDF and sewage sludge
  - Energy recovery: basic concepts
- 5. Landfilling
  - Types of landfill
  - Construction of a landfill and subsequent exploitation
  - Collection of landfill gas and leachate; appropriate landfill gas valorization and leachate treatment systems
  - Clean-up of disused landfill site; material reuse by landfill mining

#### **Initial competences**

Basic knowledge of chemistry, physics

#### **Final competences**

- 1 Have basic insights into solid waste material flows and their collection.
- 2 Have basic insights into the available techniques for recovery of solid waste with emphasis on maximum material reuse and/or energy recovery.
- 3 Have basic insights into the available techniques for final disposal of solid waste.
- 4 Formulate proposals to prevent, usefully reuse or dispose of a specific material or solid waste stream

#### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

#### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

#### **Teaching methods**

Excursion, lecture

#### **Extra information on the teaching methods**

Theory consists of lectures. Practical examples of management of specific waste or material streams are illustrated by means of company visits.

#### **Learning materials and price**

English lecture slides will be distributed to students. All course material, including background reading material, is distributed electronically by means of Ufora

#### **References**

Tchobanoglous, G., Kreith, F (2002). Integrated solid waste management, 2nd Ed. McGraw-Hill, Inc., New York - Williams P (2005). Waste treatment and disposal. Wiley, England.

#### **Course content-related study coaching**

The lecturer is available during and after the lectures for questioning, feedback and guidance. Additionally, the lecturer can be consulted electronically through e-mail, or personally upon making an appointment

#### **Evaluation methods**

end-of-term and continuous assessment

#### **Examination methods in case of periodic evaluation during the first examination period**

Written assessment with open-ended questions

#### **Examination methods in case of periodic evaluation during the second examination period**

Written assessment with open-ended questions

#### **Examination methods in case of permanent evaluation**

Participation, assignment

#### **Possibilities of retake in case of permanent evaluation**

examination during the second examination period is possible in modified form

#### **Extra information on the examination methods**

The evaluation consists of a closed-book written exam, with open questions

#### **Calculation of the examination mark**

Students who eschew period aligned and/or non-period aligned evaluations for this course unit

may be failed by the examiner.