

## Resource Recovery from Wastewater (1002771)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

<b>Course size</b>	<i>(nominal values; actual values may depend on programme)</i>		
<b>Credits</b> 3.0	<b>Study time</b> 90 h	<b>Contact hrs</b>	30.0 h

### Course offerings and teaching methods in academic year 2021-2022

A (year)	English	Gent	online discussion group	5.0 h
			lecture	15.0 h
			project	2.5 h
			seminar: coached exercises	2.5 h
			guided self-study	2.5 h
			self-reliant study activities	2.5 h

### Lecturers in academic year 2021-2022

Du Laing, Gijs	LA24	lecturer-in-charge
Ganigué, Ramon	LA25	co-lecturer
Rabaey, Korneel	LA25	co-lecturer
Vanoppen, Marjolein	LA24	co-lecturer

### Offered in the following programmes in 2021-2022

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

### Teaching languages

English

### Keywords

Resource recovery, recycling, wastewater, water

### Position of the course

In this web-based course participants are made familiar with processes used for recovery of valuable resources from liquid waste streams, as well as technologies and unit operations involved in these. The participants learn what type of components can be recovered from wastewater streams originating from various industrial activities. They learn to describe the fundamental principles and commonly applied technologies to recover resources from various wastewater streams, including the advantages, disadvantages and typical application area of each technology. They learn to set a design basis for the different recovery technologies, conduct preliminary reactor sizing and calculate performance predictions. Moreover, opportunities, challenges and research needs for resource recovery from wastewater are identified in terms of environmental and economic benefits.

### Contents

- Introduction to resource recovery from wastewater
- Nutrients (N and P) recovery from wastewater
- Recovery of organics from wastewater
- Recovery of metals from wastewater
- Water reuse
- Energy recovery from wastewater
- Case studies

### **Initial competences**

Advanced knowledge of chemistry (min. 15 ECTS at academic level), basic knowledge of microbiology and microbial technology, mathematics and physics (min. 15 ECTS at academic level)

### **Final competences**

- 1 Have systematic and applied insights in techniques for qualitative and quantitative exploration and physicochemical characterisation of resources present in the environment, and in different physical and (bio)chemical processing technologies and industrial processes to extract resources from liquid waste materials, generated throughout the value chain, and transform them into valuable products
- 2 Be able to select, apply and develop innovative technologies for optimising material flows in the value chain, with a particular focus on resource recovery from waste, taking the industrial process context into consideration.
- 3 Understand the importance of resource recovery from wastewater within the industry value chains of the 21st century in general and the global low carbon economy in particular;
- 4 Describe some of the key components that can be recovered from wastewater streams originating from various industrial activities;
- 5 Describe the fundamental principles and commonly applied technologies to recover resources from various wastewater streams, including the advantages, disadvantages and typical application area of each technology;
- 6 Set a design basis for the different recovery technologies, conduct preliminary reactor sizing and calculate performance predictions;
- 7 Identify opportunities, challenges and research needs for resource recovery from wastewater in terms of environmental and economic benefits.

### **Conditions for credit contract**

This course unit cannot be taken via a credit contract

### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

### **Teaching methods**

Guided self-study, lecture, online discussion group, project, self-reliant study activities, seminar: coached exercises

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

Web-based course with additional assignment.

### **Learning materials and price**

All course materials, including videlectures, slides and background reading materials, are distributed electronically by means of the e-learning platform.

### **References**

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

The lecturers are available through the e-learning platform for questioning, feedback and guidance.

### **Evaluation methods**

end-of-term evaluation and continuous assessment

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

Written examination with open questions, written examination with multiple choice questions, written examination

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

Written examination with open questions, written examination with multiple choice questions, written examination

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

Written examination with open questions, written examination with multiple choice questions, participation, assignment

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

examination during the second examination period is possible in modified form

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