Course Specifications

Valid as from the academic year 2018-2019

Bioresource Recovery Processes and Engineering (I002403)

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

Credits	6.0	Study time	150 h	Contact hrs	60.0 h

Course offerings in academic year 2018-2019

A (semester 1)	English
B (semester 1)	

Lecturers in academic year 2018-2019

Meers, Erik	LA24	lecturer-in-charge
Ganigué, Ramon	LA25	co-lecturer

Offered in the following programmes in 2018-2019	crdts	offering
Master of Science in Bioinformatics (main subject Systems Biology)	3	B
Master of Science in Biochemistry and Biotechnology	3	B
International Master of Science in Environmental Technology and Engineering	6	A
Exchange programme in Biochemistry and Biotechnology (master's level)	3	B
Exchange Programme in Bioinformatics (master's level)	3	B

Teaching languages

English

Keywords

Biotechnology, environmental technology, reuse, bio-energy, nutrient recovery

Position of the course

Contents

Resource recovery involves the upgrading of what is considered today as a waste, to a resource. It has become essential in the context of a circular economy. In this course, we will look at some of the key recovery approaches existing, such as: bio-energy via biogas, organics as compost or even added value products, nutrients to go back to agriculture and so on. The course essentially comprises of two parts.

In Part I, the bio-based approaches for recovery are discussed, particularly in a context of urban/industrial environments. Part I is offered in two sessions depending on the background of the incoming students. **Course offering A** targets students e.g. from the International Master Programme on Environmental Technology and Engineering and offers the sections on anaerobic digestion, composting, fermentation, bio-electrochemical systems, sulfur removal and recovery, biometallurgy. The theoretical course aspects are followed by design calculations, a term paper and a study visit. **Course offering B** targets students e.g. from the faculty of Science – Biotechnology and offers first an introductory course to wastewater treatment processes after which the same topics as for session A are dealt with. The theoretical course aspects are followed by a term paper and a study visit.

Part II (only for course offering A) focuses on agro-industrial processes and biowaste refineries. Part II will build further on biomass conversion techniques discussed in Part yet focuses more on downstream processes that allow recovery of nutrients, energy, chemicals and materials from crops, agro-residues and biobased wastestreams, and on further upgrading and utilization of recovered resources. The course works around actual innovative industrial cases and includes plant visits.

Initial competences

The course “Wastewater treatment” is an essential prerequisite. Those students who do not have this background need to follow Session B of Part I, which includes an introductory course to wastewater treatment.

Final competences

Having the ability to critically evaluate technologies and processes for resource recovery. This includes both qualitative and quantitative assessments.

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

Guided self-study, excursion, lecture, microteaching, self-reliant study activities, lecture: plenary exercises

Extra information on the teaching methods

Theory is taught via plenary lectures, this goes as well for the theoretical exercises. An excursion to a relevant installation is planned.

Learning materials and price

Course notes for part I are sold by lecturer, at printing cost

References

Meers E., Michels, E. & Velthof, G. (2018). The recovery and use of mineral nutrients from organic residues. Wiley handbook in the Renewable Resources series (in press).
Vaneeckhaute, C., Meers, E. et al. (2013) Closing the nutrient cycle by using bio-digestion waste derivatives as synthetic fertilizer substitutes: A field experiment.
Tarayre et al. (2016) New perspectives for the design of sustainable bioprocesses for phosphorus recovery from waste.
Rabaey, K. and W. Verstraete (2005). "Microbial fuel cells: novel biotechnology for energy generation." Trends in Biotechnology 23(6): 291-298 Resource recovery and reuse in organic solid waste treatment. Eds. Piet Lens, Bert Hamelers, Hany Hoitink & Werner Bidlingmaier. IWA publishing 2005. ISBN 184339054XBiofuels for fuel cells: Renewable energy from biomass fermentation. Eds. Piet Lens, Peter Westermann, Marianne Haberbauer and Angelo Moreno. IWA publishing 2005. ISBN 184339 092 2

Course content-related study coaching

Study coaching is offered during the practical exercises and after the theoretical courses. For the students who have difficulties with certain topics, additional lectures can be organized. Secondly, rehearsal sessions are organized at the end of the semester in which questions are answered and examples of examination questions are given.

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, open book examination

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

Written examination with open questions, written examination, open book examination

Examination methods in case of permanent evaluation

Assignment, peer assessment

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 exam consist of a series of short questions, followed by some longer questions in which the student has to show ability to reason. The exercises are open-book.

Calculation of the examination mark

Part I (50%): theory 12/20, exercises 8/20 ;
Part II (50%): assignment 10/20, theory 10/20.
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.