

End-of-Life Management of Packaging (I690011)

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

Credits 5.0 **Study time** 150 h **Contact hrs** 50.0h

Course offerings and teaching methods in academic year 2022-2023

A (Year)	English	Kortrijk	lecture: plenary exercises	10.0h
			excursion	10.0h
			self-reliant study activities	5.0h
			lecture	25.0h

Lecturers in academic year 2022-2023

De Meester, Steven	LA24	lecturer-in-charge
Nachtergaele, Pieter	LA24	co-lecturer

Offered in the following programmes in 2022-2023

Master of Science in Sustainable Food Packaging	crdts	offering
	5	A

Teaching languages

English

Keywords

Management of end-of-life packaging, material flows, recycling, reuse, thermal energy recovery

Position of the course

The purpose of this course is to provide the students with insights into the wide range of physicochemical techniques to process end-of-life food packaging. Therein, emphasis is made – in decreasing order of importance – on reuse, materials reuse (recycling), energy recovery and disposal with respect to the aim of solid waste and material management. The technical and organisational aspects of waste prevention, transformation and disposal are dealt with from an environmental, legal, and economical angle. Special attention is paid to specific material streams which constitute a challenge in society's transition towards a circular economy. The course enables the students to address food packaging and material reuse issues that industry is facing today and will face tomorrow.

Contents

1. Introduction
 - Material and waste flows, resource efficiency, linear versus circular economy
 - Waste and recycling policies in the EU: key concepts
 - Integrated waste management
 - Solid waste logistics
2. Recycling and material reuse technology: physical unit processes
 - Densification
 - Size reduction techniques
 - Sorting based on density, size, optical and IR properties, electromagnetic properties. Flotation and dewatering.
3. Recycling and material reuse technology: specific key waste streams
 - Plastic recycling: type of waste plastics, mechanical and thermal recycling, thermochemical recycling and gasification, energy recovery and refuse derived fuel
 - Paper/cardboard waste: types, energy and material recovery
 - Others: waste oils and lipids, food waste

4. Thermal processing and energy recovery

- Relevant physicochemical properties of waste and materials for energy recovery (density, heating values, proximate composition, elemental composition)
- Incineration of non-hazardous and hazardous waste and required flue gas treatment
- Grate ovens for municipal solid waste, fluid bed combustion for RDF and sewage sludge
- Non-conventional thermal valorisation: gasification and pyrolysis
- Energy recovery: steam cycle, organic Rankine cycle, cycle efficiency, district heating networks

5. Landfilling

- Types of landfill
- Construction of a landfill and subsequent exploitation
- Collection of landfill gas and leachate; appropriate landfill gas valorisation and leachate treatment systems
- Clean-up of disused landfill site; material reuse by landfill mining

Initial competences

Basic knowledge of chemistry and physics; Final competencies obtained in the course units 'Food packaging systems: materials, machines and packaging conditions'; 'Sustainability in food systems'.

Final competences

- 1 To have insights into material flows and the available techniques for collection, processing of end-of-life food packaging with an emphasis on maximum material reuse and/or energy recovery.
- 2 To formulate a proposal to prevent, reuse or dispose of a specific material or solid waste stream.
- 3 To qualitatively and quantitatively determine processes in packaging waste management.

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

Lecture: plenary exercises, Excursion, Lecture, Self-reliant study activities

Extra information on the teaching methods

Theory consists of lectures (can be online) (25 hrs). The calculation exercises are coached in plenary exercises (not online). (10 hrs)

Practical examples of management of food packaging waste are illustrated by means of company visits (not online). (10 hrs) Independent work (5 hrs)

Learning materials and price

A syllabus will be distributed. All other course material is distributed electronically by means of Ufora.

References

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

Assessment moments

end-of-term assessment

Examination methods in case of periodic assessment during the first examination period

Written examination with open questions

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

Written examination with open questions

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Students who eschew period aligned evaluations for this course unit may be failed by the examiner

Calculation of the examination mark

Written exam (100%)