

Food Packaging Systems: Materials, Machines and Packaging Conditions (I690006)

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

Credits 7.0 **Study time 210 h** **Contact hrs** 70.0h

Course offerings and teaching methods in academic year 2022-2023

A (semester 1)	English	Kortrijk	lecture	40.0h
			group work	5.0h
			excursion	7.5h
			lecture: plenary exercises	5.0h
			guided self-study	12.5h

Lecturers in academic year 2022-2023

Ragaert, Peter	LA23	lecturer-in-charge
Peeters, Roos	TW56	co-lecturer
Sampers, Imca	LA23	co-lecturer

Offered in the following programmes in 2022-2023

Master of Science in Sustainable Food Packaging	crdts	offering
	7	A

Teaching languages

English

Keywords

Packaging materials, packaging equipment, packaging conditions, hygienic design, packaging engineering, barrier properties, sealing properties, active and intelligent packaging, biobased & compostable packaging

Position of the course

This course provides knowledge and insights on three key aspects within food packaging: 1) materials used for packaging focusing on functionality and production techniques; 2) filling machines for food and beverages and 3) filling conditions including hygienic design and guidelines. This course also zooms in on recent advances and trends in food packaging such as active and intelligent packaging and biobased and compostable packaging.

Contents

1. Overview of packaging materials:
 - a. Glass
 - b. Metal
 - c. Paper
 - d. Plastics
2. Functionality of packaging materials
 - a. Permeability
 - b. Sealability
 - c. Thermal properties
 - d. Mechanical properties
 - e. Other properties (e.g. anti-fog, transparency)
3. Packaging engineering: production and functionalisation of packaging materials
 - a. Extrusion and co-extrusion

- b. Lamination
- c. Thermoforming
- d. Injection Blow Moulding
- e. Orientation
- f. Coating techniques:
 - f.i. Metallisation
 - f.ii. Ceramic coatings (AlO_x, SiO_x)
 - f.iii. Coatings on paper
- g. Susceptor technology
- 4. Adhesive and printing processes
 - a. Adhesive processes
 - b. Printing processes
 - c. Shrink sleeves
 - d. In-mould labelling
- 5. Packaging equipment and conditions
 - a. Type of equipment: both for food and beverages
 - b. Type of conditions: clean, ultraclean, aseptic
 - c. Hygienic design
 - d. Leak detection technology
- 6. Active & intelligent packaging
 - a. Active packaging
 - b. Intelligent packaging
- 7. Biobased and compostable plastics

Initial competences

Basic knowledge of organic chemistry is recommended

Final competences

- 1 To gain insights in engineering processes that give packaging materials the required functionality.
- 2 To explain the different factors that influence the performance of packaging materials for food products.
- 3 To gain insight in the interaction between food products, packaging materials, packaging equipment and packaging conditions
- 4 To perform calculations to determine the appropriate packaging configuration towards gas and water barriers.
- 5 To collect up-to-date and evidence-based information on the structure, processing and usage of packaging materials for food products
- 6 To gain insights in the multidisciplinary framework of food packaging and in the complexity and interactions within the packaging chain.
- 7 To critically evaluate the functionality, convenience and sustainability of the packaging of a selected product and communicate this clearly both in a written and oral format

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, Group work, Guided self-study, Excursion, Lecture

Extra information on the teaching methods

Lectures include guest lectures from companies to share their developments or insights on specific packaging topics. A selection of these lectures could take place online.

Plenary exercises focus on calculating oxygen and water ingress in food packaging (two students per group). These exercises should take place on campus. The **group work** elaborates on a selected packaged food product, in which the students (three students per group) need to describe the packaging configuration in relation to the shelf-life of the food product. Next to the functionality of the package, the students should describe aspects related to convenience and sustainability of the package. This group work includes two feedback moments to discuss the progress of the work. Presentation of the final work is performed through a written assignment and oral presentation. The selected food product will

further be elaborated in terms of microbiological and chemical stability in a second group work within the course unit 'Shelf life of packed foods'. The feedback moments could take place online.

Study visit includes company visits.

Guided self-study: in the framework of the group work, the students should gather relevant information enabling them to identify the packaging configuration of the selected packaged food product .

Learning materials and price

Slides are provided for every lecture.

References

Robertson, G.L. (Ed.) (2013). Food Packaging. Principles and Practice. Third Edition. Taylor & Francis, Boca Raton. ISBN 978-1-4398-6241-4.

Handbook of Hygiene Control in the Food Industry; Edited by Huub Lelieveld, John Holah and Domagoj Gabric, 756 p., 9780081001554.

Hygienic design of food factories; Edited by John Holah, Huub Lelieveld; 824 p., 9781845695644.

Course content-related study coaching

Student counselling is foreseen 1) during or after theoretical sessions, 2) during or after practical sessions and 3) by means of e-mail or personal meeting.

Assessment moments

end-of-term and continuous assessment

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

Written examination, Oral examination

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

Written examination, Oral examination

Examination methods in case of permanent assessment

Participation, Oral examination, Peer assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

The **examination** consists of a first part: written examination and a second part: oral examination (20 minutes) with written preparation (40 minutes).

The group work is evaluated via non-period related evaluation for which an **assignment** should be submitted and a **presentation** should be given, followed by Q&A. A **peer assessment** is also included in this evaluation.

The plenary exercises and the obtained results for the calculation of O₂- and H₂O-ingress in food packaging will be part of an **assignment** in the form of a report.

Participation on company visits and plenary exercises is compulsory.

Calculation of the examination mark

Periodic evaluation: written examination + oral examination with written preparation: 60%

Non-periodic evaluation: 40%

- Group work assignment (incl. peer-assessment and participation): 40%
- Presentation and defence of the group work: 40%
- Assignment on plenary exercises: 20%

The student needs to participate in all assignments and exams that are part of the evaluation (period aligned and non-period aligned). Students who eschew period aligned and/or non-period aligned evaluations for this course unit, or when one obtains a score lower than 8/20 (not rounded up) on one of

both parts (period aligned or non-period aligned evaluation), they will fail for this course unit. In that case the end score is set to 9/20 even when the calculation indicates a point of 10/20 or more.