

## Packaging Technology (I002673)

**Cursusomvang** (nominale waarden; effectieve waarden kunnen verschillen per opleiding)

**Studiepunten 5.0**                      **Studietijd 150 u**

**Aanbodsessies en werkvormen in academiejaar 2024-2025**

|                |        |      |  |
|----------------|--------|------|--|
| A (semester 2) | Engels | Gent | hoorcollege<br>zelfstandig werk<br>groepswerk<br>werkcollege<br>excursie |
|----------------|--------|------|--|

**Lesgevers in academiejaar 2024-2025**

|                |      |                           |
|----------------|------|---------------------------|
| Ragaert, Peter | LA23 | Verantwoordelijk lesgever |
|----------------|------|---------------------------|

**Aangeboden in onderstaande opleidingen in 2024-2025**

|  | stptn | aanbodsessie |
|--|-------|--------------|
| <a href="#">Master of Science in de bio-ingenieurswetenschappen: levensmiddelenwetenschappen en voeding</a>                    | 5     | A            |
| <a href="#">Master of Science in de biowetenschappen: voedingsindustrie</a>  | 5     | A            |
| <a href="#">Uitwisselingsprogramma bio-ingenieurswetenschappen: chemie en bioprocestechnologie (niveau master-na-bachelor)</a> | 5     | A            |
| <a href="#">Uitwisselingsprogramma bio-ingenieurswetenschappen: Food Science and Nutrition (niveau master-na-bachelor)</a>     | 5     | A            |

**Onderwijstalen**

Engels

**Trefwoorden**

Packaging engineering, sealing technology, filling systems, active and intelligent packaging, biobased and compostable plastics, circular packaging

**Situering**

This course gives an overview of important engineering techniques to enhance functionality of packaging materials focusing on barrier technology, temperature resistance, sealing technology and active and intelligent packaging systems. Both conventional packaging materials as well as re-usable, recyclable or renewable packaging materials (e.g. bioplastics) are considered, also elaborating on different sustainable and safety aspects within a national and international context. Besides, filling systems for both solid and liquid products are elaborated.

**Inhoud**

### 1. Introduction

- 1.1. Role of packaging in today's society
- 1.2. Overview packaging materials
  - 1.2.1. Metal packaging
  - 1.2.2. Glass packaging
  - 1.2.3. Paper - paperboard
  - 1.2.4. Plastics
- 1.3. The packaging chain: many stakeholders

### 2. Packaging engineering

- 2.1. Introduction
- 2.2. Production techniques rigid and flexible packaging
- 2.3. Barrier technology
  - 2.3.1. Factors affecting barrier capacities
  - 2.3.2. Case: PredOxyPack
  - 2.3.3. High barrier technology

- 2.3.4. *Low barrier technology*
- 2.4. Temperature resistance technology
  - 2.4.1. *Crystallisation technology*
  - 2.4.2. *Susceptor technology*
- 2.5. Nucleating and clarifying agents
- 2.6. Anti-fog coatings

### **3. Adhesive and printing processes**

- 3.1. Adhesive processes
- 3.2. Printing processes
- 3.3. Shrink sleeves
- 3.4. In Mould Labelling

### **4. Sealing technology**

- 4.1. Introduction
- 4.2. Seal behaviour of plastics
- 4.3. Sealing systems
- 4.4. Seal behaviour
- 4.5. Closures for plastic bottles and tubs
- 4.6. Tamper-evident and safety closures

### **5. Filling systems**

- 5.1. Filling systems for solid products
- 5.2. Filling systems for liquid products
- 5.3. Leak detection technology

### **6. Active and intelligent packaging**

- 6.1. Active packaging
  - 6.1.1. *Oxygen scavengers*
  - 6.1.2. *Carbon dioxide scavengers/emitters*
  - 6.1.3. *Water absorbers*
  - 6.1.4. *Ethylene absorbers*
  - 6.1.5. *Antimicrobial packaging*
  - 6.1.6. *Self-heating cans and containers*
- 6.2. Intelligent packaging
  - 6.2.1. *Time-temperature indicators (TTI's)*
  - 6.2.2. *Gas indicators*
  - 6.2.3. *Thermochromic inks*
  - 6.2.4. *Quality indicators*
  - 6.2.5. *Radio Frequency Identification (RFID)*
  - 6.2.6. *Provide protection against theft, counterfeiting and tampering*
  - 6.2.7. *Provide improved sorting instructions in the recycling sector*

### **7. Sustainability and packaging**

- 7.1. Circular economy & packaging
- 7.2. Biobased and compostable plastics
  - 7.2.1. *Classes*
  - 7.2.2. *Materials*
  - 7.2.3. *Resources and availability*
  - 7.2.4. *Functionality*
  - 7.2.5. *Waste management options*
  - 7.2.6. *Commercial applications as packaging materials*
  - 7.2.7. *Challenges*

### **8. Quality control of packaging materials**

- 8.1 Performance
- 8.2 Safety of packaging materials
  - 8.2.1. *Factors influencing migration*
  - 8.2.2. *Legislation*

### **9. Packaging design and logistics**

### **10. References**

#### **Begincompetenties**

Basic knowledge organic chemistry is recommended.

#### **Eindcompetenties**

- 1 Gain insight in processes which are used to improve the barrier properties, thermal properties and seal properties of packaging materials for food and non-food products
- 2 Analyse and evaluate the impact of the composition of packaging materials as well as the type of filling systems on the quality and shelf-life of packaged food and non-food products

- 3 Perform calculations to determine the appropriate packaging configuration towards gas barrier
- 4 Critically evaluate the safety of packaging materials towards food contact by means of legislation and simulations
- 5 Collect information on the structure, processing and usage of packaging materials both for food and non-food products
- 6 Gain insight on the one hand in the multidisciplinary framework of food and non-food packaging and on the other hand in the complexity and interactions within the packaging chain
- 7 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
- 8 Gain insight in the various factors determining the sustainability of packaging materials both from a resource level, usage level and waste processing level
- 9 Situate the impact of both food and non-food packaging in a broader social framework, taking into account the needs/requirements of various stakeholders within the packaging chain

#### **Creditcontractvoorwaarde**

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

#### **Examencontractvoorwaarde**

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

#### **Didactische werkvormen**

Groepswerk, Werkcollege, Excursie, Hoorcollege, Zelfstandig werk

#### **Toelichtingen bij de didactische werkvormen**

Lectures include guest lectures from companies to share their developments or insights on specific packaging topics. Seminars focus on calculating oxygen ingress in packaging and on evaluating migration profiles of food packaging. The group work elaborates on a selected packaged product, in which the students (two students per group) need to describe the packaging configuration in relation to the packaged product and propose modifications to increase functionality, convenience or 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. Excursion includes company visits. Independent work is in the framework of the group work; the students should gather relevant information enabling them to identify the packaging configuration of the selected packaged product.

#### **Studiemateriaal**

Type: Syllabus

Naam: Packaging technology  
 Richtprijs: € 5  
 Optioneel: nee  
 Taal : Engels  
 Aantal pagina's : 137  
 Beschikbaar op Ufora : Nee  
 Online beschikbaar : Nee  
 Beschikbaar in de bibliotheek : Nee  
 Beschikbaar via studentenvereniging : Ja

Type: Slides

Naam: Packaging technology  
 Richtprijs: Gratis of betaald door opleiding  
 Optioneel: nee  
 Taal : Engels  
 Beschikbaar op Ufora : Ja  
 Online beschikbaar : Nee  
 Beschikbaar in de bibliotheek : Nee  
 Beschikbaar via studentenvereniging : Nee

#### **Referenties**

- Ahvenainen, R. (Ed.). (2003). Novel food packaging technologies. Woodhead Publishing Limited, Cambridge. ISBN 1-85573-675-6.
- Morris, S.A. (Ed.). (2011). Food and package engineering. Wiley-Blackwell, West Sussex. ISBN 978-0-8138-1479-7.

- Robertson, G.L. (Ed.) (2013). Food Packaging. Principles and Practice. Third Edition. Taylor & Francis, Boca Raton. ISBN 978-1-4398-6241-4.
- ten Klooster, K., Dirken, J.M., Lox, F., Schilperoord, A.A. (Ed.) (2008). Zakboek Verpakkingen. Reed Business, Doetinchem. ISBN 978-90-6228-605-8.
- Thielen, M. (Ed.) (2012). Bioplastics – Basics, applications, markets. Polymedia Publisher GmbH, Mönchengladbach. ISBN 978-3-9814981-1-0
- Yam, K.L. (Ed.) (2009). The Wiley Encyclopedia of Packaging Technology. Wiley, Hoboken. ISBN 978-0-470-08704-6.

#### **Vakinhoudelijke studiebegeleiding**

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

#### **Evaluatiemomenten**

periodegebonden en niet-periodegebonden evaluatie

#### **Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode**

Mondelinge evaluatie

#### **Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode**

Mondelinge evaluatie

#### **Evaluatievormen bij niet-periodegebonden evaluatie**

Werkstuk

#### **Tweede examenkans in geval van niet-periodegebonden evaluatie**

Examen in de tweede examenperiode is mogelijk

#### **Toelichtingen bij de evaluatievormen**

The oral examination consists of a written preparation (40 minutes) followed by an oral examination (20 minutes). There are two other evaluation methods, besides the oral examination: evaluation of the project (group work) and evaluation of the report of the seminars. The evaluation of the project is based on the written report and on a presentation followed by a Q&A-session.

#### **Eindscoreberekening**

Periodic evaluation: oral examination with written preparation: 60%

Non-periodic evaluation: 40%

- Project: 40%
- Presentation and defense of the project: 40%
- Report on plenary exercises: 20%

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner. In case of achieving a mathematical number of 10 or more out of 20 for this course unit, this will be converted into 7 out of 20.