



#### 4. Processes based on electromagnetic radiation

##### 4.1. Microwave and dielectric heating

##### 4.2. Infrared heating

##### 4.3. Irradiation

#### 5. Food packaging

##### 5.1. Function of packaging: introduction

##### 5.2. Types of Packaging

##### 5.3. Packaging systems

##### 5.4. Modified atmosphere packaging

##### 5.5. Active and intelligent packaging

##### 5.6. Safety aspects of packaging migration

#### 6. Nonthermal processing

##### 6.1. Concept of nonthermal processing

##### 6.2. Electromagnetic processes

###### 6.2.1. Pulsed electric field

###### 6.2.2. Oscillating magnetic fields

###### 6.2.3. UV light

###### 6.2.4. Pulsed light and pulsed UV

###### 6.2.5. Irradiation

###### 6.2.3. Cold plasma

##### 6.3. Physical processes

###### 6.3.1. High pressure processing

###### 6.3.2. Ultrasound

##### 6.4. Chemical oxidants

###### 6.4.1. liquid treatment

###### 6.4.2. gaseous treatment

#### Initial competences

Have taken Inorganic Chemistry I and II, Modern Aspects of Food (Introduction of Food Science), Organic Chemistry I and II

#### Final competences

- 1 Recall the properties of food raw materials and describe, select and apply different preparation techniques for raw materials prior to processing
- 2 Explain the principles of various unit operations including thermal processing, freezing, dehydration, aseptic processing, high pressure processing, microwave heating, irradiation...etc.
- 3 Perform calculations on heat inactivation of food associated microorganisms
- 4 Explain principles of fluid flow and rheology and their applications
- 5 Be aware of the impact of these unit operations on the quality of food products in a wide sense
- 6 Understand alternatives to heat treatments in order to guard the microbial food safety and quality of food products
- 7 Communicate on the state-of-the-art of a food technology topic through paper writing and presentation

#### 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

Practicum, Lecture, Project, Seminar: coached exercises

#### Extra information on the teaching methods

Theory lectures, lab practicals. exercises, project: paper + presentation

Exercises on heat inactivation of food associated microorganisms

Lab practicals: the student learns to use several unit operations

Project: the student studies in detail a selected food technology and describes in a small paper the state of the art of said technology. Subsequently the student communicates the findings through oral presentation

#### Learning materials and price

## References

- HELDMAN D.R. & LUND D.B. (2007). Handbook of food engineering (second edition), Boca Raton, CRC Press, 1023p.
- PASSOS, M.L., RIBEIRO, C.P. (2010). Innovation in Food Engineering. New techniques and products. CRC Press, 721p. ISBN 978-1-4200-8606-5
- SINGH, R.P. & HELDMAN, D.R. (2001). Introduction to food engineering. San Diego, Academic Press Inc., 499 p. ISBN 0-12-646384-0
- VALENTAS, K.J., ROTSTEIN, E. & SINGH, R.P. (1997). Handbook of Food Engineering Practice. Boca Raton, CRC Press, 718 p. ISBN 0-8493-8694-2
- AHAVENAINEN, R. (2003). Novel Food Packaging Technologies. Woodhead Publishing Limited, Cambridge, ISBN 1-85573-675-6
- Air Products. A fresh approach to modified atmosphere packaging (MAP).
- BOSSET, J.O., GALLMAN, P.U., SIEBER, R. (1994) Influence of light transmittance of packaging materials on the shelf-life of milk and dairy products - a review. In: Mathlouthi, M. Food Packaging and preservation. Blackie Academic & Professional, London. ISBN 0-7514-0182-X
- COLES, R., McDOWELL, D., KIRWAN, M.J. (2003). Food Packaging Technology, Blackwell Publishing, Oxford. ISBN 1-84127-220-5.
- KERRY, J.P., O'GRADY, M.N., HOGAN, S.A. (2006). Past, current and potential utilisation of active and intelligent packaging systems for meat and muscle-based products: a review. Meat Science 74, 113-130.
- OZDEMIR, M. & FLOROS, J.D. (2004). Active Food Packaging Technologies. Critical Review in Food Science and Nutrition, 44, 185-193.
- Packaging Europe, 2007. Volume 2.2, 2.3 and 2.5.
- ROBERTSON, G.L. (2006). Food Packaging. Principles and Practice. Second Edition. Taylor & Francis, Boca Raton. ISBN 0-8493-3775-5
- Soft Drinks International. May 2007.
- VICKERS, F.G. & MEDLING, J. (2005). Filling equipment. In Senior, D. & DEGE, N. Technology of bottled water. Blackwell Publishing, Oxford, ISBN 1-4051-2038-X

## Course content-related study coaching

Interactive counselling through Minerva, Electronic appointment booking, weekly office hours

## Assessment moments

end-of-term and continuous assessment

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

Oral examination, Written examination with open questions

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

Oral examination, Written examination with open questions

## Examination methods in case of permanent assessment

Report, Participation, Job performance 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

Midterm: multiple choice plus open questions, written only

Final exam: multiple choice plus open questions, written + oral explanation

## Calculation of the examination mark

Midterm: 10 %

project: paper + presentation: 20 %

practicum: participation + report+ quiz: 20%

Final exam: written + oral: 50%