

Food Microbiology and Preservation (O000152)

Course size (nominal values; actual values may depend on programme)
 Credits 5.0 Study time 150 h Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2019-2020

Offering	Language	Teaching Method	Hours
A (semester 2)	English	lecture	30.0 h
		lecture: plenary	2.5 h
		exercises	
		guided self-study	2.5 h
		practicum	20.0 h
		demonstration	2.5 h
		group work	2.5 h

Lecturers in academic year 2019-2020

Rajkovic, Andreja	LA23	lecturer-in-charge
Devlieghere, Frank	LA23	co-lecturer
Uyttendaele, Mieke	LA07	co-lecturer

Offered in the following programmes in 2019-2020

Programme	crdts	offering
Bachelor of Science in Food Technology	5	A

Teaching languages

English

Keywords

Food preservation, Microbial contamination, Micro-organisms, Microbial food safety, Pathogens, Hygiene, Spoilage, Microbial analysis edit

Position of the course

The objective is to obtain a basic knowledge about the microbial aspects of food preservation, food spoilage and food safety. Based on the elementary knowledge of general microbiology, biochemistry and molecular biology, the microbial aspects of food products are discussed. The theoretical part deals with the contamination of raw materials, the factors affecting growth of micro-organisms that can result in the spoilage of food products and food poisoning, contemporary and traditional preservation methods, microbial spoilage mechanisms of specific food product (groups) and most prominent foodborne pathogens and related foodborne diseases. The practical part consists of a basic training in microbiological analysis of foods, a training in the quantification of the effect of different factors on the microbial growth, shelf life and safety of food products by predictive modelling and laboratory analysis, analysis and solutions of cases studies pertinent to actual microbiological issues found in food industry and interpretation of the microbiological criteria concerning microbial contamination of food products.

Contents

Theory

1. Microbial contamination of raw material

- 1.1. Sources of contamination
- 1.2. Contamination of various foods

2. Growth of microorganisms in foods

- 2.1. Intrinsic factors
- 2.2. Extrinsic factors
- 2.3. Implicit factors

3. Microbial aspects of food preservation

- 3.1. Lowering the degree of acidity

- 3.2. Lowering the water activity
- 3.3. Changing the redox potential
- 3.4. Use of temperature
- 3.5. Use of rays
- 3.6. Chemical preservation
- 3.7. Use of natural antimicrobial substances
- 3.8. New experimental preservation methods
- 3.9. Combination Technology

4. Microbial spoilage of foods

5. Microbial Food poisoning

- 5.1. Food intoxications
- 5.2. Food infections

6. Predictive microbiology

Exercises

1. Microbiological basic techniques

- 1.1. Sampling
- 1.2. Culture media
- 1.3. Cultivation of micro-organisms
- 1.4. Preparation of dilution series
- 1.5. Membrane filtration technique (only description)
- 1.6. Counting micro-organisms
- 1.7. Confirmation techniques

2. Methods of microbiological analysis of food products

- 2.1. Determination of the total amount of micro-organisms in selected food products
- 2.2. Spoilage flora under different storage conditions
- 2.3. Hygiene indicators
- 2.4. Pathogenic micro-organisms
(in lab exercise non-pathogenic surrogates are used due to biosafety reasons)

3. Case studies (desk work)

- 4. Exercise on predictive microbiology and interpretation of the outcomes**
- 5. Microbiological criteria**

Initial competences

Basic knowledge on general microbiology and biochemistry is required.

Final competences

- 1 Understanding the behaviour of micro-organisms in food products and the factors influencing this behaviour
- 2 Being able to adapt food processes to extend the shelf life and increase microbial safety through the obtained knowledge of the microbial aspects of food preservation
- 3 Relating specific spoilage phenomena with specific (group of) microorganisms
- 4 Correlating specific micro-organisms with specific food poisoning scenario
- 5 Determining the microbial quality of food products through microbial analysis.
- 6 Interpretation of results from microbial analysis and predictive modeling

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Guided self-study, demonstration, group work, lecture, practicum, lecture: plenary exercises

Learning materials and price

- *For this course a book is available: Food microbiology and analysis by Prof. dr. Frank Devlieghere (ed.), Andreja Rajkovic, Simbarashe Samapundo, Mieke Uyttendaele, An Vermeulen, Liesbeth Jacxsens and Johan Debevere. Cost: 25 EUR*
Other learning materials are lecture slides in PDF, as well as notes for practical exercises in PDF.

References

Microbiological guidelines - interpretation of test results. 2018. by Prof. dr. Mieke Uyttendaele (ed.), Anja De Loy-Heyndrickx, An Vermeulen, Liesbeth Jacxsens, Johan Debevere and Frank Devlieghere, Publisher Die Keure
Modern food Microbiology. 2000. Edited by J.M. Aspen Publications, Inc
Microorganisms in foods. Part 5. Microbiological specifications of food pathogens 1996. ICMSF. Blackie Academic & Professional
Microorganisms in foods. Part 6. Microbial ecology of food commodities. 1998. ICMSF. Blackie Academic & Professional

Course content-related study coaching

For the theory as well as for the theoretical exercises, the student has the possibility to ask extra information or explanation to the lecturer during contact hours or e-mail. The same is foreseen for the practical exercises and a supervisor or a professor can be contacted for extra information. Slides of the lectures are available via online platform.

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

Written examination, participation, assignment, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

Examination takes place immediately after the teaching block in May. Theory: closed book written examination with open questions that cover major aspects of the course content, and require student to follow the lectures and to study from the books and provided PDF slides; open book exam which is based on a case study, in which student first prepares a written answer that is followed by an oral defence. Exercises: written examination (closed book), lab reports, participation and work on an assignment.

Calculation of the examination mark

Theory: period aligned evaluation (66%). Exercises: period aligned (22%) and permanent (12%) evaluation.

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.