Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Food microbiology (296660)

Nositelj kolegija

prof. dr. sc. Mirna Mrkonjić Fuka

Opis kolegija

This course provides students with both theoretical and practical knowledge in food microbiology, essential for ensuring food safety and quality from production to consumption. Students will explore the positive effects of microorganisms, such as fermentation, as well as their negative impacts, including spoilage and foodborne diseases.The course covers key microbiological processes in the production, processing, and storage of plant- and animal-based foods, the main groups of microorganisms involved, and strategies for controlling pathogenic and spoilage microorganisms through physical, chemical, and biological methods. Students will also gain insights into relevant legal regulations and molecular-microbiological techniques used for the identification and characterization of microorganisms in food. Lectures serve as a foundation for practical exercises, enabling students to independently analyze foods, detect, and identify relevant microbial groups, and apply their knowledge to real-world food safety and quality scenarios

ECTS: **6.00**

Engleski jezik: **R2**

E-učenje: **R1 (s elementima R2)**

Sati nastave: 16
Predavanja: 44
Laboratorijske vježbe: 16

Izvođač predavanja

- doc. dr. sc. Irina Tanuwidjaja

Izvođač vježbi

- Valentina Odorčić, mag. ing. agr.

Ocjenjivanje

Dovoljan (2): 60%
Dobar (3): 71%
Vrlo dobar (4): 81%
Izvrstan (5): 91%

Vrsta kolegija

- Graduate studies / MS Courses taught in English (Izborni kolegij, 2. semestar, 1. godina)

Opće kompetencije

No course pre-requisite is necessary. However, an introductory microbiology course is strongly recommended since several topics will assume prior knowledge of certain microbiological terms and concepts.

Developed by Superfluo d.o.o. • www.superfluo.hr

Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Oblici nastave

- Lectures
- Assessments
- Laboratory practice/exercises

Ishodi učenja i način provjere

Ishod učenja	Način provjere
O1. Critically evaluate the role and technological significance of microorganisms in the production, spoilage, and preservation of foods of plant and animal origin, integrating microbial physiology with food system dynamics	Written exams testing theoretical understanding. Practical laboratory assessments evaluating technical skills
O2. Analyze and assess microbiological hazards across the food production chain, with particular emphasis on spoilage and pathogenic bacteria, microscopic fungi, and their toxins, and propose science-based risk mitigation strategies	Written exams testing theoretical understanding. Practical laboratory assessments evaluating technical skills
O3. Critically interpret the effects of intrinsic and extrinsic factors on the growth, survival, reproduction, and inactivation of microorganisms in food and agricultural products using predictive microbiology concepts.	Written exams testing theoretical understanding. Practical laboratory assessments evaluating technical skills
O4. Apply and compare classical, biochemical, and molecular microbiological methods for the detection, identification, characterization, and quantification of microorganisms in food systems	Written exams testing theoretical understanding. Practical laboratory assessments evaluating technical skills
O5. Evaluate and design integrated microbial control strategies in food production, including the implementation and critical assessment of HACCP systems and Good Hygiene Practices (GHP).	Written exams testing theoretical understanding. Practical laboratory assessments evaluating technical skills
O6. Formulate and critically evaluate the application of beneficial microorganisms, including starter cultures and probiotics, in fermented and functional foods, assessing their technological performance, safety, regulatory aspects, and health impacts	Written exams testing theoretical understanding. Practical laboratory assessments evaluating technical skills
O7. Critically analyze, synthesize, and interpret scientific literature in food microbiology to address complex professional and research problems using evidence-based reasoning.	Written exams testing theoretical understanding. Practical laboratory assessments evaluating technical skills

Način rada

Obveze nastavnika

Regular lectures and laboratory exercises

Obveze studenta

Regular attendance of lectures and presentation of laboratory of exercises in written form.

Developed by Superfluo d.o.o. • www.superfluo.hr

Sveučilište u Zagrebu Agronomski fakultet
Svetošimunska cesta 25, 10000 Zagreb
Telefon: +385 (0)1 2393 777
E-mail: dekanat@agr.hr
Web: www.agr.unizg.hr

Tjedni plan nastave

1. Introduction and scope of Food microbiology. Microorganisms and Food. Historical overview and the most important achievements in the field of food microbiology
2. Prokaryotic and eukaryotic microorganisms occurring in food and on agricultural products. External and internal factors affecting the growth and reproduction of microorganisms in food. Origin of microorganisms in food
3. Food poisoning caused by microbially contaminated food – foodborne intoxications and toxicoinfections. Antibiotic-resistant bacteria in food. Food as a source of antibiotic resistance genes.
4. Microbial toxins and their impact on human health. Growth, reproduction, and occurrence of molds and mycotoxins on agricultural products.
5. Significance of enterobacteria in food microbiology. Biochemical tests for the detection and identification of enterobacteria
6. Microbial spoilage of selected foods of plant and animal origin
7. Control of microorganisms in food. Inhibition of microbial growth in food through the application of physical and chemical methods.
8. Beneficial microorganisms in food. Lactic acid bacteria. Selection and application of starter/bioprotective cultures.
9. Role of beneficial microbiota in food processing.Definition of probiotic cultures. Cultivation, selection, and application of probiotic cultures.
10. Legal regulations on the microbiological quality of food and standards. HACCP system. Case study – development of a HACCP plan
11. Methods for isolation and identification of microorganisms in food. Implementation of molecular methods in microbiological analysis of foodstuffs. Metabolomics
12. Preparation of a work plan for the microbiological analysis of food and aw analysis. Morphological and phenotypic characterization of bacterial isolates.
13. Microbiological analysis of the beneficial microbiota of a selected food. Determination of technological characteristics of lactic acid bacteria isolated from food (proteolysis, lipolysis, acidification) – preliminary test. Multiplication of microbial biomass.
14. Determination of technological characteristics of lactic acid bacteria isolated from food (proteolysis, lipolysis, acidification) – final test. Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) – preliminary test
15. Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) – final test

Preporučena literatura

1. Doyle, M., Diez-Gonzalez, F. and Hill, C. (Eds.). 2019. Food Microbiology: Fundamentals and Frontiers, Fifth Edition. doi:10.1128/9781555819972
2. Salminen. S and Wright, A. V. 1998. Lactic Acid Bacteria, Marcel Dekker Lee Y K, Salminen S 2009. Handbook of Probiotics and Prebiotics. A John Willey and Sons Inc. Publication Sandholm T. M. Saarela M. 2003. Functional Dairy Products CRC Woodhead Publishing Ltd

Sličan kolegij na srodnim sveučilištima

- Food Microbiology at UNIZG PBF
- Food Microbiology and Hygiene Laboratory at BOKU, Austria

Developed by Superfluo d.o.o. • www.superfluo.hr