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| **Title and Code** of the subject:**Microbiological aspects of food quality and safety, MTMEL7011A** | **ECTS Credit Points: 4** |
| **Type** of the subject: compulsory / optional |
| **Ratio of theory and practice: 50/50** (credit%) |
| **Type and number of classes per semester**: 28 hour(s) lecture and 28 hour(s) practice per **semester** Number of teaching hours / week :2+2 (lecture and practice) |
| **Type of exam**: exam / practical course mark |
| **Subject in the curriculum:** semester 2. |
| Preliminary requirements:- Basics of food microbiology |

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| **Summary of content - theory**:  |
| The aim of the subject is to provide knowledge about the foodborne pathogens and foodborne diseases. The microbiota of the different food products, and their characteristic microbiota, focusing on the microbes causing spoilage and foodborne pathogens.Basic skills and knowledge during the practice enables student to plan and do food microbiological examinations for quality detection. 1. History of Microorganisms in Food. Role, and Significance of Microorganisms in Foods. Microorganisms and food materials.
2. Introduction to Foodborne Pathogens. Faecal-oral infection route of foodborne pathogens. The pathogenesis of foodborne diseases.
3. Food Poisoning Caused by Gram-Positive Spore-forming.
4. *Staphylococcus aureus* and staphylococcal gastroenteritis. Listeria monocytogenes and foodborne listeriosis.
5. *Salmonella* genus and foodborne gastroenteritis caused by *Salmonella*.
6. *Escherichia coli* and foodborne gastroenteritis caused by *Escherichia coli*.
7. *Shigella* genus and shigellosis. *Yersinia* genus and yersiniosis. *Vibrio* genus and vibriosis. *Campylobacter* genus and campylobacteriosis.
8. Mycotoxigenic fungi and mycotoxins.
9. Foodborne Viruses and parasites.
10. Microorganisms in fresh meats and poultry. Microorganisms in processed meats and seafoods.
11. Microorganisms in milk, fermentation, and fermented and nonfermented dairy products.
12. Microorganisms in vegetable and fruit and in their products. Microorganisms in soft drinks and bottled waters.
13. Microorganisms in cereals and bakery products, sugars, candies.
14. Microorganisms in spices, oil rich seeds, coffee, tea, herbs. Microorganisms in cans and RDE, RDU products.
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| **Summary of content - practice**: |
| Skills to be learnt: how to work in the microbiology lab; how to gain extra information about the subject of investigation; microbiology calculations; 1. Equipment, culture media, sterilization
2. Sampling for microbiological analysis
3. Plating methods and quantification of microorganisms
4. Microbiology of fish and seafood
5. Detection of *S. aureus*; Gram staining
6. Contamination of eggs, Enterobacteriaceae count
7. Microbiology of plant products, measurement of water activity
8. Microbiology of frozen food and pastries, spore-forming bacteria
9. Methylene blue reduction test and detection of *Escherichia coli* from raw milk
10. Sensitivity of microbes against antimicrobial substances and environmental factors
11. Detection and identification of *Salmonella*
12. Detection and identification of *Listeria monocytogenes* and other *Listeria* species
13. Endospore staining
14. Detection and identification of *Campylobacter* ssp.
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| **Literature, handbooks in English**  |
| Jay, J. M., Loessner, M. J., Golden, D. A. (2005): Modern Food Microbiology. ISBN 978-0-387-23413-7Adams, M. R., Moss M. O. (2008): Food Microbiology. The Royal Society of Chemistry. ISBN 978-0-85404-284-5Karaffa E., Peles F (2014): Microbiological Aspects of Food Quality And Safety. Debreceni Egyetem, Debrecen.Madigan, M. T, Martinko, J. M., Bender K., Buckley, D., Stahl, D (2015): Brock Biology of Microorganisms, Benjamin Cumming, 14th edition 1030 oldal, ISBN 978-1-292-01831-7 |
| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**
* The student knows the tools and methods used for verification of food products and their manufacturing processes.
1. **Skills:**
* The student knows the tools and methods used for verification of food products and their manufacturing processes.
1. **Attitude:**
* Open, motivated and susceptible for the background and use of innovative and modern methods and their practical application, open for the paradigm shifts of food science and technology.
* Able to recognise the values in food safety and quality, receptive for the use of efficient methods and techniques.
1. **Autonomy and responsibility:**
* Has responsibility towards the safety of food products that were produced with his/her contribution. Able to work independently.
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| **Responsible lecturer: Dr. Erzsébet Karaffa** |
| **Other lecturer(s): Dr. Károly Pál senior research fellow; Dr. Peles Ferenc Árpád, senior research fellow, PhD, Dr. Bérczesné Szojka Anikó, assistant lecturer** |

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| **Terms of course completion:** |
| 1. Completing presentations, exercises
2. Giving presentation
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| **Form of examination:** |
| written exam |
| **Requirement(s) to get signature:** |
| Completion of practical course. |

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| **Exam questions:** |
| 1. Diseases contracted exclusively from foods, and diseases contracted predominantly from the consumption of food products
2. Main groups of foodborne pathogens and examples Fecal–oral routes of transmission of foodborne intestinal pathogens. Which foodborne agents noted are not contracted via the fecal–oral route
3. Site of action of the intestinal pathogens , and examples
4. Hurdles that an intestinal pathogen must overcome in order to cause illness
5. Virulence factors of Gram-positive Gram-negative pathogens.
6. Characteristics of *Staphylococcus aureus*, pathogenicity occurrence, and food poisoning
7. Characteristics of *Listeria monocytogenes*, pathogenesis of listerosis, and control of foodborne listerosis poisoning
8. Characteristics of *Bacillus cereus* and the different types of foodborne disease caused by it
9. The characteristics and importance of *Clostridium perfringens* foodborne pathogens. Foods involved in *C. perfringens* outbreaks
10. Foodborne botulism: name and characteristics of pathogens, pathogenesis, symptoms, and affected foods
11. Characteristics of *Salmonella* genus and foodborne gastroenteritis caused by *Salmonella*
12. Characteristics and occurrence of *Escherichia coli*, foodborne pathotypes (5) and their characteristics
13. Characteristics and occurrence of *Shigella* genus and shigellosis
14. Foodborne Yersiniosis: characteristics of pathogen, pathogenesis, symptoms, and affected foods. Characteristics of *Campylobacter* genus and foodborne campylobacteriosis
15. Foodborne pathogens of the *Vibrio* genus. Characteristics of the pathogens, the pathogenesis, symptoms, and affected foods
16. Characteristics of mycotoxigenic fungi and fist of ,most important mycotoxins and mycotoxin producing genera
17. Mycotoxins produced by *Aspergillus* and *Penicillium* (characterictics, symptoms, and affected foods)
18. Mycotoxins produced by *Fusarium* (characterictics, symptoms, and affected foods)
19. Overall characteristics of foodborne viruses and pathogenesis of most important ones
20. General characteristics of foodborne protozoa. List the important ones
21. Giardiasis: characteristics of the pathogens, the pathogenesis, symptoms, and affected foods Amoebic dysentery caused by *Entamoeba hystolitica*: characteristics of the pathogens, the pathogenesis, symptoms, and affected foods
22. Toxoplasmosis and sarcocystosis: characteristics of the pathogens, the pathogenesis, symptoms, and affected foods
23. Foodborne helminths and nematodes: characteristics of the pathogens, the pathogenesis, symptoms, and affected foods
24. Most important spoilage microbes and pathogens in milk and dairy products.
25. Most important spoilage microbes and pathogens in meat.
26. Most important spoilage microbes and pathogens in fish, shellfish and egg.
27. Most important spoilage microbes and pathogens in cereals and bakery products.
28. Most important spoilage microbes and pathogens in oil rich seeds and sugars, candies, and spices.
29. Most important spoilage microbes and pathogens in fruits and fruit products.
30. Most important spoilage microbes and pathogens in vegetables and vegetable products.
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