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| **Title and Code** of the subject:  **Molecular biology methods for food authentication, MTMEL7034A** | **ECTS Credit Points: 3** |
| **Type** of the subject: **optional** | |
| **Ratio of theory and practice: 50%/50%** (credit%) | |
| **Type and number of classes per semester**: 14 hours lecture and 14 hours practice per **semester**  Number of teaching hours / week : 1+1 (lecture and practice) | |
| **Type of exam**: exam | |
| **Subject in the curriculum:** semester 2 | |
| Preliminary requirements:- | |

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| **Summary of content - theory**: |
| Course objectives:  The students of the course will have a complex knowledge that focuses on the proof of origin that defines consumer protection. Students will learn the basics of molecular genetics, will be able to interpret species identification methods based on DNA tests, protein / peptide analysis, and fatty acid composition methods. Students will get to know the current limitations and the potential of different approaches to prove the origin of animal derived food and food products.   1. Basics of molecular genetics 2. Genetic inheritance, genetic structure of the population 3. The occurrence, importance and types of mutations 4. The genome 5. Biotechnics - Biotechnology 6. Methods to detect the species in animal derived foodstuffs 7. Genetic Methods I. 8. Genetic Methods II. 9. Quantitative genetic methods 10. Authentication techniques based on DNA conformation and melting point 11. Practical solutions with DNA-based food tests 12. Proteomics and protein assay methods for species identification 13. Fats, fatty acids, fatty acid composition of animal products 14. Authentication by Fatty Acid Analysis |
| **Summary of content - practice**: |
| Skills to be learnt:  The general aim of the practice is to familiarize students with the implementation of DNA-based identification methods. The skill acquired during the practice includes genetic methods. Evaluation of results is also part of the curriculum.     1. Basic laboratory knowledge, solution preparation 2. DNA isolation from meat 3. DNA isolation from meat 4. DNA isolation from cheese, processed meat 5. DNA isolation from cheese, processed meat 6. Checking quantity and quality of genomic DNA 7. Polymerase Chain Reaction 8. Polymerase Chain Reaction 9. Polymerase Chain Reaction 10. Agarose gel electrophoresis 11. Agarose gel electrophoresis 12. Gel documentation 13. Polyacrylamide gel electrophoresis 14. Polyacrylamide gel electrophoresis |
| **Literature, handbooks in English** |
| Gaspardo B., Lavrencic A., Levart A., Del Zotto S., Stefanon B. (2010): Use of milk fatty acids composition to discriminate area of origin of bulk milk. Dairy Sci. 93. 3417-26.  Indrasti D., Man Y. B. C., Mustafa S., Hashim D. M. (2010): Lard detection based on fatty acids profile using comprehensive gas chromatography hyphenated with time-of-flight mass spectrometry. Food Chemistry, 122. 4. 1273-1277.  Montowska M., Pospiech E. (2013): Species-specific expression of various proteins in meat tissue: Proteomic analysis of raw and cooked meat and meat products made from beef, pork and selected poultry species. Food Chemistry 136. 1461–1469.  Girish P.S., Anjaneyulu A.S.R., Viswas K.N., SanthoshF.H. Bhilegaonkar K.N., Agarwal R.K., Kondaiah N., Nagappa K., (2007): Polymerase chain reaction – restriction fragment length polymorphism of mitochondrial 12S gene: A simple method for identification of poultry meat species. Vet Res. Commun. 31, 447-455.  Natonek-Wiśniewska M., Ząbek T., Słota E. (2007): Species identification of mammalian mtDNA using PCR-RFLP. Ann. Anim. Sci. 7, 2, 305-311. |
| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**  * Knows the details of the tools and methods used to control food and foodstuff  1. **Skills:**  * Knows the details of the tools and methods used to control food and foodstuff  1. **Attitude:**  * Open, motivated and responsive to the knowledge and practical application of modern and innovative procedures, open to paradigm changes in food science and technology. * Recognizes values in the area of food safety and quality, responsive to the use of effective methods and tools  1. **Autonomy and responsibility:**  * Feels responsibility for the quality and safety of food processing |

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| **Responsible lecturer: Dr. Levente Czeglédi, Associate Professor, PhD** |
| **Other lecturer(s):** |

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| **Terms of course completion:** |
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| **Form of examination:** |
| written |
| **Requirement(s) to get signature:** |
| Laboratory report, Participation in lectures according to Rules and Regulations of UD |

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| **Exam questions:** |
| 1. Basics of molecular genetics 2. Genetic inheritance, genetic structure of the population 3. The occurrence, importance and types of mutations 4. The genome 5. Biotechnics - Biotechnology 6. Methods to detect the species in animal derived foodstuffs 7. Genetic methods for food authentication 8. Quantitative genetic methods 9. Authentication techniques based on DNA conformation and melting point 10. Proteomics and protein assay methods for species identification 11. Fats, fatty acids, fatty acid composition of animal products 12. Authentication by Fatty Acid Analysis 13. Method of DNA isolation, characterization of isolated DNA 14. Critical points of PCR 15. Critical points of DNA electrophoresis |