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| **Title and Code** of the subject: **Introduction to microbiology MTBE7016A** | **ECTS Credit Points: 3** |
| **Type** of the subject: compulsory / optional | |
| **Ratio of theory and practice: 67/33** (credit%) | |
| **Type and number of classes per semester**: 28 hour(s) lecture and 14 hour(s) practice per **semester**  Number of teaching hours / week :2+1 (lecture and practice) | |
| **Type of exam**: exam / practical course mark | |
| **Subject in the curriculum:** semester 3 | |
| Preliminary requirements:- | |

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| **Summary of content - theory**: |
| Course objectives:  Within the course, students will learn about the structure, metabolism, and genetics of microbial cells. The evolution of microbes, the prokaryotes and the main phylogenetic groups of eukaryotic microbes and their characteristics are described. We present the ecological, environmental, food, biotechnological role of microbes, plant, animal and human diseases.   1. Microorganisms and Microbiology 2. Brief History of Microbiology 3. Cell Chemistry 4. Metabolism 5. Microbial Growth 6. Environmental effects of microbial growth 7. Molecular Biology of Microorganisms – Genes and Replication 8. Molecular Biology of Microorganisms –Transcription 9. Molecular Biology of Microorganisms – Translation 10. Protein synthesis 11. Microbial Evolution and systematics 12. Taxonomy of the Prokaryotes 13. Taxonomy of the Eukaryotes 14. Viruses |
| **Summary of content - practice**: |
| Skills to be learnt: Students will learn basic microbial laboratory practices including antiseptic work conditions, safe handling of microbial samples, staining microbial cells, using microscopes.  1 - 2. Tools and equipment used in the microbiological laboratory and the sterilization of them  3 – 4. Different media and cultivation methods  5 – 6. Preparation of plate count agar (PCA) media  7 – 8. Enumeration of total plate count of soil sample with plate count method  9 – 10. Preparation of pure culture with streak plate method  11 – 12. Morphological examination of microorganisms (Gram stain)  13 – 14. Practical exam |
| **Literature, handbooks in English** |
| 1. 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 2. Hogg S (2005): Essential Microbiology, John Wiley & Sons Ltd, 481 oldal, ISBN 0 471 49753 3 3. Talaro, K. P. (2015): Foundations in microbiology, Pasadena City College, Barry Chess, Pasadena City College. – Ninth edition. 929 oldal, ISBN 978–0–07–352260–9 |
| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**  * Familiar with the most important biological and microbiological processes and hazards in agriculture production (horticulture, crop production and animal husbandry), furthermore the basic microbiological test methods.  1. **Skills:**  * Able to apply the microbiological test methods acquired during training.  1. **Attitude:**  * Committed to microbiological safety of plant and animal origin raw materials.  1. **Autonomy and responsibility:** |

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| **Responsible lecturer: Erzsébet Karaffa, Ph.D** |
| **Other lecturer(s): Ferenc Peles, Ph.D., Károly Pál, Ph.D.** |

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| **Terms of course completion:** |
| 1. Participating on the exercises 2. Completing practical exercises 3. Mid-year written exam 4. Written exam |
| **Form of examination:** |
| Written |
| **Requirement(s) to get signature:** |
| 1. Participating on the exercises 2. Completing practical exercises |

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| **Exam questions:** |
| 1. Definition and aims of microbiology 2. Type of microorganisms 3. The importance of microorganisms 4. Characteristics of living systems 5. What does control the diversity and abundances of microbes in a habitat? 6. Main steps of evolution 7. The importance of microbes in the ecosystems 8. The Impact of microorganisms on humans – short descriptions 9. Minimum 3 important scientists on the field of microbiology (name, century activity) 10. The importance of Antoni van Leeuwenhoek’s studies in microbiology 11. Important discoveries, approvals and inventions of Louis Pasteur 12. Koch’s Postulates 13. Size and structure of bacterial cells. 14. The major chemical elements in living organism. 15. The macromolecules (4) and their building blocs in living organisms 16. Two monosaccharides (min 3) and their importance, the characteristics of glycosidic bounds, two polysaccharides 17. Characteristics of lipids, and their biological importance, two lipids. 18. Two types of nucleic acids, their composition and biological importance. 19. DNA structure and composition. 20. RNA structure and composition. 21. The four classes of RNA ant their functions. 22. Characteristics of amino acids, main groups (4) with examples (min 1 for each), peptid bounds 23. Protein structure (4 levels, and their types) 24. Key features of prokaryotic cells 25. Main morphological types of bacteria 26. Characteristics of cell membrane (minimum 4), main difference between eukaryotes, prokaryotes and archeal membranes 27. Functions of bacterial cytoplasmic membrane 28. Transport systems in prokaryotes (3), and their characteristics 29. Cell walls of bacteria (two main types and their characteristics), archeal cell wall 30. Definition and types of metabolism 31. Definition and types of microbial nutrients 32. List possible carbon sources for microbes 33. List possible nitrogen sources for microbes 34. Macronutrients for microbes: types (min 4), biological roles and examples 35. The importance of iron for the microbes and iron binding agents in microbes. 36. Trace elements (definition, min 3 examples and their roles in microbes) 37. Growth factors (definition, min 3 examples) 38. Types of culture media (min 2) and their characteristics 39. Define exergonic an endergonic reactions 40. Enzymes: their function in cells, the 4 steps of enzyme cycles. 41. Bacterial cell growth: characteristics and phases 42. The three steps of the central dogma of molecular biology, ad their short description. Example for violence that dogma 43. Differences between eukaryotic and prokaryotic gene expression 44. DNA supercoiling: description and function 45. Genetic elements (min 4) and their characteristics 46. Brief description of DNA replication with most important enzymes 47. Transcription: brief description 48. Transcription unit (definition and characteristics) 49. Characteristics of the genetic code (min 4) 50. Most important characteristics of the tRNA (min 4) 51. Most important characteristics of the ribosomes (min 4) 52. Most important characteristics of the translation (min 4) 53. Most important characteristics of protein folding and secretion (min 4) 54. Hypothesis (2) for the origin of life. 55. The brief description of the subsurface origin hypothesis of life. (main steps) 56. LUCA: give the whole name and its place in the microbial evolution. 57. The appearance of phototrophs: approximate time and their importance in the evolution steps 58. Formation of eukaryotic cells: describe the hypothesis and the scientific supports for it. 59. Evolution: definition and possible modes for change the microbial genomes 60. Description of microbial classification and nomenclature 61. The importance of culture collections 62. The subgroups of Gram positive bacteria (2). Give one example for each 63. The importance and subgroups of Proteobacteria 64. Phylogenetic place of Archea, and some characteristics of the taxon 65. Most important environmental parameters affecting microbial growth 66. Cardinal temperatures for microbial growth (3), groups regarding cardinal temperatures (min 3) and their characteristics 67. Groups of microorganisms regarding their pH optimum (3), and characteristics 68. Groups of microorganisms regarding their O2 usage (2), minimum 2 groups within each men groups and their characteristics 69. Organells of eukaryotic cells (minimum 3) and their characteristics 70. Most important eukarya microbes cells (minimum 3) and their characteristics |