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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
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| **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 them3 – 4. Different media and cultivation methods5 – 6. Preparation of plate count agar (PCA) media7 – 8. Enumeration of total plate count of soil sample with plate count method9 – 10. Preparation of pure culture with streak plate method11 – 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
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| **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
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| **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
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