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| **Title and Code** of the subject:**Essential molecular cell biology, MTMEL7010A** | **ECTS Credit Points: 4** |
| **Type** of the subject: compulsory  |
| **Ratio of theory and practice: 50/50** (credit%) |
| **Type and number of classes per semester**: .. hour(s) lecture and .. hour(s) practice per **semester** Number of teaching hours / week : 2+2 (lecture and practice) |
| **Type of exam**: exam  |
| **Subject in the curriculum:** semester 2 |
| Preliminary requirements:- |

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| **Summary of content - theory**: Students will understand and the structural and functional properties of eukaryotic cells, and will learn to analyze and interpret the spatial and temporal control of stochastic and determinative cellular phenomena in the context of cellular compartmentalization, cell cycle regulation, genomic integrity and evolution.  |
| Course objectives:1-3. Analysis of cellular and molecular levels of organization of living material, and system biology type of investigation methods.4-5. Regulation of eukaryotic gene expression: transcription, translation, protein folding and degradation. The genomic integrity.6-7. Epigenetic regulation of gene expression. Morphogenetic events and cell differentiation. Diurnal cycle. 8-9. Eukaryotic cells metabolism and energetic management, and the regulation of cellular homeostasis.10-11. Cellular redox potential, ageing and adaptive stress responses.12-13. Transgenic organisms and genetically modified foods. 14. The cellular basis of personalized nutrition. |
| **Summary of content - practice**:Students will carry out different molecular experiments in order to learn about the basic molecular and bioinformatics investigation methods. |
| Skills to be learnt: 1-2. Assessment of cellular toxicity.3-4. Molecular investigation methods.5-8. PCR cloning, CRISP/CAS9 genome editing and analysis of transgenic organisms.9-10. Data mining using bioinformatics databases.11-14. In silico genome-, proteome- and interactome analysis. |
| **Literature, handbooks in English**  |
| * Alberts, B., Brey, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P. (2016). Essential cell biology. 4th edition. Garland Science, Taylor & Francis Group, New York, USA. ISBN-13: 978-0815344544
* Alberts, B., Johnson, A, Lewis, J. Morgan, D., Raff, M., Roberts, K., Walter, P. (2014). Molecular Biology of the Cell. Sixth Edition. Garland Science, Taylor & Francis Group, New York. ISBN-13: 978-0815344322
* Pollard, T.D., Earnshaw, W.C., Lippincott-Schwartz, J. and Johnson, G. (2017). Cell Biology, 3rd Edition, Elsevier, ISBN: 9780323341264
* PUBMED database
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| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**
* The organization levels of living material, and the system theory based interpretation of vital phenomena.
* The pro- and eukaryotic cells structural and functional properties. The nutrition, respiration, metabolism, growth, division and death of cells.
* Multiple correlations between cellular phenomena and nutrition: the reciprocity of genetic and environmental regulation, cell cycle and redox potential regulation, signal transduction and gene expression, cellular homeostasis.
1. **Skills:**
* Capable of assessing the molecular aspects of health and nutrition, together with the molecular features of hazards to food chain.
* Students will acquire the knowledge to work in molecular laboratory using various molecular methods.
1. **Attitude:**
* Students will become aware of the importance of personalized nutrition that is based on specific correlations between the individual characteristics of genomes and the nutritional /energetic statuses, and all together standing at the basis of novel food development strategies
* Committed to food R & D & I activities
1. **Autonomy and responsibility:**
* Committed to food quality/safety and sustainable solutions that support the health of the individuals, the society and bioeconomy.
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| **Responsible lecturer: Dr. Endre Máthé PhD** |
| **Other lecturer(s): -** |

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| **Terms of course completion:** |
|  2 essays on given topic |
| **Form of examination:** |
| Written and oral exam |
| **Requirement(s) to get signature:** |
| Submission of 2 essaysAttendance at lectures is recommended, but not compulsory. Participation at practice is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at practice classes will be recorded. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, being discussed with the lecturer. Active participation is evaluated by the teacher. |

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| **Exam questions:** |
| 1. What is system biology about?
2. What are the main features of the eukaryotic cell specific material and energy flux and cellular homeostasis?
3. What is gene expression about?
4. What is the epigenetic regulation of gene expression about?
5. What are the features of eukaryotic cells’ metabolism and energetic management?
6. What are the features of the cellular redox potential?
7. What are the features of the cellular ageing and adaptive stress response?
8. What are the features of the transgenic organisms and genetically modified foods?
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