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| **Title and Code** of the subject: **Molecular and cell biology / MTBE7001A** | **ECTS Credit Points: 4** |
| **Type** of the subject: compulsory  |
| **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  |
| **Subject in the curriculum:** semester 1. |
| 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.  |
| **Schedule:**1-3. Introduction to molecular cell biology. The timeline of discoveries, methods and research strategies).4-5. The general structure and functions of eukaryotic cell.6-7. The structure and function of the genome /epigenome. Genomic integrity.8. The nuclear lamina and nuclear transport. 9. The structure and function of mitochondria. Krebs cycle, beta-oxidation and oxidative phosphorylation. 10. The structure and function of cytoskeleton. Actin filaments, centrosomes and microtubules. The cell division. 11-12. Intracellular signal transduction.13- 14. Integration of cellular activities and the cell cycle control. |
| **Summary of content - practice**:Students will carry out different molecular experiments in order to learn about the basic molecular and bioinformatics investigation methods. |
| **Schedule:**1-2. Electronic databases for molecular biology3-4. Molecular investigation methods used for Genetics, Cell biology and Biochemistry.5. Molecular dissection of cellular functions, a research strategy.6. Analysis of chromosomes. 7. Genomic and plasmid DNA isolation. 8. Restrictional endonuclease digestion of DNA and gel electrophoresis.9-11. Molecular cloning.12-14. Bacterial expression of recombinant protein. |
| **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

- Pagon RA, Adam MP, Ardinger HH, et al., editors. (1993-2014). GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2014.- Making Sense of Your Genes: A Guide to Genetic Counselling. National Society of Genetic Counselors; Genetic Alliance. Washington (DC): Genetic Alliance; 2008.- Integrating Large-Scale Genomic Information into Clinical Practice: Workshop Summary. Institute of Medicine (US). Washington (DC): National Academies Press (US); 2012. |
| **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 concept of genomic integrity and the cell cycle.
* 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** |
| **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. |
| **Exam questions:** |
| 1. What is the topic of molecular cell biology?
2. What are the main structural and functional features of the eukaryotic cell?
3. What are the main structural and functional features of the eukaryotic genome?
4. How is the nuclear transport regulated?
5. What is gene expression about?
6. What are the main structural and functional features of the mitochondria?
7. What are the main structural and functional features of the cytoskeleton?
8. What are the main structural and functional features of the intracellular signal transduction?
9. What are the features of spatial and temporal control of eukaryotic cell cycle?
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