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| **Title and Code** of the subject: **Applied plant biotechnology and resistance biology (MTMNO7014A)** | **ECTS Credit Points: 3** |
| **Type** of the subject: **compulsory** / optional  |
| **Ratio of theory and practice:50/50** (credit%) |
| **Type and number of classes per semester**: 14 hour(s) lecture and 14 hour(s) practice per **semester** Number of teaching hours / week : 1+1 (lecture and practice) |
| **Type of exam**: **colloquium** |
| **Subject in the curriculum:** semester 3 |
| Preliminary requirements:- |

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| **Summary of content**: Students need to study the history, different methods, molecular genetic, physiological and technological background, theoretical and practical perspectives of application, national and international results of plant biotechnology. Alongside students need to learn explicitly the possibilities to increase the plant resistances by biotechnological way in case of crops. |
| Course objectives:

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| **Lecture** | **Practise** |
| 1.-2.: History of biotechnology and plant tissue culture | 1.-2.: Presentation of a plant *in vitro* laboratory, acquaintance with the rules of sterile work |
| 3 – 4: Biotechnology of asexual reproduction: Micropropagation. Somatic embryogenesis, somatic seeds / somatic seedlings. Plant tissue culture in bioreactors. Clonal agriculture | 3-4.:Micropropagation: direct/indirect organogenesis |
| 5-6.: Biotechnological methods of sexual reproduction. Haploidy, diploid technique | * 1. : Somatic embryogenesis,

production of artificial seeds by encapsulation. Automatization in plant tissue culture - plant cloning bioreactors. Elicitation.  |
| 7-8.: *In vitro* gene banks, virus elimination, cryopreservation | * 1. hours: Anther culture, *in vitro* androgenesis; embryo preparation.
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| * 1. : Basic of molecular breeding of plants, nuclear and organellar genome organization. Genetic transformation of crops
 | 9-10.: Plant DNA isolation, PCR reaction, horizontal gel electrophoresis of DNA. Demonstration practice of particle bombardment by genebooster |
| 11 – 12: : Resistance biology, resistance breeding in crop production  | 11-12.: Green biomass processing for biorefinery purposes. Protein isolation and determination. Proteomic analysis by 1D/2D SDS PAGE - isoelectric focusing |
| * 1. : Protein biotechnology, green biorefinery
 | 13-14.: Proteomic analysis by 1D/2D SDS PAGE – gel electrophoresis and evaluation |

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| **Literature, handbooks in English**  |
| Altman A., Hasegawa P.M. (2012): Plant biotechnology and agriculture (Prospects for the 21st century) Kardung M. et al. (2020): Development of the Circular Bioeconomy: Drivers and IndicatorsFreeman and Beattie (2008): An Overview of Plant Defenses against Pathogens and HerbivoresNewbury, H.J. (2003): Plant molecular breeding, CrC Press. |

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| **Responsible lecturer: Miklós Fári, full professor, DSc** |
| **Other lecturer(s):** Éva Domokos-Szabolcsy PhD assistant professor; László Kaszás assistant lecturer; Zoltán Kovács PhD student |

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| **Terms of course completion:** |
| 1. From diagnostics part written exam, (part) grade recommendation - based on ZH result.
2. Symptomatic exam (recognition of diseases at least 20 out of 25) during the last week of education.
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| **Form of examination:** |
| Oral and written examination |
| **Requirement(s) to get signature:** |
| Participation in lectures and practices. Regular preparation for practical training with periodic inspections. From diagnostics part written exam, (part) grade recommendation - based on ZH result. Symptomatic exam (recognition of diseases at least 20 out of 25) during the last week of education. **Oral examination** at the end of the semester in the theoretical part of general plant pathology. |