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| **Title and code** of the subject: **Agro-environmental management II-Ecotoxcicology, evironmental risk assessment, MTMKG7020A** | **ECTS Credit Points: 4** |
| **Type** of the subject: compulsory | |
| **Ratio of theory and practice:** (credit%) **50/50** | |
| **Type and number of classes per semester**: 28 hours lecture and 28 hours practice per **semester**  Number of teaching hours / week : 2+2 (lecture and practice) | |
| **Type of exam**: exam | |
| **Subject in the curriculum:** semester 4 | |
| Preliminary requirements:- | |

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| **Summary of content - theory**: |
| Course objectives:  Fulfilling the course, students will know the potential sources of environmental risks, factors determining and controlling the exposition and transport processes within the ecological systems, and the methodology of environmental risk analysis, assessment and management. The students will be familiar with the EU legislation related to the use of environment, and risk assessment for the sectors of agriculture and food industry, and the relevant best available techniques. As a result of completing practical tasks, they will have the skills to identify the relations between ecotoxicology and environmental risk assessment and management, to measure and interpret proper data and information, as well as to carry out scenario analyses using selected software, required to the ERA. Study trips will also serve to understand the link between theory and practice. Practical tasks serve to apply the theoretical knowledge on ecotoxicology and ERA, as well as to improve skills on software use and reporting, including the followings: mass and energy balances for the agricultural and food sectors; transport modelling and scenario analyses; chemical analyses for selected pollutants in environmental samples, data interpretation linked to ERA, visualization by GIS tools; study trip to natural and agricultural sites where activities posing potential environmental risk are carried out; study trip to sites after clean-up and rehabilitation.  Contents:   1. Ecotoxicology – potential pollutants in the environment, fate and transport of pollutants in the ecological systems, expositions 2. Ecotoxicological tests 3. Licencing of new chemicals 4. Environmental risk assessment methodology 5. Transport processes and their modelling in soil and ground water 6. EU legislation for environmental risk assessment (ERA), reduction and management 7. Best available – environmentally responsible – techniques in the agriculture and food industry 8. Planning and designing clean-up technologies based on ERA 9. Latest scientific results in the area of ecotoxicology |
| **Summary of content - practice**: |
| Skills to be gained:  Students will practice the implementation of principles, and application of procedures as well as interpretation methods in the field of environmental risk assessment and ecotoxicology in the form of individual case studies using data measured in laboratory and modelling in IT environment.  Contents:   1. Finding link between environmental/ecological risk assessment and the characteristics of artificial stressors, including their fate and transport in the environment. 2. Assessment of environmental impacts related to a case study using matrices. 3. Assessing conditions for best available techniques (BAT) for a given agriculture related activity. 4. Investigation in the application of the principles of cleaner production (CP). 5. Hydrogeological modelling in IT environment, modelling an unconfined aquifer system with discharge and recharge 6. Carrying out scenario analyses in the hydrogeological modelling 7. Assessing clean up technologies and processes to a case when an accident in production or transportation happens, related to a company in the agriculture and food industry sectors. 8. Laboratory analyses for soil and water samples; measuring parameters considerable from the point of contamination transport; and assessment of the meaning of the values from environmental point of view. 9. Finding the latest scientific articles in relation to environmental risk assessment and management |
| **Literature, handbooks in English** |
| 1. [Whitacre, David M.](http://www.prospero.hu/katalogus/kereso/?form_submit=1&szerzo=Whitacre+David) (2015): Reviews of Environmental Contamination and Toxicology. [Reviews of Environmental Contamination and Toxicology](http://www.prospero.hu/katalogus/kereso/?form_submit=1&cim=Reviews+Environmental+Contamination+and+Toxicology); [225](http://www.prospero.hu/katalogus/kereso/?form_submit=1&cim=225). Springer Verlag. 144 p. ISBN-13: 9781489988201 2. [Newman, Michael C](http://www.prospero.hu/katalogus/kereso/?form_submit=1&szerzo=Newman+Michael). (2014): Fundamentals of Ecotoxicology. The Science of Pollution, Fourth Edition. CRC Press. 680 p. ISBN-13: 9781466582293 3. Áine Gormley, Simon Pollard, Sophie Rocks: Guidelines for Environmental Risk Assessment and Management. Cranfield University, 2011: <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69450/pb13670-green-leaves-iii-1111071.pdf> 4. Best available techniques – guidelines: <http://eippcb.jrc.ec.europa.eu/reference/>   <http://eippcb.jrc.ec.europa.eu/reference/BREF/IRPP_Final_Draft_082015_bw.pdf>   1. Exercise book: Practical exercises for the course of agro-environmental management II - ecotoxicology, environmental management |
| **Competencies gained** |
| 1. **Knowledge:**  * Understand principles in the environment and nature protection and apply legal requirements; * Understand and able to synthetize agricultural and environmental subjects in relation to agro-environmental issues in an interdisciplinary way; * Know the latest technology alternatives and is open to keep his knowledge up-to-date; * Familiar with the procedure of environmental risk assessment and management in the field of agro-environmental issues  1. **Skills:**  * Able to identify the relations of ecotoxicology and environmental risk assessment, to measure and interpret proper data and information, as well as to carry out scenario analyses; * Able to identify agro-environmental issues, problems and to recommend potential solutions in an innovative way  1. **Attitude:**  * Become committed to the application of best techniques to protect environment in the field of environmental management related to agriculture.  1. **Autonomy and responsibility:**  * Able to complete as well as to manage a research project in group |

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| **Responsible lecturer: Elza Kovács, PhD, associate professor** |

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| **Terms of course completion:** |
| 1. Completing assignments / exercises listed in Exercise book: Practical exercises for the course of agro-environmental management II - ecotoxicology, environmental management 2. Being active in group works 3. Completing lab works 4. Taking part in field visits |
| **Form of examination:** |
| Essay type written exam is taken in the examination period of the semester focusing on the knowledge gained. List of the topics is provided below. |
| **Requirement(s) to get signature:** |
| Submitting reports in due time, taking part actively in the practices and field trips and completing home work individually are compulsory. Student may skip class maximum 3 times during the semester. |

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| **Exam questions:** |
| 1. Introduce hazards and potential effects of a selected agricultural activity on the ecological system! 2. Introduce the fate and transport processes of typical contaminants and other environmental stressors that should be considered in the agricultural sector! 3. Introduce the methods and tools of quantitative risk assessment! 4. Introduce the process, steps of environmental risk assessment and management! 5. List the contents of an EIA report acc. to the legal requirements! 6. What are the aspects of EIA in the field of air quality protection in crop production, animal husbandry and some sectors of food industry? 7. What are the aspects of EIA in the field of surface water quality protection in crop production, animal husbandry and some sectors of food industry? 8. What are the aspects of EIA in the field of shallow ground water quality protection in crop production, animal husbandry and some sectors of food industry? 9. What are the aspects of EIA in the field of soil quality protection in crop production, animal husbandry and some sectors of food industry? 10. What are the aspects of EIA in the field of waste management in crop production, animal husbandry and some sectors of food industry? 11. Introduce the matrices with providing examples! 12. What are the aims of the IPPC? 13. What are the contents of a guideline on BAT? 14. Introduce the BAT for intensive poultry production! 15. Introduce the BAT for a pig farm! 16. Introduce the BAT for a milk processing company! 17. Introduce soil remediation and clean-up technologies for typical contaminants in the agricultural sector! |