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| **Title and code** of the subject: **Agricultural water management planning and implementation , MTMVG7022A** | **ECTS Credit: 3** |
| **Type** of the subject: compulsory |
| **Ratio of theory and practice:** (credit%) 30/70 |
| **Type and number of classes per semester**: 14 hour(s) lecture and 28 hour(s) practice per **semester**Number of classes per week: 1+2  |
| **Type of exam**: exam |
| **Subject in the curriculum:** semester 4 |
| Preliminary requirements:- |

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| **Summary of content - theory**:  |
| In order to get acquainted with agricultural production security and with the adaption to climate change students will study water retention, sustainable management of water resources, water saving irrigation technology planning, design, production methods adapted to climate change and sustainable land use planning processes. Students will acquire the appropriate methods, tools and effects of irrigation technology for the creation of a sustainable irrigated crop management conditions.Students will be able to evaluate the water capacity of soils at agricultural sites, analyzing the water balance of agricultural sites, identification of sites with erosion risk, assessment and application of agronomic, technical and forestry practices of hilly drainage, lowland drainage, analyzing and planning amelioration. Identification of sites with excess water, creating irrigation fertigation scheduling, and irrigation planning.1. Water drainage on hilly regions.2. Delineation of areas at risk of erosion, evaluation and applicability of agronomic, technical and forestry practices of hilly drainage 3. Plains water management, excess water drainage.4. Channeling, channel planning5. Methods of soil pipe drainage network planning and design. Soil and groundwater investigations methods in correspondence with soil piping, the soil pipe network construction, operation and maintenance.6. Structure and planning of Micro Irrigation Systems 7. Structure and planning of Sprinkler Systems 8. Structure and planning of Surface Design of irrigation systems9. irrigation and fertigation planning. |
| **Summary of content - practice**: |
| The purpose of the practice is to enable students to understand the water balance of arable land and orchards. In addition, Student will be able to delineate erosion risk areas, landscaping on hilly sites by agro technical, technical and forestry methods, melioration options and design. In addition, vulnerable areas can be delineated for the preparation of irrigation plans and planning of irrigation turns for nutrient solution.1. Geospatial delimitation of excess water effected areas, drainage collection calculation modeling2. Channel measurement3. Methods of designing the piping networks. Soil and groundwater studies related to soil piping.4. Designing, operating and maintaining pipeline networks.5. Design of surface irrigation systems6. Preparation of irrigation and nutrient plan for sprinkling irrigation systems7. Assessment of irrigation and nutrient management plan for sprinkling irrigation systems8. Preparation of irrigation and nutrient plan for sprinkling micro-sprinkling systems9. Assessment of irrigation and nutrient management plan for sprinkling micro-sprinkling systems |
| **Literature, handbooks in English**  |
| 1. Uhlig, U. (2011): Current Issues of Water Management. InTech Published. 340 p. ISBN: 978-9533074139.
2. Kumar, M. D., Sivamohan, M. V. K., Bassi, N. (2012): Water Management, Food Security and Sustainable Agriculture in Developing Economies (Earthscan Studies in Water Resource Management). Routledge. 256 p. ISBN: 978-0415624077.
3. Tanji, K. K., Kielen, N. C. (2006): Agricultural Drainage Water Management in Arid and Semi-arid Areas. FAO. ISBN: 978-8172334567.
4. H. Bjornlund, C. A. Brebbia, S. Wheeler: Sustainable Irrigation and Drainage IV: Management, Technologies and Policies. WIT Press / Computational Mechanics. 2012. ISBN-13: 978-1845646486
5. Chaudhry, M. H. (2007): Open-Channel Flow. Springer. 2nd edition. 540 p. ISBN: 978-0387301747.
6. Majumdar, D. K. (2012): Irrigation Water Management: Principles and Practice. PHI Learning Private Limited. 570 p. ISBN: 978-8120317297.
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| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**
* Knows in detail the specificities of agricultural water management and the relevant processes taking place, knows and recognizes the relationships between them.
* Knows in detail the methods and rules of planning and implementation of agricultural water management activities, as well as the related characteristics.
* Recognizes the constraints on the efficiency of the functioning of economic systems.
1. **Skills:**
* Able to apply and develop up-to-date agricultural water management technologies.
* Can coordinate the professional tasks of agricultural water management.
* Analyzes the work (activity) and practical problems of the managed organization with scientific basis and appropriate methods.
* Able to define, plan and organize the activity system of the field.
* Based on knowledge of the given field, able to explore the comprehensive and special relationships among different areas related to agricultural water management
* Able to identify professional problems, their versatile, interdisciplinary approach, as well as to reveal and formulate the detailed theoretical and practical background of problem solving
* able to use state-of-the-art IT tools to provide professional and effective oral and written communication.
1. **Attitude:**
* Open and responsive to the knowledge and practical application of modern and innovative practices in the field of environmental management.
* Recognizes values, responsive to the application of effective methods and tools.
* Committed to solving problems on a professional basis.
* Recognize and accept the limitations and risks of making decisions about the specialty of the profession.
* Active participant in research and development projects in the field of environmental management
1. **Autonomy and responsibility:**
* Has considerable autonomy in the implementation of a specific activity
* Capable of independent, environmentally-oriented management, the application and development of modern agricultural technologies
* Make decisions with professional responsibility.
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| **Responsible lecturer: Dr. habil. Nagy Attila, associate professor, PhD** |
| **Other lecturer(s): -** |

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| **Terms of course completion:** |
| 1. Active participation the practical lessons (at least 8)
2. Completing exercises
3. Submitting report at the end of the semester
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| **Form of examination:** |
| written exam  |
| **Requirement(s) to get signature:** |
| A report including the objective interpretation of roles, methods and the results of field scale and GIS laboratory exercises on the field of agricultural water management planning. |

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| **Exam questions:** |
| 1. Soil aspects of agricultural water management planning.
2. Describe the hillside water management.
3. Describe the methods of determination of erosion risk affected areas.
4. Describe the technical tasks of excess water control.
5. Describe the tasks of complex agricultural water management on surface.
6. Describe the sub-surface tasks of complex agricultural water management.
7. Explain the irrigation water requirement calculation methods.
8. Describe the elements of the irrigation and fertigation plan for sprinkler irrigation systems.
9. Describe the elements and parts of the irrigation and fertigation plan for micro-irrigation systems.
10. Describe how to map flow direction, accumulation and sites with potential surplus water risk based on digital elevation model .
11. Describe how to optimize surplus water canalization network by hydrological measurements.
12. Describe the way of hydraulic design of channels.
13. Describe how to design sub– soil drainage system.
14. List the calculation of water supply of soil.
15. Describe how to design a sprinkler irrigation system.
16. Describe how to design a micro irrigation system.
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