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| **Title and code** of the subject: **Irrigation for horticulture production, MTMVG 7010A** | **ECTS Credit: 3** |
| **Type** of the subject: compulsory / optional | |
| **Ratio of theory and practice:** (credit%) 70/30 | |
| **Type and number of classes per semester**: 28 hour(s) lecture and 14 hour(s) practice per **semester**  Number of classes per week: 2+1 | |
| **Type of exam**: **exam** | |
| **Subject in the curriculum:** semester 2 | |
| Preliminary requirements:- | |

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| **Summary of content - theory**: |
| Production of appropriate quality and quantity horticultural products is provided by excellent irrigation technological practices. The main purpose is the irrigation for the water demand of cultivated plants. The aim of the subject is to introduce the students to the basics of vegetable and fruit irrigation, to recognize the most effective irrigation methods in horticultural crop production, to recognize the irrigation water requirement of horticultural plants and the opportunities of irrigation modelling in horticulture.  1. The role of water management. The historical overview of irrigation. Situation of irrigation in the world.  2. Basic irrigation concepts and principles of irrigation planning. Recognition of water forms in soil.  3. Measuring of water resources in soil and water status in plants.  4. Technical basics of irrigation (water acquisition, pumps, pipe networks).  5. Technical basics of irrigation (fertigation, fertilizer delivering and dosing).  6. Irrigation methods and purposes in vegetable production.  7. Irrigation methods and purposes in fruit production.  8. Irrigation opportunities in field vegetable production.  9. Irrigation opportunities in greenhouse vegetable production.  10. Irrigation properties of certain fruit species.  11. Irrigation properties of vineyards.  12. Relationship between irrigation and plant protection in vegetable and fruit production.  13. The role of irrigation quality.  14. Remote sensing and GIS in precision irrigation techniques. |
| **Summary of content - practice**: |
| Skills to be learnt: The general aim of the practice is that students learn modern irrigation systems in vegetable and fruit plantation and such greenhouse systems, where effective growing is provided by developed irrigation control and fertigation system.  Students adopt irrigation scheduling, quantity, quality and temporal issues of irrigation practices. In order to determine irrigation water requirement, the moisture content of soil, practical calculations are learnt. Students learn the applicability of the most modern irrigation simulation programs in horticulture.   1. Soil moisture calculation, practical application of pF curve in horticulture. 2. Calculation of irrigation requirement of horticultural plants. 3. Water abstraction planning. 4. The role of FAO Cropwat 8.0 and AquaCrop 6.0 software in irrigation modelling. 5. Applicability of FAO Cropwat 8.0 irrigation modelling software in horticulture I. 6. Applicability of FAO Cropwat 8.0 irrigation modelling software in horticulture II. 7. Applicability of FAO Cropwat 8.0 irrigation modelling software in horticulture III. 8. Field exercise/farm visit I. 9. Field exercise/farm visit II. 10. Field exercise/farm visit III. 11. Field exercise/farm visit IV. 12. Field exercise/farm visit V. 13. Field exercise/farm visit VI. 14. Consultation about compulsory practical report. |
| **Literature, handbooks in English** |
| Allen, R. G., Pereira, L. S., Raes D., Smith M. (1998): Crop evapotranspiration: guidelines for computing crop water requirements. Irrigation and Drainage Paper no. 56. FAO. Rome, Olaszország, 300 p.  Christen, E., Ayars, J., Hornbuckle, J., Hickey, M. (2006): Technology and practice for irrigation in vegetables. NSW Department of Primary Industries. State of New South Wales. 59 p.  Stetson, L. E. (2011): Irrigation. 6th edition. Irrigation Research Institute. 1089 p.  Wickson, E. J. (2015): Irrigation in Fruit Growing. Scholar's Choice, 166 p. (ISBN: 978-129-809-435-3) |
| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**   - Has a high level of natural sciences and technical knowledge necessary for the operation of agricultural water management.  - Knows the applicability and the legal regulation of the latest agricultural water management technologies and procedures.  - Acknowledges in detail the characteristics of agricultural water management and processes, recognizes the existing relationships among them.   1. **Skills:**   - They are able to apply and further develop the latest agricultural water management technologies and processes  - They are able to independently interpret and apply legislation related to its professional activity.  - Capacity to analyse and evaluate agri-business and related sectors  - Have the knowledge in a written and oral communication in Hungarian and foreign languages.   1. **Attitude:**   **-** It is committed to environmental protection and a sustainable agricultural economy.  - Recognize professional values, responsive to the application of effective methods and tools  - Open and responsive to the knowledge and practical application of modern and innovative processes   1. **Autonomy and responsibility:**   - Equal partner in professional and specialist co-operation.  - Represents special science and engaged to keep the ethical rules of engineering and environment of its field. |

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| **Responsible lecturer: Prof. János Tamás** |
| **Other lecturer(s): Dr. Nagy Attila** |

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| **Terms of course completion:** |
| 1. Completing assignments / exercises 2. Submitting essay 3. Giving presentation |
| **Form of examination:** |
| written exam |
| **Requirement(s) to get signature:** |
| Active participation in lectures and exercises is a successful fulfilment of the tasks defined by the lecturer. |

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| **Exam questions:** |
| 1. Green and Ampt equation and application 2. Hazen- Williams equation and application 3. Darcy-Weisbach equation and application 4. Chezy equation and application 5. Pump efficiency and pipe line water loss optimization 6. Briefly outline the physical basis of the 'greenhouse effect’. Discuss the probable consequences of the greenhouse effect for the growth of an annual crop in your Country 7. Discuss the uses of supplementary illumination to improve and control crop growth and development in protected crops. Review the suitability of different lamp types for use in supplementary illumination 8. Review different pruning methods and water requirement relationships 9. Discuss the various ways that herbicides may be used to achieve the selective control of weeds in crops. 10. What features of a crop plant are likely to be associated with drought tolerance? 11. How serious is herbicide resistance in weeds and what strategies can be followed to restrict its occurrence or overcome its problems? 12. Discuss greenhouse irrigation control 13. Discuss water quality problems and water treatment systems 14. Hydroponic – aeroponic application and control 15. Fertigation application and control 16. How can be optimize micro sprinklers pop-up sprinklers 17. How can be optimize drip emitters 18. Crop water requirement and irrigation in apple orchards 19. Crop water requirement and irrigation in stone fruit orchards 20. Crop water requirement and irrigation in garden 21. Crop water requirement and irrigation in vineyard 22. Crop water requirement and irrigation in grass and golf course 23. Special irrigation technology (froze, color) 24. Irrigation modelling of vegetables 25. Irrigation modelling of one tropical and one non tropical fruit |