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| **Title and code** of the subject: **Urban Hydrology , MTMVG7024A** | **Credit: 3** |
| **Type** of the subject: optional |
| **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 1 |
| Preliminary requirements:- |

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| **Summary of content - theory**:  |
| Course objectives:Students are acquainted with urban environment, hydrological loop and hydrological cycle. The design and management of the urban water system based on an analysis of the entire system will lead to more sustainable solutions than separate design and management of the elements of the system. A crucial aspect of integrated urban water management (IUWM) is the early and effective involvement of stakeholders based on explored critical decision factors of local urban watershed. This course presents an overview of IUWM and the phases necessary for developing a strategic plan to move towards it. It provides assistance for shifting from a conventional approach in urban water management towards an approach based on integration that is more suitable to meet current requirements and cope with future developments more sustainably. Lectures1. Introduction - concept, urbanization - megacities
2. Definition, climate change
3. Urban microclimate
4. Urban water balance
5. Precipitation – Runoff, Infiltration
6. Grey water – water harvesting (non - structural management)
7. Evapotranspiration – Green surface, urban landscape
8. Flood management
9. Sewer network
10. Wastewater treatment
11. Biological wastewater treatment and sewage sludge management
12. Bioenergy, alternative water resources
13. Urban hydrology monitoring, smart cities
14. Decision support modeling in IUWM
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| **Summary of content - practice**: |
| Skills to be learnt:1. Team work – focus area
2. Team work –focus area
3. Team work – stakeholders
4. Remote sensing – Urban hydrology
5. Team work – Precipitation, runoff
6. Team work – Flood management
7. Case study - drinking water
8. Case study- sewer network
9. Case study- WWTP
10. Data acquisition – Land use, urban mapping
11. UH indexing
12. 3D urban environment models
13. UH landscape models
14. Reporting
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| **Literature, handbooks in English**  |
| 1. Musco, F. Counteracting urban heat island effects in a global climate change scenario
2. Urban Hydrology for small watershed TR55 USDA
3. New Urban Agenda ENSZ, Quito 2016.
4. SWIFT – IURWM decision package
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| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* |
| 1. **Knowledge:**
* Known in detail the shifting from a conventional approach in urban water management towards an approach based on integration that is more suitable to meet current requirements and cope with future developments more sustainably.

- Possessing urban hydrology and specific knowledge of study areas.- Know in detail the design and implementation of the field of activity of the profession, its implementing methods, rules and related features- Familiar with environmental protection and nature conservation natural sciences, environment as well the production of healthy, high-biological quality products.- They have acquired the relevant knowledge of sustainable farming, he/she is in the possession of the most up-to-date knowledge of cultivation technology, knowledge of research and development1. **Skills:**

- He/she is capable of a multidisciplinary, interdisciplinary approach to professional issues.- He/she is capable of identifying specific professional problems and solving them to explore and formulate a detailed conceptual and practical background.- Possesses different areas of ideas that form the knowledge system of the given field of expertise for a detailed analysis of the comprehensive and specific contexts.- He/she is able to formulate a synthetic evaluation formulation and report the results of the analysis.- He/she is able to engage in research and development projects1. **Attitude:**
* He/she is g able to engage in research and development projects
* He/she recognizes values, responsive for new methods and tools that help more effective application.

He/she is strongly committed to resolving problems on a professional basis.* Their professional interest is deepened and engaged.
* He/she is committed to environmental protection, nature conservation and a sustainable agrarian economy.
* Frankness, initiating, empathetic.
1. **Autonomy and responsibility:**
* They have considerable autonomy with comprehensive and specialized professional issues of environmental management in the implementation, representation and explanation of professional engineering.
* They are capable of independent, environmentally-friendly management, the application and development of modern agricultural technologies.
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| **Responsible lecturer: Prof. János Tamás** |
| **Other lecturer(s): Dr. Bernadett Gálya**  |

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

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| **Exam questions:** |
| 1. Definition of integrated urban water management
2. Environmental problems of megacities
3. Identification of IUWM stakeholders
4. Baseline of IUWM
5. Identification of focus area IUWM
6. Water balance equation of urban area
7. Urban microclimate
8. Urban ecology
9. Urban boundary layers
10. Precipitation, frequency
11. Infiltration, urban soils
12. Surface water and blue corridor
13. Groundwater
14. Drinking water management
15. Sewer systems
16. WWTP
17. Alternative water resources
18. Urban landscape and green corridor
19. Data acquisition
20. Urban models
21. SMART cities
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