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| **Subject name:** Protection of environmental elements I-II (Water and soil protection) | **NEPTUN-code:**RKEKE1MBNF | **Number of lessons:** lc+pr+lb1+0+2 | **Credit:** 5**Rec.**: m  |
| **Subject leader and Water Quality Protection lecturer:**Bodáné Dr. habil. Kendrovics Rita**Soil Protection Lecturer:** Dr. Mészárosné Dr. habil. Bálint Ágnes | **Position:** Associate ProfessorAssociate Professor | **Prerequisite:-** |
| **Description of knowledge:** |
| The course objective is to provide an overview of water quality protection and management topics. This scope deals with water circulation in nature and society, and the water incidents available for residential utilisation. It examines impacts and impurities affecting the natural waters of the industrialising world, the water quality resulting from that, and monitoring possibilities. It reviews general water and water management questions, like the basics of water management, fundamentals of water resources management, and current and future water demands. It shows different types of water utilisation and the return options of used water to nature. It presents basic hydrological notions, transmission of impurities in surface and subsurface waters, as well as impacts of oil pollution on water quality and possibilities of environmental clean-up. The other objective of the course is to introduce the basics of soil science - soil concepts, functions, soil-forming materials, soil physical properties, soil nutrient supply, and soil classification. Within soil conservation, the analysis of soil degradation processes and the effects of human activities on soil quality are covered in detail. It provides a comprehensive understanding of the organic and inorganic pollutants in soil, their impact and the factors that determine the spread of contamination. It presents the different technologies for soil remediation and the possibilities and international experience of remediation of contaminated sites. It deals specifically with on-site (in-situ, ex-situ) and off-site techniques. A special presentation will deal with different contaminants and their detection and remediation. |
| **Detailed description of the subject, timetable** |
| **Education Week** | **Topics for Water Conservation lectures and exercises** |
| **1.** | **Lecture:** Natural and social circulation of water.**Laboratory exercise:** Subject introduction, Field trip introduction – Introduction of Aranyhegyi stream - What we will do in the field? |
| **2.** | **Lecture:** Water in the human environment.**Laboratory exercise:** Process of water qualification, sampling, types of samples, sampling equipment, fixation |
| **3.** | **Lecture:** Type of freshwater 1: Surface water**Laboratory exercise:** Fieldwork 1: field observation of the Aranyhegyi stream |
| **4.** | **Lecture:** Surface water quality**Laboratory exercise:** How do we measure water flow? |
| **5.** | **Lecture:** Type of freshwater 2: Subsurface water**Laboratory exercise:** Fieldwork 2: measurement of water flow in the field (Aranyhegyi stream / at the border of Bp.) |
| **6.** | **Lecture:** Subsurface quality**Laboratory exercise:** The spread of contaminants in surface water and self-cleaning |
| **7.** | **Lecture:** Process of water qualification 1 - Physical parameters, Physico-chemical parameters**Laboratory exercise:** Sampling ang measuremet’s procedure |
| **8.** | **Lecture:** Process of water qualification 2 - Physical parameters, Physicochemical parameters**Laboratory exercise:** Fieldwork 3: sampling and measurement in the field (Mount Aranyhegyi) |
| **9.** | **Lecture:** Process of water qualification: Chemical parameters**Laboratory exercise**: Presentation of principles and equipment of analytical methods |
| **10.** | **Lecture:** Process of water qualification: Biological parameters**Laboratory exercise:** Surface Water Quality Standard |
| **11.** | **Rector's break** |
| **12.** | **Lecture:** Process of water qualification: Bacteriological parameters**Laboratory exercise:** Measurement in the lab (411) |
| **13.** | **Lecture:** Water Framework Directive and Ecological State Weighing**Laboratory exercise:** Written exam |
| **14.** | **Lecture:** Water pollution and protection - Oil pollution in water**Laboratory exercise:** Summary, general and individual assessment, repeat exam |
| **Education Week** | **Soil conservation lectures and exercises** |
| **1.** | **Lecture:** Definition and properties of soil.  |
| **2.** | **Laboratory exercise:** Brief description of laboratory safety: soil section, soil levels, and role of colour in determining soil types. |
| **3.** | **Lecture:** Soil phases and their role.  |
| **4.** | **Laboratory exercise:** Examine the soil texture by hand. Soil condition, compaction, secondary formations. Soil sampling: methods, rules. Determination of soil particle size distribution by sieve. |
| **5.** | **Lecture:** Silicates, soil minerals. Formation and types of soils**.** |
| **6.** | **Laboratory exercise:** Determining soil pH using different methods. Importance of soil sampling, C/N ratio, and determination by various methods. |
| **7.** | **Lecture:** Methods of Soil Protection. |
| **8.** | **Laboratory exercise:** The collected soil sample is prepared for measurement: the soil solutions are fired using different shaking techniques (ultrasonic and shaker) and solutions (1 M KCl, 0.01 M CaCl2, and 1% KCl solutions). The amount of exchangeable nitrate nitrogen is determined from the soil solutions by spectrophotometric measurement. |
| **9.** | **Lecture:** Soil colloids and their role. Physical degradation of soils.Soil conservation methods. |
| **10.** | **Laboratory exercise:** Determine the amount of exchangeable ammonium nitrogen from soil solutions using spectrophotometry. |
| **11.** | **Rector's break.** |
| **12.** | **Laboratory exercise:** Determine the amount of exchangeable ammonium nitrogen from soil solutions using spectrophotometry. |
| **13.** | **Lecture:** Organic contamination and removal of soils |
| **14.** | **Laboratory exercise:** Inorganic soil contamination and removal.Phytoremediation. Possibility of substituting laboratory exercises. |
| **Mid-term requirements** |
| **Participation in activities:** Participation is compulsory. Attendance at lectures and laboratory exercises is mandatory. Attendance will be checked! If the absences exceed 30% (only the absences for lectures are given), the student will be blocked! |
| **Papers, minutes, reports, etc.** **Water protection:** 1. Report of field works (4 x 3 points) 12 points
2. Essay and ppt (2 x 4 points) 8 points
3. Written exam 30 points

**Soil protection:**It is compulsory to give a presentation on your residence's soils, contaminants and soil remediation technologies. You will receive 5 points for this assignment.15 points for laboratory exercises. For the measurement protocols, a score of % is awarded. From this, I calculate an average and the corresponding percentage of the 15 points. Please upload the protocols to Moodle one week after each laboratory exercise—the minimum requirement is 10 points. Last week, at the agreed-upon time, we wrote the theoretical part of the test (in the form of a test) in the Moodle system. A maximum of 30 points will be achieved. The minimum requirement is 15 points. |
| **The method of obtaining a signature / mid-term mark:**1) Water protection: 50 points, Minimum: 25 points 2) Soil protection: 50 points, Minimum: 25 points. Below 50 points: unsatisfactory; 50-62 points: satisfactory; 63-75 points: average; 76-85 points: B; 86 points and above: ExcellentThose who do not achieve the minimum score will be offered a make-up test at an agreed time. |
| **The professional competencies to be acquired** |
| Ability to process measurement data using different methods and software. You must have basic and specialist statistical skills. You must be able to develop yourself. You must be able to perform calculations accurately. Be able to identify the most appropriate methods for processing your data. He/she must be able to think logically. You should be able to present your calculations and justify the results. |
| **References:** |
| **Water protection:***Mandatory:** lecture presentations: in the system, e-learning
* Hydrology: Dr. Pregun, Csaba Publication date 2011 Szerzői jog © 2011 Debreceni Egyetem. Agrár- és Gazdálkodástudományok Centruma

*Recommended literature*:* R.C.Gaur: Basic environmental engineering, New Age International Publishers. 2008 in e-learning system
* RPC Morgan: Soil Erosion and Conservation, National Soil Resources Institute, Cranfield University, Blackwell Publishing, 2005,

**Soil protection:***Mandatory:** e-book: Khan Towhid Osman: Soil Degradation, Conservation and Remediation, Springer, Dordrecht, Heidelberg, New York, London, 2014, ISBN 978-94-007-7589-3; ISBN 978-94-007-7590-9 (eBook); DOI 10.1007/978-94-007-7590-9; in the system e-learning
* lecture presentations: in the system, e-learning

*Recommended literature:** Humberto Blanco, Rattan Lal: Principles of Soil Conservation and Management, Springer Verlag, 2008 (in the e-learning system)
* Editors: Damien J. Field, Cristine L. S. Morgan, Alex B. McBratney**:** Global Soil Security, Springer Cham, 2018, <https://doi.org/10.1007/978-3-319-43394-3>, Hardcover ISBN 978-3-319-43393-6, Published: 06 December 2016, Softcover ISBN 978-3-319-82811-4 Published: 06 July 2018; eBook ISBN978-3-319-43394-3Published: 01 November 2016, Edition Number1
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