

GROUNDWATER ENGINEERING

(Specialization Environmental engineering, 4nd Year of study, 1st Semester)

Credits (ECTS): 5

Course category: mandatory

Course holder: Assist. Prof. Georgiana-Diana GABUR, PhD

Objectives of the discipline:

The discipline of *Groundwater Engineering* provides students with the theoretical concepts necessary to understand how groundwater occurs underground, the dynamics and the quantitative and qualitative characterization of groundwater. Flow and transport phenomena of pollutants, phenomena of interaction of aquifer systems with pollutants, water quality issues and practical aspects of water quality maintenance are addressed.

Specific objectives:

- Understanding the phenomena that determine groundwater localization and dynamics;
- Understanding the main concepts of groundwater chemistry;
- Understanding the main methods of groundwater investigation;
- Explaining and interpreting basic concepts, methods and models in environmental engineering problems;
- Qualitative and quantitative assessment of natural phenomena and anthropogenic activities on the quality of environmental factors;
- Identification of the best technical and technological solutions in order to implement professional projects of environmental engineering and protection.

Contents (syllabus)

Course (chapters/subchapters)
1. Soil-groundwater system. Configuration of the underground environment. Soil. Main soil properties. Groundwater. Hydrogeologic characteristics of aquifers. Importance of soils and groundwater.
2. Methods to approach the risk assessment analysis of contaminated soils and polluted groundwater. Targets, concepts and means of analysis. Soil ecological factors and determinants. Analysis and comparisons. Pathways of contaminants from soil into the human body.
3. Steps in the risk assessment process of contaminated soils and polluted groundwater. Establishing the conceptual model. Comparison of soil physical, chemical and biological characteristic values with quality standards. Definition of additional data to be known. Soil sampling and analysis. Forecasting soil evolution. Delimitation of areas requiring further studies.
4. Need-to-know data and requirements in establishing measures for the ecological remediation of contaminated soils and groundwater remediation. Analyze available data and identify appropriate strategies to protect soil quality, human and animal health.
5. Groundwater movement. General concepts.
6. Darcy's Law.
7. Hydrodynamic basis of filtration.
8. Hydraulic models of filtration.
9. Hydraulic calculation of filtration in catchment works.
10. Hydraulic calculation of filtration through earthworks.

Practical activity
1. Hydrogeological assessment - overview and case study
2. Hydrological properties of rocks
3. Risk assessment induced by contaminated soil and polluted groundwater.
4. Hydraulic conductivity.
5. Groundwater abstraction by wells. Hydraulic calculation of water abstractions (wells, drains).
6. Application of Darcy's law, limitations of the possible applications of Darcy's law.
7. Determination of physico-chemical properties of groundwater.
8. Interpretation of groundwater chemistry in the hydrogeologic context.
9. Colloquium

Bibliography

1. Baciu C., 2004 - *Hidrogeologie – elemente teoretice și aplicații practice*. Editura Casa Cărții de Știință, Cluj-Napoca.
2. Bartha I., Javgureanu V., Marcoie N., 2004 - *Hidraulică*, vol. 2, Ed. Performantica, Iași.
3. Castany, G., 1972 - *Prospecțiunea și exploatarea apelor subterane*. Ed. Tehn., București.
4. Cioc, D., 1983 - *Hidraulică*. Edit. Did. și Pedag., București.
5. Costache, Gh. 1982 - *Apele subterane și captarea lor*. Editura Tehnică, București.
6. Luca M., 1994 - *Hidraulica construcțiilor hidrotehnice*, vol. I, Ed. UT, Iași.
7. Luca M., 1998 - *Hidraulică tehnică*, vol. I, Ed. Cerami, Iași.
8. Micle, V., Neag, Ghe., 2009 – *Procedee și echipamente de depoluare a solurilor și a apelor subterane*, Editura U.T. Press, Cluj-Napoca.
9. Scradeanu D., Gheorghe A., 2007 - *Hidrogeologie generala*, Edit. Univ. Bucuresti.
10. Stanciu P., 2002 - *Miscarea apei pe versanti permeabili*. Ed. HGA, Bucuresti.
11. Stătescu Fl., 2003 - *Monitorizarea calității solului*, Editura “Gh. Asachi” Iași, ISBN 973-621-049-9, pag. 198, Iasi.
12. Stătescu Fl., 2004 - *Evoluția solurilor ameliorate*, Editura Politehniun, Iași, ISBN 973-621-097-9, 100 pag., Iasi.
13. Stătescu Fl., Cotiușcă-Zaucă, D., 2008 - *Model de evaluare a riscului solurilor contaminate*, Editura Politehniun, ISBN 978-973-621-251-2, pag. 100.
14. Stătescu Fl., Pavel V.L., 2011 - *Știința solului*, Editura Politehniun, ISBN 978-973-621-373-1, pag. 329.
15. Stătescu Fl., Pavel V.L., 2015 - *Tehnici moderne de cercetare a solului*, Editura Politehniun, ISBN 978-973-621-448-6, pag. 266.
16. Stătescu Fl., Pavel V.L., 2017 - *Procese de Degradare a Solului*, Politehniun, ISBN 978-973-621-468-4, pag.120.
17. Stătescu, Fl., Cotiușcă-Zaucă, D., 2008 - *Model de evaluare a riscului solurilor contaminate*, Editura Politehniun, ISBN 978-973-621-251-2, pag. 100.
18. Varduca A., 1997 - *Hidrochimie și poluarea chimică a apelor*. Ed. HGA, Bucuresti.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Final exam	Written examination	60%
Evaluation of the activity during the semester	Written and oral assessments during the semester	40%

Contact

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