Seepage and groundwater hydraulics - BMEEOVVDT81

I. Subject Specification

1. Basic Data

1.1 Title

Seepage and groundwater hydraulics

1.2 Code

BMEEOVVDT81

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2

1.5 Evaluation

Exam

1.6 Credits

3

1.7 Coordinator

name	Dr. Csoma Rózsa
academic rank	Associate professor
email	csoma.rozsa@emk.bme.hu

1.8 Department

Department of Hydraulic and Water Resources Engineering

1.9 Website

https://epito.bme.hu/BMEEOVVDT81
https://edu.epito.bme.hu/course/view.php?id=2498

1.10 Language of instruction

english

1.11 Curriculum requirements

Ph.D.

1.12 Prerequisites

1.13 Effective date

2 February 2022

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2. Objectives and learning outcomes

2.1 Objectives

The aim of the course is to make students recognize basic and special phenomenon in the field of seepage and groundwater flow, to learn how to find and evaluate the literature to describe it and how to make a synthesis.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. to be aware of the general terminology of hydrogeology
2. to be aware of the general equations describing seepage and groundwater flow, and also special phenomenon
3. to be aware of the phenomenon and methods to be applied in case of compound hydrogeological systems

B. Skills

1. to be able to describe groundwater flow systems with the proper hydraulic models,
2. based on the knowledge in the technical literature to be able to give a detailed introduction of a smaller, special topic
3. to be able to present his/her results in proper oral and written form,
4. to be able to participate in discussions in the fireld if seepage and groindwater flow

C. Attitudes

1. to collaborate with the teachers and his/her mates in gaining knowledge,
2. to follow the lectures, to make effort to understand the study material,
3. to strive for the proper identification of problems in connection with seepage and groundwater flow and their proper solution,
4. to strive for accuracy in his/her calculations/solutions,
5. to realize the importance of the effects of human activities on the environment.

D. Autonomy and Responsibility

1. to be independent in exploring the resources to introduce seepage and groundwater flow procedures,
2. to be open to careful and deep going critique,
3. to collaborate with the mates to discover certain field and to discuss it,

4. to understand the complexity, comprehensiveness of the problems and recognizing the synergies.

2.3 Methods

The first part of the course consists of lecutes on special questions of seepage and groundwater flow. After it, the students prepare presentations of cca 30 min. on topics agreed with the lecturer and the class mates. The topic should be connected to the research field of the student, if possible. Each presentation is followed by a discussion.

2.4 Course outline

Hét	**Előadások és gyakorlatok témaköre**
1.	Basic elements, basic equations: a recall and standardisation: I. seepage flow
2.	Basic elements, basic equations: a recall and standardisation: II. groundwater flow
3.	Groundwater modelling, theorems and methodology
4.	Models based on superposition
5.	Tóth's theorem of groundwater basins
6.	Special questions of ubderground transpor processes : I. advection
7.	Special questions of ubderground transpor processes : II. other transport mechanisms
8.	Beyond Darcy flow: microseepage
9.	Beyond Darcy flow: turbulent seepage
10.-14.	students' presentations

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

2.5 Study materials

a) Tankönyvek:

1. Bear, J.: Hydraulics of Groundwater. McGraw-Hill Inc. New-York, 1979.
2. Bear, J.: Dynamics of Fluids in Porous Media. American Elsevier Publishing Company Inc. New York London Amsterdam, 1988.
3. Bear, J. - Verruijt, A.: Modelling Groundwater Flow and Pollution. D. Reidel Publishing Company, Dordrecht, 1987.
4. Friend, J.J.: Groundwater Pollution. Developments in Water Sciences No. 4. Elsevier Scientific Publishing Company Amsterdam - Oxford - New York. 1975
5. Haitjema, H. M.:. Analytic Element Modelling of Groundwater Flow. Academic Press. San Diego, 1995.
6. Kinzelbach, W.: Groundwater Modelling. Developments in Water Sciences No. 24. Elsevier Scientific Publishing Company, Amsterdam - Oxford - New York, 1986.
7. Marino, M. A: - Luthin, J. N.: Seepage and Groundwater. Developments in Water Sciences No. 13. Elsevier Scientific Publishing Company, Amsterdam - Oxford - New York, 1982.
8. Strack, O. D. L.: Groundwater Mechanics. Prentice-Hall, Englewood Cliffs, New Jersey, 1989.
9. Verruijt, A.: Theory of Groundwater Flow. Macmillan Civil Engineering Hydraulics Series. Macmillan and Co. Ltd. London, 1970.
10. Wang, H. F. - Anderson, M. P.: Introduction to Groundwater Flow Modelling. Finite Difference and Finite Element Methods. W.H.Freeman and Company, San Francisco, 1982.
11. József Tóth: Gravitational Systems of Groundwater Flow. Theory, Evaluation, Utilization. Cambridge Univerity Press, 2009.

b) Online materials: materials uploaded to the web site of the subject, e.g.:

1. Lecture notes, electronic lecture notes,
2. Slides of lectures and practices

2.6 Other information

2.7 Consultation

The instructors are available for consultation during their office hours, as advertised on the department website at the beginning of the semester.

This Subject Datasheet is valid for:

Inactive courses

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

The assessment of the learning outcomes specified in Clause 2.2 above and the evaluation of student performance via the presentation and the discussions.

3.2 Assessment methods

Teljesítményértékelés neve (típus)	Jele	Értékelt tanulási eredmények
Exam presentation	EP	A.1-A.3; B.1-B.3; C.1-C.4; D.1, D.4
Activity during the discussions	A	A.1-A.3; B.4; C.1, C.5; D.3-D.4

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

Jele	Részarány
EP	80
A	20
Összesen	**100%**

3.4 Requirements and validity of signature

At least 70% of the attendance of the classes are expected, and activity during the discussions after the presentation of the class mates.

3.5 Grading system

If the grade for the presentation is at least satisfactory, the the final grade is the weighted average value of the grades obtained, where the weights are according to the clause 3.3.

3.6 Retake and repeat

The presentation can be retaken once without any fee at the time given Detailed class schedule. The grade to be considered is the more favorable for the student.

3.7 Estimated workload

Tevékenység	Óra/félév
Contact hours	14×2=28
the independent study of given literature for the presentation	20
independent literatore research for the presentation	30
the preparation of the presentation	12
Összesen	**90**

3.8 Effective date

2 February 2022

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