UNIVERSITY OF MISKOLC

FACULTY OF
EARTH AND ENVIRONMENTAL
SCIENCE AND ENGINEERING

HYDROGEOLOGICAL INTERPRETATION

Hydrogeology Engineer MSc

2023/24 Semester I.

COURSE COMMUNICATION FOLDER

University of Miskolc
Faculty of Earth Science
Institute of Environmental Management

Table of contents

1. Course introduction, teacher, number of lessons, credits 3
2. Course syllabus 6
3. Example Test 8

1. Course introduction, teacher, number of lessons, credits

Course Title: Hydrogeological interpretation **Instructor:** Dr. Márton Tóth, assistant professor	**Code:** MFKHT730024 **Responsible department/institute:** Institute of Environmental Management
	Type of course: Compulsory
Position in curriculum (which semester): 3	**Pre-requisites (if any):** MFKHT710017
No. of contact hours per week (lecture + seminar): 1+1	**Type of Assessment (examination/ practical mark / other):** practice mark
Credits: 2	**Course:** full time

Course Description:

The students will be familiar with the basic concepts, tasks and purposes of complex hydrogeological interpretation. The students will also learn about the main properties of measured hydrological and hydrogeological data sets and about geostatistical as well as optimization calculations. The students will be prepared to process and analyze multidimensional hydrogeological data sets on order to make effective interpretation.

The short curriculum of the subject:

Measurements and data set types in hydrogeology and hydrology. Data processing to gain information. Data distribution models in groundwater science. Fitting and regression analysis. The role of histograms. Sample statistical properties, uncertainty determination. Frequently used statistical probes in water sciences. The basic concepts of optimization. Rare event determination concerning flood levels and groundwater levels. Water level curve characteristics. Sample collection strategy in environmental and water sciences. Determination of weather probability curve. Extreme precipitation events and their predictions. Complex interpretation of different types of groundwater data.

Compatencies to evolve:

Knowledge:

T1 – It includes knowledge of hydrogeology, water resource management, water quality protection, water treatment, production and waterworks operat

T2 – Extensive knowledge of hydrogeological assessment and monitoring techniques related to watershed approach and considers ecological water demands.

T4 – Have a working knowledge of computer-aided design and analysis

T5 – Knows and understands hydrogeological modelling techniques.

T7 – Have knowledge of a wide range of problem-solving techniques for research or academic work.

T8 – Have general and specialist management skills to manage complex design work.

Ability:

K2 – Ability to process information from the knowledge frontiers of professional experience of the discipline, ability of problemsolving, and interpreting hydrogeological issues.

K4 – Ability to effectively apply water production techniques and knowledge of modern well construction technologies.

K5 – Ability to apply design, knowledge and technologies related to water supply and water treatment at a high level.

K6 – Prepared to tackle complex water resource management, water conservation and aquifer protection challenges.

K9 – Ability to model hydrodynamics and transport of groundwater flow systems

K10 – Prepared to effectively apply relevant national and European professional, environmental and conservation legislation

K13 – The ability to independently participate in and manage research, development and expertise in the field of hydrogeology

K14 – Ability to lead and participate in complex design work and project management in water management and water supply

Attitude:

A1 – Open-minded and receptive, active in learning about professional and technological methodological developments in the fields of geosciences and environmental engineering, and in solving geological problems from an engineering perspective

A4 – Deep commitment and professional solidarity

A6 – Respect and act in accordance with the ethical principles and written rules of work and professional culture, and be able to adhere to them when managing small teams

A8 – Characterised by intuition, consistency and a willingness to learn.

Autonomy and responsibility:

F1 – Act independently and proactively to solve professional problems.

F2 – Have a responsible attitude towards the environment.

F5 – Committed to sustainable natural resource management practices.

F6 – He/she is responsible claims in expert oppinions, professional judgements and for the work carried out under his/her supervision.

Assessment and grading:

Students will be assessed with using the following elements.

Attendance:	15 %
Final exam	85 %
Total	100%

Grading scale:

% value	Grade
90 -100%	5 (excellent)
80 – 89%	4 (good)
70 - 79%	3 (satisfactory)
60 - 69%	2 (pass)
0 - 59%	1 (failed)

Compulsory or recommended literature resources:

- Dr. Steiner Ferenc: A geostatisztika alapjai. Tankönyvkiadó, Budapest, 1990.
- Dr. Csoma János, Dr. Szigyártó Zoltán: A matematikai statisztika alkalmazása a hidrológiában. VITUKI, Budapest, 1975.
- EPA QA/G-9: Guidance for Data Quality Assessment. Practical Methods for Data Analysis. 2000.
- D.R. Helsel, R. M. Hirsch: Statistical Methods in Water Resources. Elsevier, 1992. Graham Borradaile: Statistics of Earth Science Data. Springer, 2003.
- Webster R., Oliver A. M.: Geostatistics for environmental scientist, Wiley, 2007.

2. Course syllabus

Hydrogeological interpretation
Syllabus
Autumn semester
Hydrogeological Engineer MSc, Semester III., Compulsory course

09.05	General Grapher use; Frequency, duration
09.12	Scale and place parameter determination
09.19	Most frequent value
09.26	ANOVA
10.03	ANOVA practice
10.10	Variogram
10.17	Kriging
10.24	Basic of Fourier transformation
10.31	Holiday
11.07	Correlation, cross-correlation
11.14	Spectral analysis of cross-correlogram
11.21	Parameter sensitivity analysis
11.28	General practice; Consultation
12.05	Test
12.12	Test repetition

3. Example Test

Hydrogeological interpretation
Test I.
2019.12.02

1 Exercise-Analysis of Varince

There were two treatment where the leachate calcium concentration was analyzed. The question is there is significant difference between the treatments or not?

2 Exercise-Create cross-correlogram

There is a precipitation and water level data series. Create the cross-correlogram of the two variable!

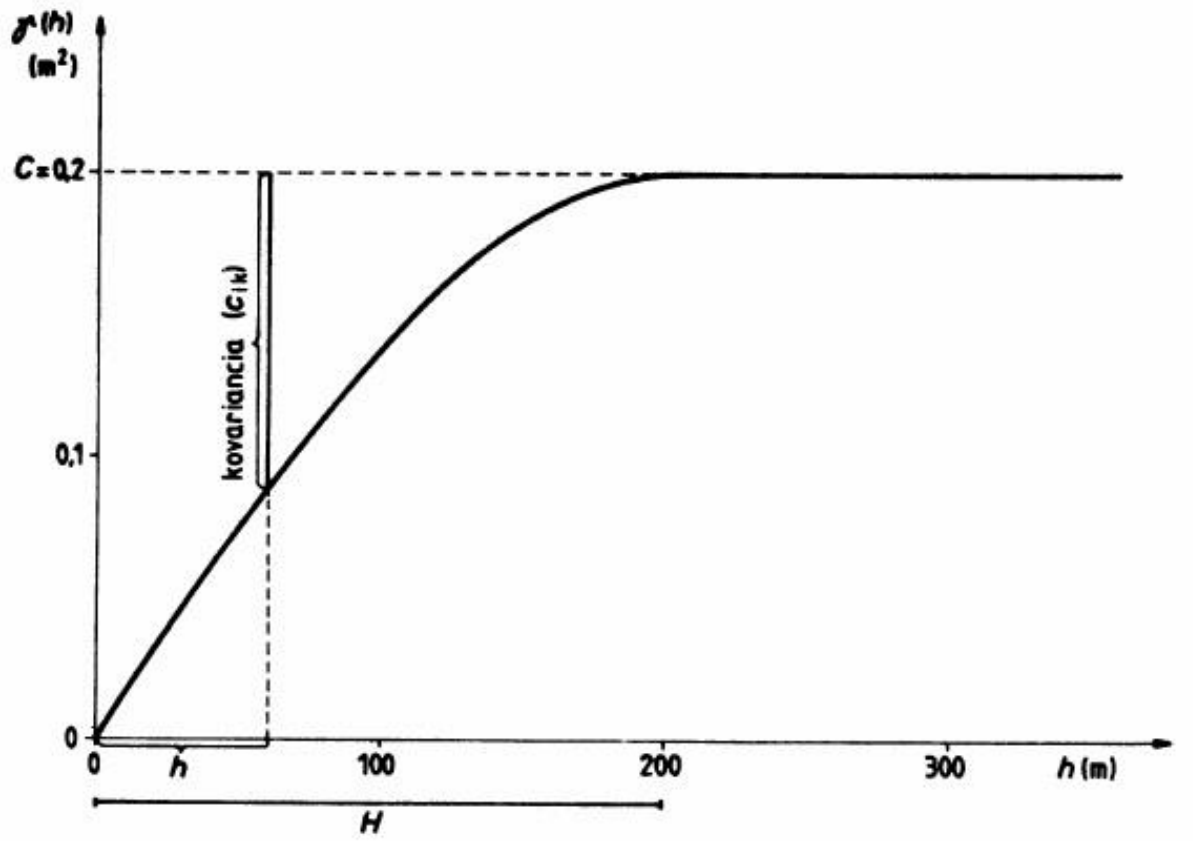
3 Exercise-Calculate Fourier constant

There is a sign. Determine the value of Fourier constant related to the 4th frequency bin!

4 Exercise-Determine Krige weights

There is a point pair system. Determine the Krige weights for the Unknown Point, if the H (radius of influence) = 2.5, C (covariance) = 2!

$$\gamma(h) = \begin{cases} C\left[1{,}5 \cdot \dfrac{h}{H} - 0{,}5\left(\dfrac{h}{H}\right)^3\right] & ha \quad 0 \le h \le H \\ C & ha \quad h > H \end{cases}$$


γ*(h)
(m²)
C=0,2
0,1
0
kovariancia (c_ik)
0
h
100
200
300
h (m)
H