HYDROGEOLOGICAL INTERPRETATION

Hydrogeology Engineer MSc

2020/21 Semester I.

COURSE COMMUNICATION FOLDER

University of Miskolc
Faculty of Earth Science
Institute of Environmental Management

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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 the courses will be online	**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, T2, T4, T5, T7, T8

Ability: K2, K4, K5, K6, K9, K10, K13, K14

Attitude: A1, A4, A6, A8

Autonomy and responsibility:F1, F2, F5, F6

Assessment and grading:

Students will be assessed with using the following elements.

Attendance:	15 %
Short quizzes	10 %
Midterm exam	40 %
Final exam	35 %
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

09.08	General Grapher use; Frequency, duration
09.15	Most frequent value
09.22	ANOVA
09.29	ANOVA practice
10.06	Variogram
10.13	Kriging
10.20	Basic of Fourier transformation I.
10.27	Basic of Fourier transformation II.
11.03	Correlation, cross-correlation
11.10	Spectral analysis of cross-correlogram
11.17	Parameter sensitivity analysis
11.24	General practice; Consultation
12.01	Test
12.08	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!

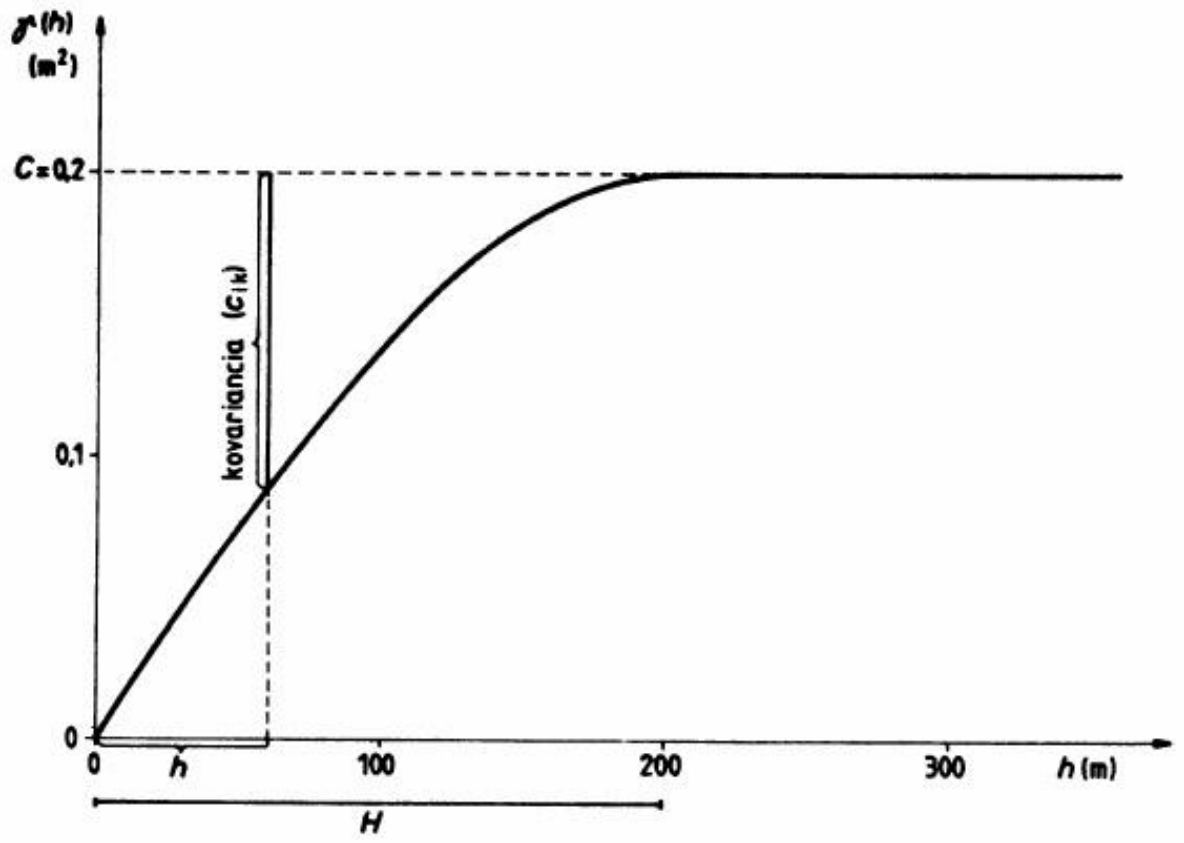
3 Exercise-Calculate Fourier constant

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(k))
0
h
100
200
300
h (m)
H