Hydrology 2 - BMEEOVVAI41

I. Subject Specification

1. Basic Data

1.1 Title

Hydrology II.

1.2 Code

BMEEOVVAI41

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2
Lab	2

1.5 Evaluation

Midterm grade

1.6 Credits

3

1.7 Coordinator

name	Dr. József Szilágyi
academic rank	Professor
email	szilagyi.jozsef@emk.bme.hu

1.8 Department

Department of Hydraulic and Water Resources Engineering

1.9 Website

https://epito.bme.hu/BMEEOVVAI41
https://fiek2.mywire.org/course/view.php?id=3580

1.10 Language of instruction

english

1.11 Curriculum requirements

Compulsory in the Specialization in Infrastructure Engineering (BSc) programme

1.12 Prerequisites

Strong prerequisites:

- Hydrology I (BMEEOVVAT41)

Recommended prerequisites:

- Mathematics A1a (BMETE90AX00)
- Mathematics A3 for civil engineers (BMETE90AX07)

Exclusion:

- Hidrológia II (BMEEOVVAI13)

1.13 Effective date

1 September 2022

2. Objectives and learning outcomes

2.1 Objectives

This course focuses on probability and statistics, time series and linear models most frequently employed in hydrology. It also covers fundamentals in reservoir design and flood level estimation both in gauged and ungauged basins. Solution of the practical problems with the help of MATLAB will enable one to successfully apply such concepts for water resources management and civil engineering design.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. Familiarity with the most frequently encountered concepts in hydrology.
2. Knows the basic concepts in mathematical statistics (including hypothesis testing) and their applications in water resources management and civil engineering design.
3. Awareness of the conditions necessary for applying linear regression models.
4. Familiarity with time series model applications, basics in reservoir design, and details in flood level estimation.

B. Skills

1. Problem solving capacity in water resources management and civil engineering design by hydrological statistics, linear and time series models.
2. Thorough knowledge of linear models in hydrology, their modifications and problem-specific applications, including Monte-Carlo type simulations for reservoir design.
3. Thorough understanding and correct application of statistical concepts often employed in hydrology and water resources management.
4. Aptitude for writing MATLAB code for solving problems in hydrology and civil engineering design.
5. Capacity of simplifying complex problems and finding solutions.

C. Attitudes

1. Cooperates with the instructor during the learning process.
2. Continuously and actively seeks ways of gaining knew knowledge even beyond the required curriculum and employs the internet for finding intuitive answers to research problems.
3. Open to learn new software skills.
4. Attempts to perform precise problem solutions.

D. Autonomy and Responsibility

1. Resolution to solving homework on one's own within feasible limits.

2.3 Methods

Lectures on theory. Practical guidance about the steps needed for solving computational/modelling problems and the software required. Consultation of the homework individually or in groups using one's own laptop on top of written (e-mail) and personal oral communication during consultation hours.

2.4 Course outline

Week	**Topics of lectures and/or exercise classes**
1.	Engineering hydrology, probability theory and statistics. Relative frequency, probability. Random variable.
2.	Distributions of random variables. Theoretical and empirical (cumulative) distribution functions (CDF & DF). Properties of DFs. Statistical moments.
3.	Common distribution functions applied in hydrology. Parameter estimation by the method of moments.
4.	Application of CDFs in hydrology. Representativeness, independence, homogeneity.
5.	Fitting of CDFs to measurements. Goodness of fit.
6.	Correlation and regression. Best-fit equation for linear regression. Properties.
7.	Cross- and auto-correlations. Trend analysis. Periodical components of time series.
8.	Autoregressive models.
9.	Forecasting with time series. Monte-Carlo simulation of time series.
10.	Reservoirs in civil engineering. Types of reservoirs. Morphological and hydrological characteristics.
11.	Characteristics of water supply reservoirs. Reservoir sizing. Water supply reliability calculations. Monte-Carlo simulation of water-supply reliability.
12.	Flood-mitigation reservoirs and their sizing.
13.	Empirical peak discharge estimation on ungauged watersheds. The rational method.
14.	Additional empirical flood level estimation methods.

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) Textbooks:

1. McCuen, R. H., 1998. Hydrologic analysis and design, Prentice Hall, USA.
2. Haldar, A., Mahadevan, S., 2000. Probability, reliability, and statistical methods in engineering design, John Wiley, New York, USA.

2.6 Other information

2.7 Consultation

Time of consultations: advertised on the course's webpage (occasionally by specific request), in the office of the course instructor or on the website of the course instructor.

This Subject Datasheet is valid for:

2023/2024 semester I

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

Evaluation of the participant's learning progress described in A 2.2. is performed by two written tests and six homework assignments.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1st homework (partial performance evaluation)	HW1	B.1-B.4; C.1-C.4; D.1
2nd homework (partial performance evaluation)	HW2	B.1-B.4; C.1-C.4; D.1
3rd homework (partial performance evaluation)	HW3	B.4-B.5; C.1-C.4; D.1
4th homework (partial performance evaluation)	HW4	B.5; C.1-C.3; D.1
5th homework (partial performance evaluation)	HW5	B.1-B.2, B.5; C.1-C.4; D.1
6th homework (partial performance evaluation)	HW6	A.1; B.1-B.2, B.5; C.1-C.4; D.1
1st written test (partial performance evaluation)	WT1	A.1-A.4; B.3-B.5
2nd written test (partial performance evaluation)	WT2	A.1-A.4; B.1-B.5

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

3.3 Evaluation system

Abbreviation	Score
HW	50%
WT1-WT2	25%-25%
Sum	**100%**

3.4 Requirements and validity of signature

Non-relevant.

3.5 Grading system

Grade	Points (P)
excellent (5)	85%<=P
good (4)	70<=P<85%
satisfactory (3)	55<=P<70%
passed (2)	40<=P<55%
failed (1)	P<40%

Each test and homework must be completed by at least 40% of the maximum score.

3.6 Retake and repeat

1. The homework is due back within two weeks always.
2. The homework can be corrected within that time limit.
3. There is a make-up test in the 15th week of the semester.

3.7 Estimated workload

Activity	**Hours/semester**
participation in contact classes	14×3=42
preparation for the tests	2×8=16
preparation of homework	6×4=24
study from notes, textbooks	8
Sum	**90**

3.8 Effective date

1 September 2022

This Subject Datasheet is valid for:

2023/2024 semester I