Hydromophology - BMEEOVVMV-2

I. Subject Specification

1. Basic Data

1.1 Title

Hydromophology

1.2 Code

BMEEOVVMV-2

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2
Field course	(3)

1.5 Evaluation

Exam

1.6 Credits

4

1.7 Coordinator

name	Dr. János Józsa
academic rank	Professor
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1.8 Department

Department of Hydraulic and Water Resources Engineering

1.9 Website

https://epito.bme.hu/BMEEOVVMV-2
https://fiek2.mywire.org/course/view.php?id=3536

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Compulsory in the Water and Hydro-Environmental Engineering (MSc) programme

1.12 Prerequisites

1.13 Effective date

2 February 2022

2. Objectives and learning outcomes

2.1 Objectives

The aim of the course is to provide the students with theoretical and practical knowledge required for the hydromorphological assessment of rivers. Accordingly, the following will be covered during the semester: i) the theoretical description of flows, and their practical applicability, ii) flow measurement methods, iii) the role of turbulence, its theoretical description and measurement methods, iv) theoretical and empirical description, and measurement methods of sediment transport, v) the analysis of bed material, vi) large-scale morphological assessment of rivers, vii) geophysical bed surveys and viii) catchment-scale sediment transport processes. In addition to the lectures, students also take part in a field course where they apply the theoretical knowledge acquired during the semester.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. Knows the mathematical description of flows (Navier-Stokes and Reynolds-averaged Navier-Stokes equations).
2. Knows the role of turbulence in mixing processes.
3. Knows the modern flow measurement methods.
4. Knows the theoretical and empirical description of fluvial sediment transport.
5. Knows the state-of-the-art measurement methods of fluvial sediment transport.
6. Knows the calculation methods of fluvial sediment load.
7. Knows the natural morphological processes of rivers.

B. Skills

1. Able to assess which simplified description of flows can be used for solving specific engineering tasks.
2. Able to select the suitable flow measurement method for solving various engineering problems.
3. Provides an empirical estimate of the fluvial sediment load.
4. Able to determine the suitable sediment measurement methods in case of rivers with different hydromorphological characteristics.
5. Compiles the measurement procedure required to assess the hydromorphological condition of rivers.
6. Able to assess the complex hydromorphological condition of rivers.

C. Attitudes

1. Collaborates with the instructors and fellow students to expand knowledge.
2. Constantly acquires knowledge.
3. Open to the use of new data processing methods during the field course.
4. Open to the use of modern and state-of-the-art measurement techniques and equipments during the field

course.

5. Strives to achieve accurate problem solution.

D. Autonomy and Responsibility

1. Accepts substantiated critical remarks.
2. Participates in solving the tasks of the field course independently and in cooperation with fellow students.

2.3 Methods

Lectures, calculations, demonstration of instruments during the field course, group measurements and data processing.

2.4 Course outline

Week	**Topics of lectures and/or exercise classes**
1	Introduction: Role of hydromorphology in the civil engineering practice
2	Theoretical description of flows: Kinematics of fluids
3	Theoretical description of flows: Mechanics of ideal fluids
4	Theoretical description of flows: Mechanics of viscous fluids
5	Flow measurement methods
6	Flow-bed interaction, incipient motion of sediment particles
7	Theoretical description of sediment mixing
8	Theoretical description of suspended sediment and bedload transport
9	Measurement methods of suspended sediment and bedload transport
10	Sampling and analysis of bed material – and the meaning behind it
11	Large-scale morphological analysis of rivers
12	Methods of geophysical bed survey
13	Sediment transport at catchment scale
14	Field course: introduction and preparation

Field course: 3 days in the exam period. The students are working in groups of 4-5 students in the BME measurement camp in Göd. The measurements are carried out in the section of the Danube River near Göd. The field course has three main parts: field data collection, laboratory analysis and data processing:

1. Field data collection:
    - riverbed topography survey
    - water surface slope measurement
    - acoustic flow measurements
    - suspended sediment sampling
2. Laboratory analysis:

- determination of suspended sediment concentration and particle size distribution by us-ing traditional direct (filtration) and indirect methods (laser diffraction and infrared scattering)

3. Data processing:
   - preparation of riverbed topography map
   - evaluation of flow data, identification of special flow structures
   - sediment transport rates

At the end of the field course, the groups will submit a report presenting the hydromorphological characteristics of the studied section of the Danube River, based on their measurements and knowledge.

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. Bogárdi, János: Sediment transport in alluvial streams. Akadémiai Kiadó, Budapest, 1974, 836p.
2. Németh, Endre: Hidromechanika. Tankönyvkiadó, Budapest, 1963, 883p. *In Hungarian*.
3. M. García et al: Sedimentation Engineering: Processes, Measurements, Modeling, and Practice, American Society of Civil Engineers, 2008 - Technology & Engineering, 1132p.

b) Online materials:

1. Józsa, J., Baranya, S.: Hidromorfológia HEFOP jegyzet. Digital lecture notes *in Hungarian*.
2. Baranya, S. et al.: Hidromorfológiai mérőgyakorlat. Digital lecture notes of the field course. *In Hungarian*.

2.6 Other information

1. Attendance at the field course is mandatory. Duration: 3 days. Location: BME measurement camp in Göd. Date: pre-scheduled shifts during the exam period.

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 – or after agreed by email.

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 occurs via: attendance to lectures, a midterm test, attendance to the field course and preparation of a field study report, and a written exam.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
midterm test	MT	A.1-A.4
field course (continuous performance evaluation)	FC	B.1-B.6; C.1-C.5; D.1-D.2
written exam	E	A.5-A.7

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
MT	20%
FC	30%
E	50%
Sum	**100%**

3.4 Requirements and validity of signature

To obtain the signature, it is required that the student participates in at least 70% of the lectures, 100% of the field course, and completes the midterm test and the field course at least at a Sufficient level.

3.5 Grading system

Exam score less than 40% of the total results in an Insufficient mark.
In case of fulfilling the attendance requirements, and passing the midterm test and the written exam, the final grade is calculated as a weighted (according to 3.3.), rounded average of the score of the midterm test, field course and written exam.

3.6 Retake and repeat

The midterm test can be retaken or repeated once in the week of repeats, free of charge. In case of correction, the favourable result will be taken into account. If the student is not able to obtain a grade other than Insufficient with the replacement, he/she may make a second attempt after the payment of the fee specified in the Regulations.
However, the field course – due to its nature – cannot be retaken, repeated or otherwise replaced.

3.7 Estimated workload

Activity	Hours/semester
contact hours	14×2=28
preparation for the test	12

preparation for the field course	16
attendance at the field course	3×8=24
home studying of the written materials	20
preparation for the exam	20
Sum	**120**

3.8 Effective date

2 February 2022

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Inactive courses