Hydraulics 2 - BMEEOVVAI42

I. Subject Specification

1. Basic Data

1.1 Title

Hydraulics 2

1.2 Code

BMEEOVVAI42

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2
Seminar	1

1.5 Evaluation

Exam

1.6 Credits

3

1.7 Coordinator

name	Dr. Tamás Krámer
academic rank	Associate professor
email	kramer.tamas@emk.bme.hu

1.8 Department

Department of Hydraulic and Water Resources Engineering

1.9 Website

https://epito.bme.hu/BMEEOVVAI42
https://fiek2.mywire.org/course/view.php?id=3529

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Compulsory in the Specialization in Infrastructure Engineering (BSc) programme

1.12 Prerequisites

Strong prerequisites:

- Hydraulics 1 (BMEEOVVAT42)

Recommended prerequisites:

- Mathematics A1a - Calculus (BMETE90AX00)
- Civil Engineering Informatics (BMEEOFTAT42)

1.13 Effective date

2 February 2022

Hydraulics 2 - BMEEOVVAI42

---

2. Objectives and learning outcomes

2.1 Objectives

To introduce you to hydraulic structures, water motion, transport processes and their methods of analysis.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. Know the equation and the classification of steady-state, gradially varied open flow profiles.
2. Distinguish between the general formulas for flow over various types of weirs.
3. Understand the basic hydraulic properties of river flood waves, bores and periodic surface waves; and be able to summarise the laws and equations governing these motions.
4. Know the principal transport processes and their equations.
5. Know how to characterise and classify river sediment.

B. Skills

1. Gain familiarity in solving problems involving hydraulic structures, water waves and groundwater seepage with a calculator.
2. Be able to perform calculations involving iterations using a spreadsheet software or a programming language.
3. Can summarise their hydraulic calculations in a written form.

C. Attitudes

1. Aim at solving numerical problems correctly and accurately.
2. Support their calculation results by arguments, and document them with sufficient detail so that it reflects a conscious use of hydraulic methods.

D. Autonomy and Responsibility

1. Implements hydraulic calculation algorithms individually based on the written notes supplied with the problem.

2.3 Methods

Lectures, exercise classes, assignment solved individually, written and oral communications, application of projector and blackboard.

2.4 Course outline

Week	Topics of lectures and/or exercise classes
1	Gradually varied open channel flow. Relation of normal and critical depth. Calculating the conveyance capacity of bottom sill.
2	Effect of bed slope. Typical water surface profiles.
3	Hydraulics of water regulation structures. Weir types and their analysis. Free and submerged (drowned) overflow. Sluice gates, free and submerged underflow. Estimating the length of a gradually varied reach.
4	Rapidly varied open channel flow. Bores, depression waves and their effect on channel banks.
5	Causes and characteristics of wave motion. Short and long waves, wind-induced waves, wave runup. Head loss caused by culverts.
6	Pumps in pipe systems. Suction head calculation, selecting the main operation parameters of a pump. Rapidly varied flow in closed pipes, effect of a sudden closure.
7	Water hammer. Closure/opening shock waves in open channels.
8	Flood hydraulics, conveyance in compound river beds with floodplain.
9	Seepage hydraulics. Groundwater flow, well hydraulics, combined effect of a group of wells. Dewatering, residence time. Effect of surface infiltration. Calculating periodic water motion on and below a wavy free surface.
10	Model similarity laws and their application. Froude and Reynolds models. Undistorted and distorted models. Dimensional analysis.
11	Basic transport phenomena in surface and subsurface waters. Calculating the pumping of groundwater in order to lower the piezometric head below foundation pits.
12	Motion of bed load and suspended sediment load, bed stability and bank erosion. Calculating the settling velocity of suspended particles.
13	Demonstration of hydraulic phenomena in the laboratory.
14	Introduction to river ice and stratified flows.

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) Textbook:

1. Andrew Chadwick, John Morfett, Martin Borthwick: Hydraulics in Civil and Environmental Engineering, Fifth Edition, CRC Press, 2013

b) Online material:

1. Lecture notes

2.6 Other information

None

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 occurs via two midterm tests, homework assignment and written examination.

3.2 Assessment methods

Evaluation form	Abbrev.	Assessed learning outcomes
1st midterm test	MT1	A.1-A.2; B.1; C.1-C.2
2nd midterm test	MT2	A.3; B.1; C.1-C.2
homework (small homework)	HW	B.2-B.3; C.1-C.2; D.1
written examination	E	A.1-A.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
MT1	15%
MT2	15%
HW	20%
Total achievable during the semester	**50%**
E	50%
Sum	**100%**

3.4 Requirements and validity of signature

To get the signature you must exceed 40% of the maximum score of both midterm tests and prepare the homework individually, without sharing with others, at a sufficiently good quality.
If you already obtained the signature in a previous semester and you join a normal (not an exam) course, then your new result will overwrite any previous result.
If you have achieved midterm results counting towards your exam grade of this subject sometime in the four previous semesters, then these results may also be accepted in the current semester.

3.5 Grading system

An exam not exceeding 40% of the maximum score results in a failed (1) exam.
If you pass the exam then the final grade is calculated as the weighted average of the midterm tests, homework and final exam as specified in Clause 3.3.

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%

3.6 Retake and repeat

1. Late homework can be submitted till the deadline determined in the Detailed course schedule, after paying the fees due according to the regulations.
2. Any of the two midterm tests can be retaken at the time and place specified in the Detailed course schedule. This first retake is free regardless of your previous score, i.e., you can also retake in order to improve the score of a passed midterm test. In any case the new score overwrites the previous.
3. If you cannot pass the subject (obtain a final grade higher than 1) with the retake in clause (2) then you can try to improve one failed midterm test a second time. This second retake is not free, however: you must pay the due fees according to the regulations. The time and place of the second retake is also specified in the Detailed course schedule.

3.7 Estimated workload

Activity	**Hours/semester**
contact hours	14×3=42
preparation for the tests	2×8=16
homework	16
preparation for the examination	16
Sum	**90**

3.8 Effective date

2 February 2022

This Subject Datasheet is valid for:

Inactive courses