

I. Tantárgyleírás**1. Alapadatok***1.1 Tantárgy neve***MODELING OF PUBLIC WATER NETWORK SYSTEMS***1.2 Azonosító (tantárgykód)***BMEEOVKMOV63***1.3 Tantárgy jellege*

Kontaktórák tanegység

1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	2
Gyakorlat	1

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Félévközi érdemjegy

1.6 Kreditszám

4

1.7 Tárgyfelelős

név	Dr. Fülöp Roland
beosztás	Egyetemi docens
email	fulop.roland@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Vízi Közmű és Környezetmérnöki Tanszék

1.9 A tantárgy weblapja<https://epito.bme.hu/BMEEOVKMOV63>
<https://edu.epito.bme.hu/course/view.php?id=3527>*1.10 Az oktatás nyelve*

angol

1.11 Tantárgy típusa

Kötelezően választható az Infrastruktúra-építőmérnök (MSc) szak Víz- és vízi környezetmérnöki specializációján

1.12 Előkövetelmények

Recommended prerequisites:

- Hydrology II. (BMEEOVVAI41)
- Hydraulics II. (BMEEOVVAI42)
- Public Works II. (BMEEOVKAI41)

1.13 Tantárgyleírás érvényessége

2022. szeptember 1.

2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The aim of the course is to introduce students to the theoretical foundations of modern urban stormwater management that go beyond the traditional knowledge of urban stormwater drainage, taking into account the expected consequences of climate change. Introduce students to international good practice methods and related design procedures based on simulation modelling. The course also aims to equip students with the network modelling skills required for the design and operation of pressurised and gravity utility networks. To prepare students to use network modelling software at a skill level. Key topics include: modelling of pressurised systems; hydraulic modelling of gravity sewer networks; model building and calibration; optimisation for design and operations management.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése után a hallgató

A. Tudás

1. understands the basic processes of urban hydrology
2. knows the methods of calibration of the model
3. understand the levels of modelling and the rules for their creation
4. is familiar with the methodology for determining rainfall loads and the resulting load model
5. understanding of the methodology for determining water demand
6. understands simple elements of the physical (hydraulic) model
7. knowledge of the basic elements of a topological model and its application
8. knowledge of the different types of models (topological, physical, consumption)
9. knowledge of the mathematical modelling possibilities of water supply and stormwater drainage networks
10. knowledge of the range of pollutants that can be washed from the urban surface by precipitation, their generation and leaching processes,
11. knowledge of the principles for the design of a monitoring network for calibration of runoff and flow processes in an urban catchment and its stormwater drainage system,
12. knowledge of the theoretical principles of seepage hydraulics and their practical application in an urban environment,
13. is familiar with the theoretical context of dynamic network surge calculation and the limitations of at least one practical software calculation method applicable to urban stormwater management,
14. understands the applicability of time-varying model precipitation and measured historical precipitation events in modelling,

B. Képesség

1. building a simulation model to describe a real urban environment,
2. evaluating the results provided by the simulation software,
3. designing a monitoring network for a given municipality/section of a municipality (urban catchment) to calibrate the runoff and flow processes of the stormwater drainage system located in the municipality/section,
4. being able to apply one of the spatial information software tools in the modelling of urban stormwater management,
5. being able to produce a consumption model,
6. preparing mathematical models of real water networks and stormwater drainage networks,
7. modelling the processes of networks described by mathematical models,
8. performing complex analyses of water supply and stormwater networks,
9. expressing his/her ideas in an organised way, orally and in writing.

C. Attitűd

1. collaborates with the teacher and fellow students to develop their knowledge,
2. expands their knowledge through continuous learning,
3. is open to the use of information technology tools,

4. seeks solutions that are different from the routine,
5. strives to apply the principles of energy efficiency and environmental, awareness in the solution of modelling problems in water supply networks.

D. Önállóság és felelősség

1. independently interprets stormwater management tasks under supervision
2. independently carries out modelling of water supply and stormwater drainage networks based on available data,
3. is open and able to participate in group work,
4. the student is committed to the principles and methods of systematic thinking and problem solving.

2.3 Oktatási módszertan

Lectures, computational exercises, written and oral communication, use of IT tools and techniques, optional independent and group work, work organisation techniques.

2.4 Részletes tárgyprogram

Week	Topics of lectures and/or exercise classes
1.	The principle of stormwater management, its necessity, current obstacles to its application in domestic legal, technical and economic regulation. The consequences of climate change on urban stormwater drainage.
2.	The role of integrated urban water management, including urban stormwater management. Differences between new and old traditional stormwater drainage. The limitations of rational method. Simulation modelling of stormwater drainage systems: theory (Storm Water Management Model (SWMM) by US EPA)
3.	Good practice I: methods for modifying the annual urban stormwater balance, controlling surface runoff and network runoff. Simulation modelling of stormwater drainage systems: practice (Storm Water Management Model (SWMM) by US EPA)
4.	Simulation modelling of stormwater drainage systems: theory and practice (Storm Water Management Model (SWMM) by US EPA), Handing out of Homework1 (HW1)
5.	Good practice II: how to handle extreme rainfall events? Examples of possible solutions. Consultation on HW1.
6.	Green roofs, green walls: technical solutions and their effectiveness in controlling run-off. Consultation on HW1.
7.	Consultation on HW1.
8.	Simulation of urban flooding. Consultation on HW1.
9.	Consultation on HW1.
10.	Simulation modelling of water distribution systems: theory and practice (EPANET), handing out of Homework2 (HW2).
11.	Simulation modelling of water distribution systems: basics of modelling.
12.	Simulation modelling of water distribution systems: elements of the model.
13.	Simulation modelling of water distribution systems:

	consumption model creation, Midterm test.
14.	Simulation modelling of water distribution systems: evaluation of simulation results.

A félév közbeni munkaszüneti napok miatt a program csak tájékoztató jellegű, a pontos időpontokat a tárgy honlapján elérhető "Részletes féléves ütemterv" tartalmazza.

2.5 Tanulástámogató anyagok

1. Walski, P. et al.: Advanced Water Distribution Modeling and Management (2003, HaestadPress)
2. USAEPA: EPANET V 2.0 - Program and Documentation Download (www.epa.gov)
3. Rossman, L.A.: Storm Water Management Model, User's Manual, Version 5.1, U.S. Environmental Protection Agency, 2015.
4. Rossman, L.A, Huber, W.C.: Storm Water Management Model Reference Manual Volume 1 – Hydrology, 2016, EPA No. 600/R-15/162A.

2.6 Egyéb tudnivalók

2.7 Konzultációs lehetőségek

Consultation dates:

During courses or via e-mail:

e-mail: varga.laura@emk.bme.hu, darabos.peter@emk.bme.hu, bodi.gabor@emk.bme.hu

Jelen TAD az alábbi félévre érvényes:

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

The assessment of the learning outcomes set out in 2.2 is based on a midterm test, active participation in the preparation of a computational exercise (partial assessment) and the submission of the homework assignments.

3.2 Teljesítményértékelési módszerek

Type of assessment	Short name	Evaluation
Midterm test	T	A.1-A.14; B.1-B.9; C.1-C.5; D.1-D.4
Homework 1	HW1	Homework 1 (active participation, continuous performance assessment during the computational exercises and based on the documentation of the HW1)
Homework 2	HW2	Homework 2 (active participation, continuous performance assessment during the computational exercises and based on the documentation of the HW2)

A szorgalmi időszakban tartott értékelések pontos idejét, a házi feladatok ki- és beadási határidejét a "Részletes féléves ütemterv" tartalmazza, mely elérhető a tárgy honlapján.

3.3 Teljesítményértékelések részaránya a minősítésben

Abbrev.	Score
T	40%
HW1	30%
HW2	30%
Sum	100 %

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

To get signature, the student must achieve at least 50% of the points that can be obtained according to point 3.3, i.e. at least 50% in the midterm test, at least 50% in the computational exercise during the lessons and 50% in the submitted documentation.

3.5 Érdemjegy megállapítása

Grade	Percentage (P)
excellent (5)	$80 \leq P$
good (4)	$70 \leq P < 80\%$
satisfactory (3)	$60 \leq P < 70\%$
pass (2)	$50 \leq P < 60\%$
fail (1)	$P < 50\%$

3.6 Javítás és pótlás

1. Midterm test may be retaken once free of charge.
2. Midterm test can be retaken the second time with fee.

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Tevékenység	Óra/félév
attendance at contact lessons	$14 \times 3 = 42$
mid-semester preparation for the modelling exercises	$14 \times 1 = 14$
preparation for the Midterm test	12
out-of-courses working time required to complete the HWs	12

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homework assignment (including separate consultation)	40
Sum	120

3.8 A tárgykövetelmények érvényessége

2022. szeptember 1.

Jelen TAD az alábbi félévre érvényes: