Hydrography and Hydroinformatics - BMEEOVVMV64

I. Tantárgyleírás

1. Alapadatok

1.1 Tantárgy neve

Hydrography and Hydroinformatics

1.2 Azonosító (tantárgykód)

BMEEOVVMV64

1.3 Tantárgy jellege

Kontaktórás tanegység

1.4 Óraszámok

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

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Félévközi érdemjegy

1.6 Kreditszám

5

1.7 Tárgyfelelős

név	Dr. József Szilágyi
beosztás	Egyetemi tanár
email	szilagyi.jozsef@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Vízépítési és Vízgazdálkodási Tanszék

1.9 A tantárgy weblapja

https://epito.bme.hu/BMEEOVVMV64
https://edu.epito.bme.hu/course/view.php?id=3539

1.10 Az oktatás nyelve

magyar és angol

Hydrography and Hydroinformatics - BMEEOVVMV64

1.11 Tantárgy típusa

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

1.12 Előkövetelmények

Recommended prerequisites:

- Modelling of Hydrosystems (BMEEOVVMV-1)
- Civil Engineering Informatics (BMEEOFTAT42)
- Hydrology II (BMEEOVVAI41)
- Numerical Methods (BMEEOFTMK51)
- Methods of Engineering Analysis (BMEEOHSMK51)

1.13 Tantárgyleírás érvényessége

2022. február 2.

2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The objective of the course is that the student get familiar with system theory, linear algebra and linear systems in general for solving simple hydrological problems and also advance his/her skill of MATLAB programming. Other objectives are that the student get acquainted with the hydrological forecasting approach having been used operatively in Hungary for over 30 years now, widen his/her knowledge on time series modelling, be able to solve such practical problems, get an insight into information systems used in hydrology, into flood forecasting, into data-driven models and optimization techniques employed in the water management practice in Hungary.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése utána a hallgató

A. Tudás

1. Familiarity with the most frequently encountered time series concepts and models employed in hydrological research and ability to apply them for one's own research.
2. Knows the function of the Hungarian hydro-informatics system.
3. Knows the different service levels, modelling, and data requirements for flood alerting and forecasting.
4. Can give examples for data-driven approaches and optimizations in water resources management.

B. Képesség

1. Advanced problem solving capacity in hydrological modelling and forecasting using linear and time series models.
2. horough knowledge of linear models of hydrology, their modifications and problem-specific applications.
3. Thorough understanding of time series models often employed in hydrology and water resources research, their correct applications and strengthened skill to further develop such models.
4. Aptitude for writing MATLAB code performing „brute-force” calibration and its application for solving problems in hydrology and civil engineering.
5. Capacity of solving complex modelling problems by MATLAB.

C. Attitűd

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. Önállóság és felelősség

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

2.3 Oktatási módszertan

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 Részletes tárgyprogram

Week	**Topics of lectures and/or exercise classes**
1	Flood warning and forecasting
2	System theory. Ordinary differential equations. Impulse response and convolution
3	The Wiener-Hopf and Yule-Walker equations
4	Using MATLAB for linear algebraic problems in hydrology I
5	Using MATLAB for linear algebraic problems in hydrology II
6	The Saint-Venant equations and their simplifications. State-space formulation of the continuous, spatially discrete linear kinematic wave. The Kalinyin-Milyukov-Nash cascade
7	The Discrete Linear Cascade Model: classical pulsed data system
8	The Discrete Linear Kascade Model: linearly interpolated data system
9	Forecasting with the DLCM.
10	The Boussinesq equation, the Diskin-Jakeman-Young rainfall-runoff model
11	Autoregressive processes, the Gauss-Markov process
12	The Kalman-filter and its application. Model calibration. Accounting for nonlinearity in linear models. GIS and remote sensing examples in hydrology
13	Optimalization methods in water resources management
14	Artificial neural networks in water resources management.

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

a) Textbooks:

1. Szilágyi J., Szöllősi-Nagy A., 2010. Recursive streamflow forecasting: a state-space approach, CRC Press, London, UK.
2. Brockwell, P., 2010. Introduction to time-series and forecasting, Springer, New York, USA.

3. Bras, R. L., Rodriguez-Iturbe, I., 1993. Random functions and hydrology, Dover, London, UK.

2.6 Egyéb tudnivalók

None

2.7 Konzultációs lehetőségek

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

Jelen TAD az alábbi félévre érvényes:

Inactive courses

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

Evaluation of the participant's learning progress described in A 2.2. is performed by a written final test and nine homework assignments.

3.2 Teljesítményértékelési módszerek

Evaluation form	Abbreviation	Assessed learning outcomes
1st homework (partial performance evaluation)	HW1	B.1-B.2; C.1-C.4; D.1
2nd homework (partial performance evaluation)	HW2	B.1-B.2; C.1-C.4; D.1
3rd homework (partial performance evaluation)	HW3	B.1-B.2, B.5; C.1-C.4; D.1
4th homework (partial performance evaluation)	HW4	B.1-B.2, B.5; C.1-C.4; 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
7th homework (partial performance evaluation)	HW7	B.1-B.2, B.5; C.1-C.4; D.1
8th homework (partial performance evaluation)	HW8	A.2-A.3; B.1-B.4; C.1-C.4; D.1
9th homework (partial performance evaluation)	HW9	A.4; B.1-B.5; C.1-C.4; D.1
Written test (final performance evaluation)	WT	B.1-B.5

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

Abbreviation	Score
HW	70%
WT	30%
Sum	**100%**

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

Non-relevant.

3.5 Érdemjegy megállapítása

The table displays the final grade limits. The average grade of the homework assignments counts by 70% while the grade of the final test by 30%. The percentages are relative to the maximum score.

Grade	Score (P)
excellent (5)	85%<=P
good (4)	70<=P<85%
average (3)	55<=P<70%

satisfactory (2)	40<=P<55%
un satisfactory (1)	P<40%

The final test must be completed by at least 40% of the maximum score.

3.6 Javítás és pótlás

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 A tantárgy elvégzéséhez szükséges tanulmányi munka

Activity	**Hours/semester**
participation in contact classes	14×4=56
preparation for the final test	8
preparation of homework	9×8=72
study from notes, textbooks	14
Sum	**150**

3.8 A tárgykövetelmények érvényessége

2022. február 2.

Jelen TAD az alábbi félévre érvényes:

Inactive courses