Reinforced Concrete Bridges - BMEEOHSA-B2

I. Tantárgyleírás

1. Alapadatok

1.1 Tantárgy neve

REINFORCED CONCRETE BRIDGES

1.2 Azonosító (tantárgykód)

BMEEOHSA-B2

1.3 Tantárgy jellege

Kontaktórás tanegység

1.4 Óraszámok

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

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Vizsga

1.6 Kreditszám

4

1.7 Tárgyfelelős

név	Dr. Kovács Tamás
beosztás	Egyetemi docens
email	kovacs.tamas@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Hidak és Szerkezetek Tanszék

1.9 A tantárgy weblapja

https://epito.bme.hu/BMEEOHSA-B2
https://edu.epito.bme.hu/course/view.php?id=4674

1.10 Az oktatás nyelve

magyar és angol

1.11 Tantárgy típusa

Kötelező az építőmérnöki (BSc) szak Híd és műtárgy specializációján

1.12 Előkövetelmények

Strong prerequisites:

- RC and Masonry Structures (BMEEOHSAS42)
- Timber Structures (BMEEOHSAS44)

Weak prerequisites:

- Bridges and Infrastructures (BMEEOHSAS43)

1.13 Tantárgyleírás érvényessége

2020. február 5.

2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The primary aim of the course is to provide the students with basic knowledge on structural behaviour as well as aspects of structural details for reinforced concrete and timber bridges. During the semester the following topics are discussed in lectures: long-term behaviour of concrete; typical cross-sectional forms of concrete superstructures: reinforced concrete slabs, grid-type and box girder bridges, precast concrete superstructures; prestressing in bridges: idea and technologies; modern construction methods: incremental launching, segmental and monolithic balanced cantilever methods; cable-stayed bridges; arch bridges; typical structural types of timber bridges: truss, frame, arch, plate, hipped-plate and suspension bridges; structural analysis of timber pedestrian bridges; durability and fire resistance of timber bridges; constructive timber preservation.

Another aim of the course is to make the students experienced in verifying the most important structural requirements of pre- and post-tensioned concrete as well as timber bridges.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése utána a hallgató

A. Tudás

1. knows the basic systems of reinforced and prestressed concrete bridges and the basic principles of their structural behaviour,
2. knows the recent pre- and post-tensioning technologies applied for concrete bridges,
3. knows the recent erection methods for concrete bridges,
4. knows the structural system and behaviour as well as the basic design aspects for concrete arch and cable-stayed bridges,
5. knows the structural system and behaviour as well as the basic design aspects for timber bridges.

B. Képesség

1. able to determine the necessary minimum number of girders as well as the preliminary verification of most important design requirements for precast concrete superstructures,
2. able to determine the necessary amount of prestressing as well as the cable layout for post-tensioned concrete bridges,
3. able to verify the most important design requirements for timber bridges as well as to control their dynamic behaviour.

C. Attitűd

1. cooperates with the lecturer,
2. improves his/her knowledge by consecutive learning activities,
3. open to use numerical software,
4. makes effort to perform exact and error-free calculations,
5. makes effort to understand the structural behavior of bridges and to acquire their design procedures,
6. makes effort to apply cost-effective and sustainable structural solutions.

D. Önállóság és felelősség

1. capable of designing and sizing the prestressing system of pre- or post-tensioned concrete bridges at basic level,
2. able to determine the necessary minimum sizes of timber pedestrian bridges as well as to design and size the connections of these bridges at basic level,
3. uses systematized thinking approach.

2.3 Oktatási módszertan

Lectures, individually performed homework (analysis and verification tasks), written and oral communication, use of IT tools and techniques.

2.4 Részletes tárgyprogram

Week	Topics of lectures and/or exercise classes

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1.	Typical cross-sectional forms of concrete superstructures.
2.	Prestressing in bridges I: General principles. Modification of internal forces by prestressing. Prestressing materials. Bonded and unbonded prestressing. Prestressing technologies (pre-tensioning, post-tensioning). Structural details, cable arrangement, anchorages.
3.	Precast concrete superstructures, change of structural system during execution, effect of long-term behaviour of concrete, continuity reinforcement.
4.	Design of a precast concrete bridge girder
5.	Prestressing in bridges II: Consideration of prestressing effect in analysis. Losses of prestress, design of beam end.
6.	Reinforced concrete slabs. Grid type and box girder bridges (modelling, torsional behaviour, models for the division of loads between main girders in transverse direction).
7.	Typical structural types of timber bridges. Timber truss bridges. Constructional principles, structural details
8.	Structural analysis of timber pedestrian bridges. Traffic loads from pedestrian traffic. Design for ultimate and serviceability limit states. Analysis of the main load-carrying structure for pedestrian and vehicle traffic as well as wind-induced vibration. Preliminary dynamic analysis of a timber pedestrian bridge
9.	Frame, arch, plate, hipped-plate and suspension timber bridges. Durability and fire resistance of timber bridges. Constructive timber preservation.
10.	Preliminary design of a post-tensioned box girder superstructure
11.	Modern construction methods for concrete girder bridges: incremental launching, segmental and monolithic balanced cantilever methods, other construction methods. Flow of forces, Transient design situations. Technology and auxiliaries.
12.	
13.	Cable-stayed bridges. Structural forms, flow of forces, modelling, structural details, construction method. Preliminary and detailed design. Dynamic effects and analysis methods.
14.	Arch bridges. Structural forms, flow of forces, modelling, structural details, construction method. Thrust line. Stability verifications.

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:

- Pipinato, A. (Ed.): Innovative Bridge Design Handbook - Construction, Rehabilitation and Maintenance, Elsevier, 2016, ISBN: 978-0-12-800058-8 (recommended)

b) Online materials:

- Structural analysis of a precast concrete superstructure (manual to homework)
- Structural analysis of a post-tensioned box girder (manual to homework)

2.6 Egyéb tudnivalók

1. The homework focus on the most important structural verifications of a precast concrete and a post-tensioned box girder type superstructure. The homework shall be completed individually in steps (subtasks related to midterms) with oral consultation.
2. Solution of subtasks of homework are presented in exercise classes included in the official schedule. Attendance on these lectures is compulsory.

2.7 Konzultációs lehetőségek

The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail to the instructors.

Jelen TAD az alábbi félévre érvényes:

2025/2026 semester I

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

The assessment of the learning outcomes specified in clause 2.2. above and the evaluation of student performance occurs via three homework (HW) during the semester and a written exam at the end of the semester. The maximum points for the homework are 13 (HW1), 7 (HW2) and 10 (HW3) and those for the exam are 70. In total 100 points (100%) are acquirable.

3.2 Teljesítményértékelési módszerek

Evaluation form	Abbreviation	Assessed learning outcomes
Homework#1 (midterm evaluation)	HF1	A.1-A.3; B.1; C.1-C.6; D.1, D.3
Homework#2 (midterm evaluation)	HF2	A.5; B.3; C.1-C.6; D.2-D.3
Homework#3 (midterm evaluation)	HF3	A.1-A.3; B.1; C.1-C.6; D.1, D.3
exam (synthetized evaluation)	V	A.1-A.5; B.1-B.3; C.1-C.6; D.1-D.3

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	30%
exam	70%
Total	**100%**

The exam is successful only if at least 50% of the aquirable points are collected.

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

1. Attendance on at least 70% of lectures.
2. Successful submission of each homework (min. 50%).

3.5 Érdemjegy megállapítása

The final grade is determined on the basis of acquired total points as follows:

Grade	Points (P)
excellent (5)	85<=P
good (4)	75<=P<85%
satisfactory (3)	65<=P<75%
passed (2)	50<=P<65%
failed (1)	P<50%

3.6 Javítás és pótlás

1. The homework not submitted until the submission deadline set in the detailed subject requirements may be submitted until the associated retake deadline set in the detailed subject requirements but is subject to payment of repetition fee.
2. If the result of a submitted homework remains below 50% according to clause 3.4 above, or when the retake deadline has been missed, the signature of the subject shall be refused.
3. Successful exams may be repated in the same exam period. In that case the result of the last exam becomes official.

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Total: 4 credits × 30 hours/credits = 120 hours/semester.	Activity	Hours/semester
	contact hours	14×3=42
	homework	22+12+18=52
	preparation for the exam	26
	Sum	**120**

3.8 A tárgykövetelmények érvényessége

2020. február 5.

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2025/2026 semester I