

## I. Tantárgyleírás

### 1. Alapadatok

#### 1.1 Tantárgy neve

**PRESTRESSING TECHNOLOGIES**

#### 1.2 Azonosító (tantárgykód)

**BMEEOHSMsFST16-00**

#### 1.3 Tantárgy jellege

Kontaktórás tanegység

#### 1.4 Óraszámok

| Típus             | Óraszám / (nap) |
|-------------------|-----------------|
| Előadás (elmélet) | 2               |

#### 1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Félévközi érdemjegy

#### 1.6 Kreditszám

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#### 1.7 Tárgyfelelős

|          |                                                                      |
|----------|----------------------------------------------------------------------|
| név      | Dr. Kovács Tamás                                                     |
| beosztás | Egyetemi docens                                                      |
| email    | <a href="mailto:kovacs.tamas@emk.bme.hu">kovacs.tamas@emk.bme.hu</a> |

#### 1.8 Tantárgyat gondozó oktatási szervezeti egység

Hidak és Szerkezetek Tanszék

#### 1.9 A tantárgy weblapja

[epito.bme.hu](http://epito.bme.hu)

<https://edu.epito.bme.hu/course/view.php?id=5272>

#### 1.10 Az oktatás nyelve

magyar

#### 1.11 Tantárgy típusa

Kötelezően választható a Szerkezet-építőmérnök (MSc) szak Tartószerkezetek specializációján

#### 1.12 Előkövetelmények

#### 1.13 Tantárgyleírás érvényessége

2025. szeptember 1.

## **2. Célkitűzések és tanulási eredmények**

### *2.1 Célkitűzések*

The primary objective of the course is to fully recognize the prestressing technologies, to understand and to evaluate their applicability to civil engineering structures in order to favourably influence their structural behaviour. Another goal is to get knowledge in construction and detailing of prestressing systems as well as in design methods of prestressed structures. Main topics: types of prestressed structures, properties of materials used to prestressing technologies, characteristics of prestressing systems, consideration of prestress in analysis, long-term effects to prestressing force, anchorage types to transfer prestress from tendon to member, application of prestressing in building construction (building floors, roofs, facades), engineering work (tanks, foundations), bridge construction (suspended and stressed-ribbon bridges), special prestressing methods. Another objective of the course is for each student to make significant progress in the area of problem recognition, understanding and problem solving competences, in relation to his/her own level of input competences, with the possibility of individual tutor support. Further aims are to deepen students' knowledge in the use of digital technologies (design softwares) as well as to acquire a complex knowledge in field of structural engineering at a level that will allow them to present this competence as an element of their portfolio.

### *2.2 Tanulási eredmények*

A tantárgy sikeres teljesítése után a hallgató

#### A. Tudás

1. Knowledge of materials, their characteristics and the conditions of their applicability to prestressed structures. 2. Knowledge of the available prestressing technologies and their details. 3. Knowledge in considering prestress in analysis of 1D structural members. 4. Knowledge of the reasons behind the decrease of prestress in time as well as the related calculation processes. 5. Knowledge of the applicability of prestressing technologies for slabs. 6. Knowledge of the applicability of prestressing technologies for shells. 7. Knowledge of the system of stay-cables and principles of their design. 8. Knowledge of the design principles and methods for prestressed structures according to the Eurocode.

#### B. Képesség

1. capable of modeling the prestressing action and, on the basis of that, determining the internal forces in prestressed 1D structural members, slabs and shells as well as conceptually designing the flow of forces in these structures. 2. capable of understanding the flow of forces in special (cable-stayed, extradosed and stressed-ribbon) bridges built with prestressing technology and elaborating design subtasks of these structures. 3. able to improve the structural behaviour by the use of prestressing systems for ordinary structures. 4. capable of elaborating technological alternatives when designing ordinary prestressed structures. 5. capable of elaborating technological details in relation to execution of prestressing systems. 6. able to elaborate structural analyses for the design of prestressed structures. 7. capable of calculating the required amounts of prestressing systems for the design of prestressed structures. 8. capable of evaluating and effectively using the literature of the field.

#### C. Attitűd

1. Carry out his/her duties to the best of his/her ability and to a high standard. 2. Open to carrying out his/her tasks independently, but in consultation with others involved in the task. 3. Strives to carry out his/her tasks and take decisions in consultation with the other members of staff, preferably in cooperation. 4. Open to learning about professional and technological developments and innovations in the field of civil engineering, particularly in his/her field of specialisation. 5. Strives for continuous self-education. 6. Respects the principles of environmental protection, quality control, equal access and application of it, health and safety at work, and engineering ethics. 7. Carries out work processes as efficiently as possible, avoiding as far as possible waste of materials, time and energy. 8. Combines inputs and considerations from different fields (e.g. technical, social, legal, environmental) in the development of projects and in the execution of work.

#### D. Önállóság és felelősség

1. individually capable of modelling structures and realizing the flow of forces, 2. individually capable of performing basic structural calculations, 3. individually capable of using design manuals, 4. uses systematized thinking approach.

### *2.3 Oktatási módszertan*

Lectures in present form, individually performed homework (design tasks) with oral (consultation), written

communication (midterm-test), use of IT tools and techniques.

## 2.4 Részletes tárgyprogram

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1. Principle of prestressing structures. History of the prestressing technology. Materials for prestressing. 2. Prestressing systems. Bonded and unbonded prestressing. 3. Consideration of prestress in analysis (equivalent prestress). 4. Design of a prestressed floor slab I. 5. Losses of prestress. Anchorages, design of anchorage zones. 6. Design of a prestressed floor slab II. 7. Prestressing of building floor slabs (optimization of prestress, minimum reinforcement, effect of global deformation on prestress). 8. Suspended prestressed structures (prestressed shells). 9. Suspended prestressed structures (suspended roofs and facades). 10. Prestressed foundation slabs and industrial floors. 11. Prestressed tanks. 12. Prestressing in bridge construction (cable-stayed and extradosed bridges). 13. Technology of stay-cables. 14. restressing in bridge construction (stressed-ribbon bridges).

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

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a) Books Pipinato, A. (Ed.): Innovative Bridge Design Handbook [?] Construction, Rehabilitation and Maintenance, Elsevier, 2016, ISBN: 978-0-12-800058-8 MSZ EN 1992 Betonszerkezetek tervezése, Magyar Szabványügyi Testület fibBulletin 30 Acceptance of stay cable systems using prestressing steels fibBulletin 31 Post-tensioning in buildings fibBulletin 33 Durability of post-tensioning tendons fibBulletin 55, 56 fibModelCode 2010, Volume 1, 2 b) Downloadable materials Downloadable lecture notes on the website of the subject

## 2.6 Egyéb tudnivalók

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Homework comprises of a design which shall be solved in phases following their interpretation on lectures with the help of oral consultation.

## 2.7 Konzultációs lehetőségek

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

*Jelen TAD az alábbi félévre érvényes:*

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**II. Tárgykövetelmények****3. A tanulmányi teljesítmény ellenőrzése és értékelése***3.1 Általános szabályok*

The assessment of the learning outcomes occurs via one midterm tests (MT) and one homework (HW) during the semester.

*3.2 Teljesítményértékelési módszerek*

| Assessment Name (Type)            | Code | Assessed Learning Outcomes                 |
|-----------------------------------|------|--------------------------------------------|
| homework (midterm evaluation)     | HW   | A.1-5, A.8; B.1, B.3-7; C.1-5, C.7; D.1-4. |
| midterm test (midterm evaluation) | MT   | A.1-8; B1-8; C.1-7; D.1-4.                 |

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*

| Code  | Weight |
|-------|--------|
| HW    | 30%    |
| MT    | 70%    |
| Total | 100%   |

*3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége*

Signature is not available in this subject.

*3.5 Érdemjegy megállapítása*

| Grade            | Score (P)          |
|------------------|--------------------|
| excellent (5)    | $85 \leq P$        |
| good (4)         | $75 \leq P < 85\%$ |
| satisfactory (3) | $65 \leq P < 75\%$ |
| pass (2)         | $50 \leq P < 65\%$ |
| fail (1)         | $P < 50\%$         |

*3.6 Javítás és pótlás*

Each homework subtask (HW#1-3) not submitted until deadline set in the "Detailed semester timetable" can be submitted, subject to the repetition fee, until the deadline for repetition set in the "Detailed semester timetable". The submitted homework cannot be improved thus, if its result remains below 50%, passing the subject (based on Sec. 3.5 condition 2) above) has to be refused. The midterm test can be retaken once during the repetition week.

*3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka*

| Activity      | Hours/Semester      |
|---------------|---------------------|
| contact hours | $14 \times 2 = 28$  |
| homework      | $11 + 11 + 10 = 32$ |
| midterm tests | $3 \times 10 = 30$  |

*3.8 A tárgykövetelmények érvényessége*

2025. szeptember 1.

Jelen TAD az alábbi félévre érvényes: