

## I. Tantárgyleírás

### 1. Alapadatok

#### 1.1 Tantárgy neve

Basis of Design

#### 1.2 Azonosító (tantárgykód)

BMEEOHSAT41

#### 1.3 Tantárgy jellege

Kontaktórák tanegység

#### 1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	2

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

Félévközi érdemjegy

#### 1.6 Kreditszám

3

#### 1.7 Tárgyfelelős

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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

<https://epito.bme.hu/BMEEOHSAT41>

<https://edu.epito.bme.hu/course/view.php?id=324>

#### 1.10 Az oktatás nyelve

magyar és angol

#### 1.11 Tantárgy típusa

Kötelező az építőmérnöki (BSc) szakon

### 1.12 Előkövetelmények

Strong prerequisites:

- Basics of Statics and Dynamics (BMEEOTMAT41)

Recommended prerequisites:

- Introduction to strength of materials (BMEEOTMAT42)

### 1.13 Tantárgyleírás érvényessége

2022. szeptember 1.

## 2. Célkitűzések és tanulási eredmények

### 2.1 Célkitűzések

The primary aim of the course is to provide the students with basic knowledge on the process of civil engineering design and the structural behaviour. During the semester the following topics are discussed: engineering design, structural design process and methodology, hierarchic and spatial structures; modelling of structures (structural model); probabilistic background of structural design, partial (safety) factor method; actions on structures, selection of critical load case, design load; internal stress and strain, material laws, elastic and plastic resistance; analysis methods, geometrically linear and nonlinear analysis, linear and nonlinear material behaviour, superposition; limit states (ULS&SLS), structural failure modes; design of structural members (beams and columns), design of structures for horizontal actions; bracing systems; selection of structural form and material, thrust line; spatial structures; classification of structures according to their form and static behaviour.

### 2.2 Tanulási eredmények

A tantárgy sikeres teljesítése utána a hallgató

#### A. Tudás

1. knows the engineering fields,
2. knows the actions on structures and the ways of their determination,
3. knows the partial factor design method,
4. knows the verifications associated with ultimate and serviceability limit states,
5. knows the concept of geometrically linear and nonlinear structural behaviour as well as the linear and nonlinear material behaviour,
6. knows the basic steps of sizing and structural verification,
7. knows the main structural failure modes,
8. knows the boiler formula, the concept of thrust line and the flow of forces in spatial structures.

#### B. Képesség

1. able to create the structural model of a real structure,
2. capable of defining the actions on structures according to the EC,
3. able to determine the critical load arrangement on structures and their critical combinations,
4. able to realize the flow of vertical and horizontal forces in structures and to calculate the extremities of internal forces or stresses in statically determined structures,
5. capable of performing ultimate and serviceability limit state verifications,
6. capable of elaborating ordered and checkable structural calculations,
7. able to summarize the basic assumptions of the calculations and to express the results in preliminary drawings.

#### C. Attitűd

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1. open to use IT tools,
2. makes effort to perform exact and error-free calculations.

### 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, individually performed homework (calculation tasks), written (forum) and oral (joint consultation) communication, use of IT tools and techniques (voting during lectures, searching in databases, online homework), optional individual and team work.

### 2.4 Részletes tárgyprogram

Week	Topics of lectures and/or exercise classes
1.	Introduction, modelling of structures, design process. Structural form. Selection of form and material. Structural model.
2.	Introduction, modelling of structures, design process. Structural form. Selection of form and material. Structural model.
3.	Probabilistic background of structural design, partial (safety) factor method. Classification of actions. Actions on structures
4.	Probabilistic background of structural design, partial (safety) factor method. Classification of actions. Actions on structures
5.	Probabilistic background of structural design, partial (safety) factor method. Classification of actions. Actions on structures
6.	Material laws. Geometrically linear and nonlinear analysis, elastic and plastic resistance. Superposition.
7.	Material laws. Geometrically linear and nonlinear analysis, elastic and plastic resistance. Superposition.
8.	Beams and columns. Design of structures for horizontal actions, bracing systems.
9.	Beams and columns. Design of structures for horizontal actions, bracing systems.
10.	Beams and columns. Design of structures for horizontal actions, bracing systems.
11.	Beams and columns. Design of structures for horizontal actions, bracing systems.
12.	Thrust line, vaults. Spatial structures.
13.	Thrust line, vaults. Spatial structures.

14.	Classification of structures according to their form and static behaviour. Discussion of structural catastrophes.
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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) Online materials:

- Downloadable abstracts based on Kollár, L.P.: Basis of structural design, 2015

### 2.6 Egyéb tudnivalók

1. Homework contain short tasks with the aim to give help preparing for the tests rather than providing new knowledge. Solutions will be available immediately after the relevant submission deadline before the relevant test. In order to model test conditions, the solution shall be hand-written without using any software (e.g. Mathcad).
2. Numerical results of homework shall be submitted in electronic form (upload of results through the website of the subject), furthermore, the hand-written solution (in scanned or photo form) shall be submitted until the relevant deadline. Any homework is considered to be completed if BOTH submissions have been successful.
3. Hand-written submission shall contain the solution of all tasks including formulae, substitutions as well as numerical results equal to those uploaded electronically (see details in homework) and dimensions.
4. Submission of tests is conditional on showing an identity document including photo and signature at the beginning of the test.

### 2.7 Konzultációs lehetőségek

1. Joint consultations before each test to help preparing for the tests are organized outside the official schedule. Attendance on these consultations are optional.
2. The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail: [kovacs.tamas@epito.bme.hu](mailto:kovacs.tamas@epito.bme.hu)

Jelen TAD az alábbi félévre érvényes:

2024/2025 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 tests (T) and three homework (HW) during the semester.

## 3.2 Teljesítményértékelési módszerek

<b>Evaluation form</b>	<b>Abbreviation</b>	<b>Assessed learning outcomes</b>
Test#1 (midterm evaluation)	T1	A.1-A.4; B.1-B.4, B.6-B.7; D.1-D.4
Test#2 (midterm evaluation)	T2	A.5-A.7; B.5-B.7; D.1-D.4
Test#3 (midterm evaluation)	T3	A.1-A.8; B.1-B.7; D.1-D.4
Homework#1 (midterm evaluation)	HW1	A.1-A.4; B.1-B.4, B.6-B.7; C.1-C.2
Homework#2 (midterm evaluation)	HW2	A.5-A.7; B.5-B.7; C.1-C.2
Homework#3 (midterm evaluation)	HW3	A.1-A.8; B.1-B.7; C.1-C.2

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

<b>Abbreviation</b>	<b>Score</b>
T1-T3	82%
HW1	6%
HW2	6%
HW3	6%
<b>Sum</b>	<b>100%</b>
Extra points (for those, who have already fulfilled 50% out of T1&T2 and complete T3 above 50%) equal to 10% of the lowest test result (out of Test#1, #2 and #3) and limited to a maximum of 8.	8%

## 3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

Attendance on at least 70% of lectures.

## 3.5 Érdemjegy megállapítása

Conditions to receive grade:

- Average of the best two total results out of those obtained from Tests#1, #2 and #3 (three results) shall be at least 50%.
- Average of the best two results of theoretical test parts out of those obtained from Tests#1, #2 and #3 (three results) shall be at least 40%.
- Obtaining at least a total of 45 points according to clause 3.3 above.

The final grade is determined as follows:

<b>Grade</b>	<b>Points (P)</b>
excellent (5)	90<=P

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good (4)	$75 \leq P < 90\%$
satisfactory (3)	$60 \leq P < 75\%$
passed (2)	$45 \leq P < 60\%$
failed (1)	$P < 45\%$

### 3.6 Javítás és pótlás

There is no minimum requirement for individual midterm tests, therefore no possibility for individual retake of tests is available

### 3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Total: 3 credits  $\times$  30 hours/credits = 90 hours/semester.

Activity	Hours/semester
contact hours	$14 \times 2 = 28$
homework	$11 + 11 + 10 = 32$
preparation for tests	$3 \times 10 = 30$
<b>Sum</b>	<b>90</b>

### 3.8 A tárgykövetelmények érvényessége

2022. szeptember 1.

Jelen TAD az alábbi félévre érvényes:

2024/2025 semester I