

I. Tantárgyleírás**1. Alapadatok***1.1 Tantárgy neve***STRENGTH OF MATERIALS***1.2 Azonosító (tantárgykód)***BMEEOTMBSFC003-00***1.3 Tantárgy jellege*

Kontaktórás tanegység

1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	1
Gyakorlat	3

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Vizsga

1.6 Kreditszám

5

1.7 Tárgyfelelős

név	Sárosiné Dr. Lakatos Ilona Éva
beosztás	Egyetemi docens
email	lakatos.eva@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Tartószerkezetek Mechanikája Tanszék

1.9 A tantárgy weblapjaepito.bme.hu<https://edu.epito.bme.hu/course/view.php?id=5326>*1.10 Az oktatás nyelve*

angol

1.11 Tantárgy típusa

Kötelező az építőmérnöki (BSc) szakon

1.12 Előkövetelmények

Erős követelmény: Statika szintemelő ; Gyenge követelmény: Statika

1.13 Tantárgyleírás érvényessége

2025. szeptember 1.

2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The aim of the subject is to introduce the fundamental concepts of strength of materials, the concepts of loads, stresses, strains, and displacements, as well as the relationships between them using which the basic problems, sizing, and checks can be carried out. Particular emphasis is made on the calculation of stresses and strains due to simple and complex internal forces of bars and beams. The presented methods enable the solution of certain statically indeterminate problems. By completing the subject, this knowledge will enable the student to accomplish tasks related to civil engineering problems.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése után a hallgató

A. Tudás

1. knows the concepts of loads, stresses, strains, and displacements, 2. knows the concept of a bar and a bar element, 3. knows the geometric quantities characterizing the cross-section of a beam, and the calculation methods, 4. knows the linearly elastic and the linearly elastic and perfectly plastic material models, 5. knows the internal forces arising in cross-sections of a beam, the resulting stresses, and the formulas for the calculation, 6. knows the deformations of cross-sections of a beam, the relationships to the internal forces and the strains in individual points, 7. knows the displacements of cross-sections of bars loaded by certain internal forces, 8. knows how temperature affects the strains,

B. Képesség

1. calculates the stresses and strains in bars under tension-compression, solves the sizing and checking problems, 2. calculates the stresses and strains arising from pure shearing, solves the sizing and checking problems, 3. calculates the stresses and strains arising from torsion for simple cross-sections, solves the basic sizing and checking problems, 4. calculates the stresses and strains arising from uniaxial bending, solves the sizing and checking problems, 5. recognizes the biaxial bending and calculates the associated stresses and strains, solves the sizing and checking problems, 6. calculates the stresses arising from shearing coupled with simultaneous bending, 7. calculates the stresses in cross-sections subjected to eccentric tension-compression in the cases of linearly elastic material and no-tension material, 8. calculates the displacements of bars under tension-compression, torsion and bending, 9. calculates the reactions of statically indeterminate structures based on displacement calculations, if the degree of statical indeterminacy is one,

C. Attitűd

1. aims at accurate and flawless problem solving, 2. elaborates the solution such that it is clear to understand or possibly to continue, 3. aims to be precise in wording,

D. Önállóság és felelősség

1. open to critical comments, 2. is prepared to recognize and correct errors,

2.3 Oktatási módszertan

Lectures and calculation practices based on the electronically distributed workbook, solving home works and practice problems in individual or team work.

2.4 Részletes tárgyprogram

1. Internal force diagrams (repetition). Introduction: the subject matter of strength of materials, fundamental concepts, the linearly elastic material model. 2. The concept of a beam and beam element, its internal forces and deformations. Geometric properties of cross-sections: the concepts of centroid and moments of inertia. The fundamentals of calculation of inertia, examples. 3. The concept of centric tension-compression, basic equations, introductory numerical examples, calculation of deformations: homogeneous and inhomogeneous beams, the effect of temperature change. 4. Centric tension-compression, numeric examples. Statically indeterminate structures. 5. The concept of pure shearing, screws, rivets, basic examples. Checking of simple connections for centric tension-compression and pure shearing. 6. Torsion of cross-sections with rotational symmetry, the concept of polar moment of inertia, calculation of deformations. Calculation of stresses arising from torsion, examples. 7. Basic equations of bending. Calculation of normal stresses and deformations. Uniaxial bending of inhomogeneous cross-sections, calculation of normal stresses and deformations. 8. Calculation of displacements, statically indeterminate structures. Simple displacement calculations for cantilevers and simply supported beams. 9. Biaxial bending. Eccentric tension-compression: fundamental relationships for the calculation of stresses, the

concept of neutral axis. 10. Eccentric tension-compression, numeric examples. The concept of Cullmann's kernel. 11. Cross-section with no-tension material, calculation of stresses in structures (column, wall). 12. The reciprocity of shear stresses. Bending and shearing: Zhuravskii's theory, introductory examples 13. Calculation of stresses in beams with solid cross-sections under simultaneous bending and shearing. Bending, tension, shearing, torsion, numerical examples. Complex internal forces. 14. Summary and repetition.

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

- Kaliszky S., Kurutzné Kovács M., Szilágyi Gy.: Szilárdságtan, 2000; - Beer, Johnston: Mechanics of materials; - Budynas: Advanced Strength and Applied Stress Analysis; - Popov: Mechanics of materials; - Gere – Goodno: Mechanics of Materials. Cengage Learning, 2015

2.6 Egyéb tudnivalók

- Students attending checks must not communicate with others during the check without explicit permission, and must not hold any electronic or other communication device switched on. - Students who have obtained a valid signature and have registered for a course other than examination course cannot lose their signature and eligibility for exam, but the final results are to be computed based on the new test results.

2.7 Konzultációs lehetőségek

- The instructors are available for consultation during their office hours, as advertised on the department website OR - by prior arrangement.

Jelen TAD az alábbi félévre érvényes:

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

- Evaluation of learning outcomes described in Section 2.2. is based on two mid-term tests, and an exam in the examination period. - There are 90 minutes for the preparation and the submission of each mid-term test. - The duration of the preparation part of the exam is 105 minutes. - A mid-term test is valid (counted in the final grading) if its score reaches 50%.

3.2 Teljesítményértékelési módszerek

Teljesítményértékelés neve (típus)	Jele	Értékelt tanulási eredmények
1st mid-term test (summarizing assessment)	MT1	A.1-A.8; B.1-B.2, B.9; C.1-C.3
2nd mid-term test (summarizing assessment)	MT2	A.1-A.8; B.3-B.4, B.8-B.9; C.1-C.3
Written exam (summarizing check)	E	A.1-A.8; B.1-B.9; C.1-C.3; D.1-D.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

Jele	Részarány
MT1	25%
MT2	25%
E	50%
Sum	100%

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

A student is to obtain a signature and has eligibility for the exam

-if both mid-term tests are valid and

-the average of the three valid mid-term tests reaches or exceeds 50%.

3.5 Érdemjegy megállapítása

Érdemjegy	Pontszám (P)
jeles(5)	$85 \leq P$
jó(4)	$75 \leq P < 85\%$
közepes(3)	$65 \leq P < 75\%$
elégséges(2)	$50 \leq P < 65\%$
elégtelen(1)	$P < 50\%$

3.6 Javítás és pótlás

- Each of the mid-semester tests can be retaken only once at dates announced at the beginning of the semester. - In the case of each test, the better one of the results of the ordinary test and its retake is considered. - At the end of the semester, a second retake is available to the students if only one of the tests has no successful result at that time (i.e. two tests are successful after the first retakes). - The second retake covers the whole semester, the result of the second retake replaces that of the remaining unsuccessful test.

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Tevékenység	Óra/félév
contact lessons	$28 \times 2 = 56$
preparation for lessons during the semester + home works	$28 \times 1 = 28$
preparation for the checks	$4 \times 9 = 36$

Strength of Materials - BMEEOTMBsFC003-00 - 2025/26/2

Tevékenység	Óra/félév
study of the assigned written sources	30

3.8 A tárgykövetelmények érvényessége

2025. szeptember 1.

Jelen TAD az alábbi félévre érvényes: