Tárgytematika / Course Description

Strength of Materials

GKNB_AMTA003

Tárgyfelelős neve / Teacher's name: dr. Pere Balázs

Félév / Semester: 2022/23/1

Beszámolási forma / Assesment: Vizsga

Tárgy heti óraszáma / Teaching hours(week): 2/2/0

Tárgy féléves óraszáma / Teaching hours(sem.): 0/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The objective of this course is elaborate on the knowledge of engineering mechanics (statics) and to teach the students the purpose of studying strength of materials with respect to mechanical engineering design and analysis. The course introduces the students to the concepts of engineering mechanics of materials and the behavior of the materials and structures under applied loads.

To establish an understanding of the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior. To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics. To discuss the basic mechanical principles underlying modern approaches for design of various types of structural members subjected to axial load, torsion, bending, transverse shear, and combined loading. To build the necessary theoretical background for further structural analysis and design courses.

TANTÁRGY TARTALMA / DESCRIPTION

Week 1	Course overview. Review of basic basic concepts of strength of materials. Introduction to stress and strain tensors
Week 2	Review of axially loaded bars state of stress and strain. Design of structures for working safely and verification.
Week 3	Review of bending moment loaded beams state of stress and strain. Description of differential equation of the elastic curve.
Week 4	Review of moment of inertia of the cross-sectional area. Steiner–law. Mohr's circle for moment of inertia. Principal axis of inertia and principal strains.
Week 5	Review of torsional moment loaded beams with circle and pipe cross sections state of stress and strain.
Week 6	Buckling analysis of columns.

Week 7	Review of general state of stress, principal stresses and principal axes. Mohr's circle for state of stress. **Mid-term written exam 1**
Week 8	Review of general state of strain, general Hooke's low. General theories of design of structures for working safely and verification. Review of equivalent stress theories (Mohr, von Mises).
Week 9	Review of strain measurement with strain gauges. Principle of superposition.
Week 10	Review of axial and bending moment combined loaded beams state of stress and strain. Review of unsymmetric bending moment loaded beams state of stress and strain.
Week 11	Review of bending and torsional moment combined loaded beams state of stress and strain. Eccentric axial loading.
Week 12	Transverse shear.
Week 13	Betti's theorem. **Mid-term written exam 2**
Week 14	Castigliano's theorem. **Complement exam**

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

Midterm tests:
Two times in the semester (somewhen in the 6th and 12th weeks) **tests will be given** from the topics of the lectures of the
previous weeks. Each tests are worth maximum 20 points. (2 pages: each page contains a problem solving for 8 points and
a theoretical question for 2 points.)
If one reaches at least 30 points in the two midterm tests, (s)he gets an offered grade.

- 30-34 points good (4)
- 35-40 points excellent (5)

Conditions for signature (to be fulfilled during the class-period and necessary for acquiring the grade):
At least **6 points** (from 40 points) must be reached in the **two midterm tests**.
If some one does not reach 6 point in the two midterm tests, (s)he can write a retake test in the last week. The maximum is
20 points in this test. At least 6 points are needed for the signature.
Lab measurement (optional)
Lab test have to be written (from theory), where **at least 3 points** from 5 must be reached.
Measurement have to be performed, **report have to** be prepared and **submit** (for additional max. **5 point**).
Exam (grade):
The sum of the points of the mid-term tests and exam determines the mark. The grading is as follows

- 0-47 points fail (1)
- 48-61 points pass (2)
- 62-75 points satisfactory (3)
- 76-90 points good (4)
- 91-120 points excellent (5)

Students must provide proof of their identity with an official card (eg. ID card, passport, driving license, etc.) at the tests.
Those students, who apply unauthorized means (book, lecture notes, infocommunication means, etc.) different from those

listed in the course requirement or adopted by the lecturer in charge of the course assessment will be disqualified from the
exam as a consequence of their action, and the exam mark will automatically become “Fail (1)”.
Consultation:
Each lecturer will have one hour per week for consultation. Time and place will be determined according to the needs of students.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Égert J. – Jezsó K.: Mechanics - Strength of Materials, Universitas-Győr Kht. 2006.
Égert J. – Jezsó K.: Mechanics - Strength of Materials Workbook, Universitas-Győr Kht. 2004.