Tárgytematika / Course Description

Statics

GKNB_AMTA001

Tárgyfelelős neve / Teacher's name: dr. Antali Máté

Félév / Semester: 2021/22/2

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

Learning objectives: Learn the general concept and methods of statics. Learn to create mechanical models of real structures, especially rod/beam structures. Learn about force systems acting on these structures. Solve the problems of statically determinate structures. Gain ability to draw internal force diagrams.

TANTÁRGY TARTALMA / DESCRIPTION

Week 1: Subject and division of mechanics. Mechanical modeling, basic concepts, axioms.

Week 2: Force systems with a common point of application. Possible ways for giving the force vector. Decomposition of force vectors.

Week 3: Resultant of forces. Conditions of equilibrium of force systems. Equilibrium of two and three forces. Algebraic and graphical determination of resultants.

Week 4: Statics of rigid bodies. Moment of force systems. Resultant of coplanar force systems. Fundamental principle of statics. Concept of a couple. Generalization of concept of force systems. Determination of the resultant of coplanar non-concurrent force systems. Determination of the resultant of coplanar parallel force systems.

Week 5: String polygon method. Distributed force systems over a line. Equilibrium of coplanar force systems. Frame with two supports. Fixed cantilever. Support with three rods.

Week 6: Ritter’s method (algebraic solution), Culmann’s method (graphical solution). Resultant of spatial/3D parallel force systems. Resultant of weight force systems. Center of gravity (centroid) of bodies.

Week 7: Determination of center of gravity of plane figure, lines.

Week 8: Equilibrium of spatial force systems. Concept and types of internal forces/moments: normal force, shear force, torsion moment, bending moment.

Week 9: Determination of internal forces of planar structures. Drawing of internal force/moment diagrams of planar structures.

Week 10: Generalization of the concept of internal forces/moments for spatial/3D cases. Determination of functions of internal forces.

Week 11: Relation between functions of loads and internal forces. Drawing of bending moment diagram by means of integration of shear force. Exercises for internal forces/moments diagrams straight and non-straight rod structures.

Week 12: Statics of structures. Statically determinate and undeterminate structures. Simple structures, three-pinned structure, Gerber beam. Exercises for diagrams of internal forces of Gerber beams. Statically determinate trusses. Determination of member forces by means of method of joints and method of sections.

Week 13: Modeling of real structures. Coulomb’s friction law. Slipping friction. Rolling resistance.

Week 14: Equilibrium of force systems acting of rough bodies. Stability of equilibrium.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

There are two midterm tests in the semester. First is on Week 7 and the second one is on Week 13. Maximum 20 points can be get in these midterm tests respectively. (Maximum 2X20=40.) If someone does not achieve at least 6 points in the two midterm exams, (s)he has to take a retake midterm exam. Maximum 20 points can be get in this retake exam. If (s)he does not achieve at least 6 points, (s)he will not be allowed to take an exam.

If someone achieves 30-34 points in the two midterm exams, (s)he is offered a 4 (good) grade. If someone achieves 35-40 points in the two midterm exams, (s)he is offered a 5 (excellent) grade.

Written exam: simple theoretical questions and problem solving. 80 is the maximum points.

Total points and grades:

0 – 47: 1 (fail)

48 – 61: 2 (pass, satisfactory)

62 – 75: 3 (fair, average)

76 – 90: 4 (good)

91 – 120: 5 (excellent)

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Égert, J., Pere, B.: Mechanika-Statika, lecture notes (in Hungarian), Universitas-Győr Kht., 2006.