LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Teknisk mekanik
Engineering Mechanics

FHLA05, 7,5 credits, G1 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED M
Date of Decision: 2023-04-11

General Information

Main field: Technology.
Compulsory for: BME2, K2, W2
Elective for: E4, N4-nf
Language of instruction: The course will be given in English

Aim

The aim of the course is to provide basic knowledge in mechanics and solid mechanics with applications on realistic problems. The course also aims to increase common knowledge in engineering and the ability to build and analyse models.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to explain and use the basic concepts force, moment, stress and strain
- understand the relations between force/moment and motion
- be able to describe the phenomena of plasticity, fatigue and fracture

Competences and skills
For a passing grade the student must

- be able to formulate, structure and solve problems in statics and dynamics using the laws of Newton and the principles of conservation
- be able to describe velocities and accelerations in different coordinate systems

Judgement and approach

For a passing grade the student must

- be able to dimension construction elements such as bars, beams and shafts loaded by forces, bending moment or torque

Contents

The course comprises basic parts from rigid body mechanics as well as deformable body mechanics and strength of materials.

In rigid body mechanics both static and dynamic problems are treated. In statics the equations of equilibrium are formulated from free body diagrams and problems with concentrated as well as distributed forces are handled. The distributed forces come from applications in hydrostatics and computation of centroids.

The dynamics part of the course is based on the laws of Newton. Particle motion is described in linear and curvilinear coordinates and the equations of motion of the particle are established. Equivalent formulations based on the principles of preservation of energy and momentum are also treated. Examples of applications are taken both from daily life experience such as climbing ladders, moving furniture, riding a bike or a rollercoaster and technical applications from robotics and ballistics.

In deformable body mechanics the tensorial concepts of stress and strain are first defined. The relations between stress and strain, i.e. constitutive laws, for different materials are established and applications from the dimensioning of different simple construction elements (lines, rods, beams, trusses etc) are treated. Important phenomena such as fatigue and fracture are also discussed.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written final exam complemented by a non-compulsory written midterm diagnostic test which contributes up to 20 percent to the final result, if taken in the same reading period.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: Mathematics, basic courses.
The number of participants is limited to: No
The course overlaps following course/s: FHLF15, FHLA10

Reading list

- Dietmar Gross, Werner Hauger, Jörg Schröder, Wolfgang A. Wall, Nimal Rajapakse: Engineering Mechanics 1, Statics. Springer, 2013, ISBN: 978-3-642-30319-7. Online access via Lund University Library.
- Dietmar Gross, Werner Hauger, Jörg Schröder, Wolfgang Wall, Javier Bonet: Engineering Mechanics 2, Mechanics of Materials. Springer, 2018, ISBN: 978-3-662-56272-7. Online access via Lund University Library.

- Dietmar Gross, Werner Hauger, Jörg Schröder, Wolfgang Wall, Sanjay Govindjee: Engineering Mechanics 3, Dynamics. Springer, 2014, ISBN: 978-3-642-53712-7. Online access via Lund University Library.

Contact and other information

Course coordinator: Stephen Hall, stephen.hall@solid.lth.se
Course coordinator: Ralf Denzer, ralf.denzer@solid.lth.se
Course homepage: http://www.solid.lth.se
Further information: As a course text we use excerpts from the books Gross et al. Engineering Mechanics, vol 1 - 3. See section Course literature below.