LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Mekanik
Mechanics

VSMA25, 7,5 credits, G1 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED V
Date of Decision: 2023-03-21

General Information

Main field: Technology.
Compulsory for: V1, BR1
Language of instruction: The course will be given in Swedish

Aim

The aim of the course is to give basic knowledge in mechanics with application to real-world problems. Modelling is trained in the course. The problem-solving ability is developed by using the laws of Newton and mathematical tools for defining and analysing computational models describing the physical world.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- Be able to explain basic concepts as force, moment, velocity, acceleration, work, energy, power, impulse and momentum.
- Be able to use the basic concepts in a physical context.

Competences and skills
For a passing grade the student must

- Be able to use relations (i.e. laws of acceleration, energy and impulse) describing bodies in equilibrium and motion, based on the basic concepts.
- In an idealised physical world, separate an object from its surroundings (making a free-body diagram), identify relevant basic concepts and relations an use them for solving the problem.

Judgement and approach
For a passing grade the student must

- Be able to assess the reasonableness in obtained computational results.
- Be able to report the solution of a problem in a clear way (basic conditions, assumptions, calculations, results and conclusions).

Contents

A characteristic feature of mechanics is that it tries to capture the patterns of behaviour and and phenomena of nature in terms of mathematical models. The subject thereby has a strong connection to calculus and linear algebra courses. Two basic models for bodies are treated in detail - particle and rigid body. It is important to, in a real situation, have the ability to separate a problem from its surroundings (drawing a free-body diagram) and choose a suitable model for analysis of the problem. Mathematical concepts and methods from linear algebra and calculus are consolidated and deepened when they can be given a clear physical interpretation in the models of mechanics.

The Mechanics course can roughly be divided into statics and dynamics, depending on whether the bodies which are studied are at rest or in motion. Dynamics can be further divided into particle dynamics and rigid body dynamics, depending on whether the extension of the body in question needs to be taken into account.

Statics: two and three-dimensional force systems. Equilibrium. Centre of mass and centroid, friction.

Dynamics: kinematics of particles, kinetics of particles (Newton's second law, work and energy, impulse and momentum). Plane kinematics of rigid bodies. Plane kinetics of rigid bodies.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written examination, consisting of a theory and a problem part.

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: FMA420 Linear Algebra OR FMAB20 Linear Algebra AND FMAA05 Calculus in One Variable.
The number of participants is limited to: No
The course overlaps following course/s: VSMA15

Reading list

- Per-Åke Jansson, Ragnar Grahn, Mikael Enelund: Mekanik, Statik och dynamik. Studentlitteratur, 2018, ISBN: 9789144116594.

Contact and other information

Examinator: Susanne Heyden, susanne.heyden@construction.lth.se
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