SG1107 Mechanics 7.5 credits

Mekanik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus valid from Fall 2022

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Physics and mathematics according to the curriculum of the programme S

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The students should be able to, starting with a concrete mechanical problem, make idealizations, motivate and create a mathematical model, solve it using mathematical or numerical methods and finally critically scrutinize the result. Further the students should be able to differentiate between reality and theoretical model and understand the interaction between basic observations, model building, and axioms, postulates, laws and their consequences.

Measurable aims: After passing the course the students should be able to: Define the basic concepts and quantities in mechanics and explain how they are related, e.g. velocity, acceleration, mass, time, force, and moment of force. Formulate the laws of motion and derive the connections between them, e.g. Newton's laws for particles, inertial systems, laws about equilibrium of rigid bodies. Identify and define typical systems of forces and a manifold of more abstract mechanical quantities (center of mass, momentum, angular momentum, resultant force, impulse, angular impulse, work, kinetic and potential energy, conservative and non-conservative forces). Discuss central mechanical phenomena (such as free fall, free damped and undamped harmonic oscillation, forced oscillation, resonance, uniform circular motion, elastic and completely inelastic impact, etc). Analyze given systems of forces, and simplify them as far as possible. Analyze given motions with suitable choice of coordinate systems (inertial systems). Calculate forces and positions of equilibrium. Starting from Newton's laws and kinematic and geometric relationships put down mathematical models for different types of particle motions and make calculations of this motion.

Course contents

Vector algebra and dimensional methods, review.

Force and moment of force.

Systems of forces; couples, equipollent force systems.

Centre of mass, systems of particles, rigid bodies, compound bodies.

Equilibrium, conditions for equilibrium, 2D and 3D, friction.

Kinematics of particles, components of force and acceleration.

Work and energy; power and kinetic energy, conservative systems, energy conservation.

The moment equation;

Oscillations, free and forced, damped and undamped.

Examination

- INL1 - Assignments, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

Hand in assignments (INL1; 1,5 university credits), a theory exam (TEN1; 1,5 university credits) and a problem exam (TEN2; 4,5 university credits). The theory exam can be taken by passing two exams during the course.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.