

Engineering Mechanics II

Programme course

6 credits

Mekanik, del 2

TMME04

Valid from: 2017 Spring semester

Determined by

Board of Studies for Electrical
Engineering, Physics and Mathematics

Date determined

2017-01-25

Offered for the last time

Spring semester 2023

Replaced by

TFYB04 + ny kurs 2025

Main field of study

Applied Physics, Mechanical Engineering

Course level

First cycle

Advancement level

G2X

Course offered for

- Applied Physics and Electrical Engineering, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Statics and particle mechanics. Basic courses in algebra and analysis (especially the geometric interpretations of scalar and vector products, and ordinary differential equations).

Intended learning outcomes

The purpose of the course is to give the students an understanding knowledge of the basic laws of rigid body mechanics, and ability to independently apply the laws on concrete problems. After the course the student should:

- Know the definitions of the fundamental concepts used in rigid body mechanics, such as velocity, angular velocity, acceleration, angular acceleration, linear momentum, angular momentum, mass moment of inertia, linear impulse, angular impulse, power, work and energy.
- Be able to derive expressions for, and also compute, the entities above for problems of an engineering nature.
- Be able to draw free body diagrams, formulate kinematic constraint equations, formulate Euler's laws and derive the ordinary differential equations that describe how bodies move.
- Be able to solve these differential equations numerically for mechanical systems with at most three degrees of freedom using MATLAB.
- Be able to perform simpler derivations of results in rigid body mechanics.
- Be able to describe the outcome of simpler mechanical experiments in qualitative terms.
- Be able to identify results that are clearly unreasonable.

Course content

Planar kinematics of rigid bodies (velocity and acceleration relations, instant center of velocity, relative motion). Planar kinetics of rigid bodies (Euler's laws of motion, mass moment of inertia, power, work energy, impulse, angular impulse, impact). Spatial kinematics of rigid bodies (angular velocity vector, velocity and acceleration relations). Spatial kinetics of rigid bodies (Euler's laws of motion, mass moment of inertia matrix, fixed axis rotation, Euler's equations, work, energy, impulse, angular impulse, impact, gyro dynamics).

Teaching and working methods

The lectures treat important subjects, and may contain experiments to illustrate the presented theory. During the classes, the students strengthen their ability to solve problems independently. In a compulsory computer exercise, MATLAB is used to simulate the motion of a mechanical system.

Examination

UPG1	Examination	1 credits	U, G
TEN1	Written examination	5 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: Multibody Dynamics and Robotics, Models of Mechanics, Flight Dynamics Y, Analytical mechanics, Biomechanics

Department

Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent

Peter Schmidt

Examiner

Peter Christensen

Course website and other links

Education components

Preliminary scheduled hours: 58 h

Recommended self-study hours: 102 h

Course literature

P. Christensen, Elementär mekanik, del 2: stelkroppsmekanik

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.