

Mechanics II

Programme course

4 credits

Mekanik, fördjupningskurs

TFYA55

Valid from: 2017 Spring semester

Determined by

Board of Studies for Electrical
Engineering, Physics and Mathematics

Date determined

2017-01-25

Main field of study

Applied Physics, Physics

Course level

First cycle

Advancement level

G2X

Course offered for

- Physics, Bachelor's Programme

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

Mechanics I, Linear Algebra, Calculus in several variables

Intended learning outcomes

The aim of the course is to give the students a further knowledge and deeper understanding of classical mechanics. After completing the course the student should know how to:

- Solve problems in mechanics by applying Newton's and Lagrange's equations of motion
- Apply the theory on dynamics in noninertial frames, systems of particles and rigid body rotation
- Perform and analyze an experiment or simulation

Course content

Repetition of basic concepts: Inertial frames, Newton's laws for a particle in Cartesian and polar coordinates, conservation of momentum, angular velocity vector. Newton's laws in non-inertial frames: acceleration without rotation, inertial forces, rotating frames, Coriolis and centrifugal forces applied on motion relative to the earth. Dynamics of particle systems: center of mass, the angular momentum vector and its division into orbital and spin parts, torque. Rigid body dynamics: Rotation about fixed axis, moment of inertia and products of inertia, rotation about given point, inertia tensor, principal axes, Euler's equations applied to axially symmetric top and stability conditions for free rotation. Introduction to analytical mechanics: Lagrange's equations, generalized coordinates, constraints, degrees of freedom.

Teaching and working methods

The content of the course is presented in the form of lectures. Selected problems will be solved during exercises. Laboratory work is included in the course.

Examination

LAB1	Laboratory course	1 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5

Grades

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

Other information

Supplementary courses: Analytical mechanics, Theory of Relativity

Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent

Magnus Boman

Examiner

Magnus Johansson

Course website and other links

https://www.ifm.liu.se/edu/coursescms/tfya55_mekanik/index.xml

Education components

Preliminary scheduled hours: 32 h

Recommended self-study hours: 75 h

Course literature

Additional literature

Books

John R. Taylor, (2005) *Classical Mechanics*
University Science Books

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.