

# Physics and Mechanics

Programme course

6 credits

Fysik och mekanik

TFYA87

Valid from: 2017 Spring semester

**Determined by**  
Board of Studies for Computer Science  
and Media Technology

**Date determined**  
2017-01-25

## Main field of study

Applied Physics, Physics

## Course level

First cycle

## Advancement level

G1X

## Course offered for

- Computer Science and Software 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

Introductory mathematics, calculus of one variable, calculus of several variables, differential equations, basic programming

## Intended learning outcomes

To introduce and treat basic physics: classical mechanics, electrostatics and electrodynamics. After successful completion of the course, the student should be able to use, evaluate and create models that describe processes or events related to these areas of physics. The student should be able to solve basic problems in mechanics using kinematical motion equation, force laws, energy principles and momentum equations in the following areas:

- Particle mechanics,
- Mechanics of particle systems, Dynamics of rigid bodies and Statics,
- Mechanical oscillations.

The student should individually and in group be able to apply physical modeling and experimental problem solving to treat basic problems related to these areas. The student should also be able to solve basic problems in electrostatics and electrodynamics. Furthermore, the student should be able to demonstrate a conceptual understanding for the physical principles treated in the course.

## Course content

- Model development:  
The basic steps of model development - idealization, formalization, calculation and interpretation, robustness. Experimental problem solving - hypothesis, dimension analysis, measurement and error estimation.
- Particle mechanics: Kinematics, position, time, velocity, acceleration, angular position, angular velocity, angular acceleration, equations of motion and relative motion. Kinetics, mass, momentum, force, impulse, angular momentum, torque. Work, kinetic energy, power, conservative forces, potential energy, conservation of mechanical energy.
- Mechanics of particle systems and dynamics of rigid bodies: center of mass, conservation of momentum, conservation of angular momentum, kinetic energy of particle systems, moment of inertia.
- Mechanical oscillations: Amplitude, frequency, wavelength, period and angular frequency, phase, wave velocity, superposition, interference, optical light.
- Electrostatics: Charge, Coulomb's law, electric potential, electric field, energy.
- Electrodynamics, electromagnetic fields and waves: Direct and alternating current, Ohm's law, series and parallel resistance, power, Lorentz force, magnetism, induction, electromagnetic fields and waves.

## Teaching and working methods

The course contains lectures, laboratory and modeling exercises in group, and problem solving exercises.

## Examination

UPG1	Group assignment	2 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5
LAB1	Laboratory work	1 credits	U, G

## Grades

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

## Other information

Supplementary courses: Automatic control, Advanced Game Programming

## Department

Institutionen för fysik, kemi och biologi

## Director of Studies or equivalent

Magnus Johansson

## Examiner

Mats Fahlman

## Course website and other links

## Education components

Preliminary scheduled hours: 44 h

Recommended self-study hours: 116 h

## Course literature

### **Additional literature**

#### **Books**

R.D.Knight, *Physics for scientists and engineers* 3rd edition

#### **Articles**

## 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](http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).