



DEPARTMENT OF PHYSICS

FYP302 Mechanics B, 7.5 credits

Mekanik B, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Physics on 2013-03-12 and was last revised on 2023-10-24 to be valid from 2024-01-15, spring semester of 2024.

Field of education: Science 100%

Department: Department of Physics

Position in the educational system

The course is included in the Physics, Bachelor of Science Programme and is also given as a freestanding course.

Advanced course in the main subject physics.

The course can be part of the following programme: 1) Bachelor of Science in Physics (N1FYS)

Main field of studies

Physics

Specialization

G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Entry requirements

For admission to the course it is required that the student has knowledge in linear algebra, real analysis, mechanics and mathematical physics corresponding to the two first years in the Physics, Bachelor of Science Programme, or that equivalent knowledge has been acquired in some other way.

Learning outcomes

Having passed the course Mechanics B, advanced course in physics the student is

expected to:

Knowledge and understanding

- be familiar with the definition and the use of inertial reference frames;
- be able to derive the Lorentz transformation and know its properties and its consequences for the structure of the space-time;
- have acquired knowledge of relativistic mechanics and its most important applications;
- be familiar with general tensors and vectors and be able to formulate Maxwell's equations using tensors;
- have acquired knowledge of physical concepts within advanced mechanics;
- know how a physical theory can be formulated based on a variation principle;
- know how to describe the movement of a rigid body in several dimensions;
- know the relativistic covariant formulation of physics;

Competence and skills

- have trained an inquiring working method;
- be able to describe completed experiments in writing;
- have developed the ability to work independently and in collaboration with others;
- be able to explain relativistic effects with thought experiments;
- be able to solve relativistic collision processes;
- be able to use Lagrangians to derive equations of motion;
- be able to solve dynamic problems numerically with appropriate software;

Judgement and approach

- be able to assess and analyse data from experiments and numerical simulations;
- have trained a critical way of thinking.

Course content

The course consists of two subcourses: *Theory of relativity* and *Analytical mechanics*.

Sub-courses

1. Theory of relativity (*Relativitetsteori*), 3 credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

This part includes: The history of relativity theory, inertial reference frames and Lorentz transformations, relativistic kinematics, relativistic optics, space-time and 4-vectors, relativistic mechanics, tensors, manifestly relativistic electromagnetism.

2. Analytical mechanics (*Analytisk mekanik*), 4.5 credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

In this part, analytical mechanics is used to formulate computer models of

mechanical phenomena such as: The movement of rigid bodies, mechanical oscillations and waves, nonlinear oscillations, chaos and dynamic systems.

Form of teaching

Used forms of teaching:

Lectures, demonstration and exercise classes and project work.

Language of instruction: Swedish

Some lectures may be in English.

Assessment

Examination formats:

Part 1: Oral exam, 3.0 credits

Part 2: Project report, 4.5 credits

A student who has failed twice in an exam of the course, or part of the course, has the right to request another examiner. The application is sent to the relevant department.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

For grade Pass of the whole course, Pass in all parts are required.

For grade Pass with Distinction of the whole course, Pass with Distinction of at least one part is required and at least Pass on the other part.

For each part applies:

Part 1: Oral exam with grade Fail, Pass or Pass with Distinction.

Part 2: For grade Pass, approved project report is required. For grade Pass with Distinction, it is required that the project report describes a comprehensive study of the parameter space of the systems and that it contains an in-depth analysis of the results.

Course evaluation

At the end of the course, a possibility is given to anonymously fill out a course evaluation. The result is published on the course homepage in University of Gothenburg's learning management system.