UNIVERSITY OF GOTHENBURG

DEPARTMENT OF PHYSICS

FYP101 To become a physicist, 7.5 credits

Att bli fysiker, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Physics on 2011-06-08 and was last revised on 2024-02-07 to be valid from 2024-09-02, autumn semester of 2024.

Field of education: Science 100%
Department: Department of Physics

Position in the educational system

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

The course can be part of the following programmes: 1) Marine Science, Bachelor's Programme (N1MAV), 2) Bachelor of Science in Physics (N1FYS), 3) Medical Physicist Programme (N1SJU), 4) Teacher Training Programme (L1LÄR) and 5) Bachelor of Science Programme in Chemistry (N1KEM)

Main field of studies	*Specialization*
Physics	G1N, First cycle, has only upper-secondary level entry requirements

Entry requirements

General entrance requirements for university studies and the Swedish upper secondary courses Physics 2, Chemistry 1, Mathematics 4/Mathematics E or equivalent.

Learning outcomes

After completion of the course To become a physicist, the student should be able to:

Knowledge and understanding

- show an insight into the scientific method and the scientific world view;
- demonstrate an understanding of the concept of a physical model;
- to distinguish the differences between quantity, unit, measure and dimension;
- demonstrate an insight into how physical models are constructed through an interplay between experiment and theory;
- account for the base units in the SI-system, how they are defined, their associated dimensions, prefixes and standard notations;
- understand the importance of structure and style in technical report writing and account for genre specific conventions for texts in physics;
- classify different sources of error in experimental data, *e.g.*, systematic errors, random errors etc.;
- understand and distinguish the concepts precision and accuracy;
- demonstrate an acquired insight into roles played by physicists in societal issues related to energy, environment, health and economy;

Competence and skills

- perform unit conversions and relate derived units from base units within the SI-system;
- perform basic dimensional analysis to approach problems in physics, check results for dimensional correctness and make order of magnitude estimates;
- fit power laws to measured data;
- perform basic error estimation;
- plan, carry out and analyze simple experiments to obtain empirical models using the scientific method;
- perform continuous and systematic documentation during experiments;
- write a scientific/technical report according to genre specific conventions in physics;
- analyze and visualize data using Matlab;
- write simple scripts and programs in Matlab;
- import och export data from Matlab;
- describe and analyze challenges related to sustainable development;

Judgement and approach

- assess the validity of simple empirical models based on a knowledge of the underlying experimental data on which the models are based upon;
- to discuss societal issues in a scientific perspective based on ecological, economic and social aspects.

The course is sustainability-related, which means that at least one of the learning outcomes clearly shows that the course content meets at least one of the University of Gothenburg's confirmed sustainability criteria.

Course content

Basic physical principles, scientific methodology, the SI-system and related base units, derived units, prefixes, unit conversions, dimensional analysis, dimensional correctness, technical report writing and style conventions in physics, planning experiments, curve fitting, linearization, error analysis, systematics and practice of experimental work, constructing empirical models from experimental data, scientific perspectives related to ecological, economic and socieatal aspects. Basic use of the software Matlab including programming, variables, expressions, vectors, programming conventions and general good practices in programming, debugging, plotting graphs and data visualization, iteration, recursion, vectorization, functions and conditional clauses.

In addition, the course contains lectures by invited speakers telling about their research and/or education related matters.

In Sub course 2, the material is applied in a practical setting where an empirical model is obtained experimentally.

Sub-courses

1. **Basic physical principles and applications** *(Fysikens grunder och tillämpningar),* 3 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
2. **Experimental problem-solving** *(Experimentell problemlösning),* 2 credits
   Grading scale: Pass (G) and Fail (U)
3. **Programming with Matlab** *(Programmering med Matlab),* 2.5 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

Form of teaching

Sub course 1: Lectures and guest lectures
Sub course 2: Laboratory work
Sub course 3: Computer exercises

Language of instruction: Swedish

Assessment

Sub course 1: two written midterms (quizes), 3.0 credits.
Sub course 2: for a pass grade (G) an approved technical report is required along with active participation during all laboratory sessions. Assessment of active participation is made by the responsible teachers present at the laborations. (Grade: Pass, Fail), 2.0

credits.
Sub course 3: approved computer exercises. (Grade: Pass, Fail). A written report on a separate project (Grade: Pass with distincion), 2.5 credits.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).
For the grade Pass (G) for the entire course, the grade G is required in sub courses 1, 2, and 3. For the grade Pass with Distinction (VG) for the entire course, the grade VG is required in at least one of the sub-courses 1 and 3, and the grade G in the remaining sub courses.

Course evaluation

A course evaluation should be arranged after the course has ended where all participating students are given the possibility to provide anonymous feedback via a course survey. The course responsible should, together with student representatives, discuss and assess the completed survey. Meeting notes should afterwards be made available via the university learning platform.