UNIVERSITY OF GOTHENBURG

PHYSICS

FYF131 Basic course in physics A, distance learning, 15 higher education credits

Fysik med didaktiskt perspektiv A, distans, 15 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Physics on 2012-04-03 to be valid from 2012-04-03.

Field of education: Science 100%
Department: Physics

Position in the educational system

The course is given as a freestanding course in the main subject physics where didactic aspects are considered. It is appropriate as an introductory course in physics for future teachers and others scientifically interested.

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

Entry requirements

Learning outcomes

The general aim of the course is that the students develop a conceptual understanding of physics on the basis of the disciplinary foundation of physics. On completion of the course, the students are suppose to have developed basic knowledge of the emergence as well as character of physics. They should also be aware about criteria that characterise science in contrast to pseudoscience.

On successful completion of the course the student will:

Knowledge and understanding

- be able to describe, explain and predict physical phenomena in nature, everyday life and society.
- be able to use scientific methods and models in physics.
- have the understanding that experiments play a central role and that the knowledge is built up in an interplay between observations, models and theories.
- identify and discuss ethical issues on the basis of a scientific perspective as well as ethical issues that natural sciences create.

Skills and abilities

- orally and in writing be able to present simple physical problems.
- have developed an ability to plan and carry out experiments as well as be able to use measuring instruments and analyse measurement data.
- be able to set up hypotheses and models, and carry out experiments to verify or revise a hypothesis or a model.
- realise the connection between the ability to explain for others and understand a physical phenomenon oneself.

Judgement and approach

- have developed an ability to analyse society issues in a scientific perspective.
- have developed an ability to explain physical phenomena.

Course content

The course gives an introduction to basic mechanics and thermodynamics and consists of four parts. The course contains both theoretical and laboratory elements, where the latter aim to develop the student's experimental ability as well as consider the didactic aspects of experimental physics.

Part 1. Mechanics, 6.0 credits

In mechanics, the scientific view of the world, the laws of motions in classical mechanics and in special relativity theory are treated. This part includes:

- Space, time, mass, position, velocity, acceleration.
- Force, Newton's laws, gravitation, the movements of planets, stars and galaxies in the universe, inertial forces in accelerated systems.
- Conservation laws: linear momentum, energy and angular momentum.
- Introduction to the rotational motion of a rigid body.
- Introduction to special relativity theory.
- Experimental problem-solving aiming to develop the ability to plan carry out and

evaluate experiments. This part includes dimension and error analysis, curve fitting, as well as lab book keeping and report writing.

- Science-historical milestones for the development of the scientific understanding of mechanics, for example the difficulties with relative motion.

Part 2. Mechanics, experimental problem-solving, 1.5 credits

During the course about 6 home laboratory tasks are given, using equipment that mostly is available in an ordinary home. In some case, the student can need to acquire certain materiel.

The course syllabi of the primary and lower-secondary school and the upper secondary school emphasize the importance of that the pupils understand the relationship between physical studies and development of concepts, models and theories. The home laboratory tasks are organised so that the student is encouraged to see this connection. At the home laboratory tasks, the student should reflect on the learning process and come up with some suggestions on how the phenomenon that is studied in the laboratory task should be presented for pupils or public..

Part 3. Thermodynamics, examination, 6.0 credits

This part is concentrated on understanding of the first and second laws with application to engines, cooling engines and heat pumps.

- Thermodynamic systems, state variables and thermodynamic processes, as well as thermal equilibrium and temperature.
- Temperature, work and heat are defined in physics and are compared with the everyday use of the words.

- The first law of thermodynamics, heat, work and internal energy.
- The second law of thermodynamics and entropy.
- State equations, kinetic gas theory, heat transfer, heat capacitivity, as well as isothermal and adiabatic processes.
- The concept of energy in ordinary life, society and science. The complexity and ethical considerations concerning these of the energy issues. Different energy sources are treated. Energy transformations.
- Fission, radiation and radioactivity, decay and half-lifes.

Part 4. Thermodynamics, experimental problem-solving, 1.5 credits

During the course about 6 home laboratory tasks are given, using equipment that mostly is available in an ordinary home. In some case, the student can need to acquire certain materiel.

The course syllabi of the primary and lower-secondary school and the upper secondary school emphasize the importance of that the pupils understand the relationship between physical studies and development of concepts, models and theories. The home laboratory tasks are organised so that the student is encouraged to see this connection. At the home laboratory tasks, the student should reflect on the learning process and come up with some suggestions on how the phenomenon that is studied in the laboratory task should be presented for pupils or public.

Form of teaching

Used forms of teaching:

The course is given at distance without components with compulsory attendance. On the

other hand, a number of optional sessions of problem solving nature can be offered.

Language of instruction: Swedish

Assessment

Examination formats:

Examination takes place through compulsory written assignments of problem-solving nature, written examinations as well as home labs and laboratory reports.

Part 1: written assignments and written examination, 6.0 credits

Part 2: laboratory reports, 1.5 credits

Part 3: written assignments and written examination, 6.0 credits

Part 4: laboratory reports, 1.5 credits

Students have the right to a change of examiner, if practically possible, after having been failed twice on the same examination. The application shall be sent to the board of the department and has to be in writing.

Grades

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

For grade of Pass on the whole course, at least Pass in all parts is required.

For grade Pass with distinction on the whole course, Pass with distinction on the parts 1 and 3 is required as well as Pass on the parts 2 and 4. You can also reach Pass with distinction on the whole course if the mean value of the two results on the parts 1 and 3 corresponds to Pass with distinction, in addition to the requirement of Pass of the parts 2 and 4.

For each part applies:

Part 1: Written exam with grade Fail, Pass or Pass with distinction.

Part 2: For grade Pass, approved laboratory reports are required.

Part 3: Written exam with grade Fail, Pass or Pass with distinction.

Part 4: For grade Pass, approved laboratory reports are required.

Course evaluation

At the end of the course an anonymous course evaluation is provided. A compilation of the result is available after the course in the Study expedition at Department of physics.