SH1010 Physics for the Built Environment 9.0 credits

Fysik för den byggda miljön

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for SH1010 valid from Autumn 2008

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Physics,Technology

Specific prerequisites

Recommended prerequisites: The course starts from level A in Physics or level B in Science from high school. Knowledge from Mathematics and models and Mathematical methods I, is assumed.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The course will give the student a relative broad general knowledge in Physics and also give the base for further studies in the main and related areas.

After the course the student should be able to:

- Describe fundamental concepts, model and compute simple processes in mechanics, energy of flows, fluid mechanics, electricity and waves.
- Identify phenomena in the environment where physical principles are applicable.
- Write a report from a physical study of a phenomena, e.g. how the sun can be used to provide energy in buildings. The student then should be able to analyze parts of the process but also describe the whole.

Course contents

Basic classical physics

Physical quantities, Units and Dimensions. Force and momentum. Equilibrium. Friction. Work, power and energy. Kinematics in Cartesian coordinate system.

Newton's laws. Equations of motion. Hooke's law - elasticity theory.

Simple harmonic motions in one dimension, damped oscillations.

Project task: Study and explain the relation between speed and personal injuries in case of traffic accident.

Energy processes and phase transitions

Equations of states. Reversible and irreversible processes.

Kinetic-molecular theory of an ideal gas. Transfer of heat. Thermodynamic concepts. The first and second law of thermodynamics. Different forms of energy. Applications of first law of thermodynamics on closed and open systems and also equation of energy.

Project task: Design and explain how a heat engine transforms heat into work.

Electricity and electromagnetism

Electrical circuits. Ohm's law and Kirchhoff's rules. Equation systems. Complex calculation method. Complex power. Three-phase currents. Electromagnetic waves. Electromagnetic spectrum, visible light - sunlight - long wave electromagnetic radiation. Sensors: Physical principles, ordinary designs.

Project task: Windows with low emissivity.

Fluid mechanics and flow of energy

Hydrostatic pressure. Forces caused by fluids in motion. The continuity and energy equation of incompressible fluids. Energy equations. Dimensional equation. Flow in pipes, channels and porous matter. Measuring of fluid properties. Transfer of heat.

Project task: Describe and analyse the function of a solar collector.

Course literature

To be announced.

Examination

- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 7.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

Two written examinations (TEN1; 3cr; TEN2; 3 cr)
Project works (PROJ1; 1,5 cr; PROJ2; 1,5cr)

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.