



LTH

FACULTY OF
ENGINEERING

Course syllabus

Energi- och omvärldsfysik Energy and Environmental Physics

FAFA76, 7,5 credits, G1 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED N

Date of Decision: 2023-04-17

General Information

Main field: Technology.

Compulsory for: I1

Language of instruction: The course will be given in Swedish

Aim

The student should develop an understanding for basic concepts and relations in Physics, which are of importance for the conception the world around us and for the technological development, and which constitute a part of the scientific basis for a Master of Engineering in Industrial Engineering and Management. The student should be provided with means to comprehend the most important physical concepts, the empirical laws, as well as theories of particular importance for a sustainable societal development regarding energy. The student should practice problem solving, perform experimental work and train thinking in scientific models.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to understand the relation between experiments, models and theories.
- be able, in physical terms, to describe and analyze physical phenomena in nature, technology and society; in particular flows of energy, conversions of energy and efficiencies in such processes.
- have knowledge of the fundamental Physics that is required to be able to communicate with experts.
- be aware of concepts and terminology relevant for sustainable development.

Competences and skills

For a passing grade the student must

- be able to use basic skills in physics and with varying degrees of approximation apply models to analyze, comprehend and describe different technical problems.
- be able to discuss, consider and balance aspects and positions that are important in the context of sustainable development.
- be able to communicate and present technical problems and achieved results to persons with varying educational background.
- be able to clearly describe, discuss and analyze experiments and results in a written report.
- be able to orally phrase and present arguments and discuss these in small groups.

Judgement and approach

For a passing grade the student must

- be able to demonstrate an understanding of scientific methods and to realize possibilities and limitations of Physics.
- be able to identify his/her further need of knowledge also within other areas.
- realize the possibilities and limitations of producing energy for human consumption.
- be aware of aspects of energy other than those related strictly to science and of the complexity that may be present in reality-based problems.

Contents

Problem solving: models, techniques for problem solving, interaction between models and experiments. Measurements: experiments, analysis, presentation of experimental data. Energy: conservation, transport, quality, resources, environmental impact. Gases: concentration, pressure, transport. Ideal and real gases. The laws of thermodynamics: temperature, heat, thermal energy, heat engines, refrigerators. Electromagnetic radiation: thermal radiation, energy balance, interaction of light with matter, especially atoms. Ionizing radiation: activity, decay, absorbed dose, dose equivalent. Applications.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Written exam, participation in a compulsory lecture, passing grade in project and laboratory exercises.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0121. **Name:** Energy and Environmental Physics.

Credits: 5. **Grading scale:** TH. **Assessment:** Written exam.

Code: 0221. **Name:** Lab, Sessions, Project, Compulsory Lecture on Climate.

Credits: 2,5. **Grading scale:** UG. **Assessment:** Passed laboratory sessions and project, presence at compulsory lecture on climate.

Admission

Assumed prior knowledge: FMAA05 Calculus in One Variable, part 1 or similar.

The number of participants is limited to: No

The course overlaps following course/s: FAF220, FAFA05, FAFA20, FAFA30, FAFA35, FAFA45, FAFF25, FAFA15, FAFA65, FAFA70

Reading list

- Jönsson, Göran: Fysik i vätskor och gaser. Teach Support, 2016, ISBN: 9789197249997. The part of the course that comprise thermodynamics is presented in this book.
- Jönsson, Göran: Utdrag ur Atomfysikens grunder. Teach Support, 2012, ISBN: 9789163389580. Only parts of this book will be used. The chapters will be distributed by the Physics Department.
- Kurslaboratoriet för fysik, LTH: Laborationshandledningar. 2017. Instructions for laboratory exercises are available through Canvas.
- Kevin Fissum: Kursmodul Kärnfysik v2.2. 2019. A compendium compising the nuclear physics in the course.

Contact and other information

Course coordinator: Andreas Ehn, andreas.ehn@forbrf.lth.se

Course homepage: <https://canvas.education.lu.se/>

Further information: It is mandatory to attend the first lecture in order to be admitted to the course. Some elements may be taught and assessed in English. This includes a maximum of 1.5 hp, in the form of laboratory sessions or written assignments.