Course syllabus

Energi- och omvärldsfysik
Energy and Environmental Physics

FAFA70, 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: W1
Language of instruction: The course will be given in Swedish

Aim

The student will develop an understanding of basic concepts within the Physics that form the scientific basis for a Master of Science in Environmental Engineering. The course will be a tool for understanding physical concepts, laws and theories with a focus on energy and energy supply. The course aims at training the student in modelling, problem solving and experimental methodology. The course also aims at providing a perspective on, and problematisation around the engineer's role in the development of a sustainable society.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- understand how modeling - in the form of mathematical models, analogies and pictures - interact with laboratory experiments and reality
- be able to (in physical terms) describe and analyze phenomena, especially flows of energy, energy conversions and exchange of energy, in nature and in technical systems
- understand the environmental impact of the use of energy and how it affects the living conditions on Earth
- have a knowledge of Physics that facilitates communication with experts from different fields, crucial for the development of Sustainable Engineering.

Competences and skills
For a passing grade the student must

- be able to use physical models to analyze, understand and describe technical problems
- be able to use the Physics and the Experimental methods presented in the course, and relate them to real engineering problems
- be able to write a well-structured laboratory report in which experimental data are presented and analyzed
- be able to communicate (written) and present (orally) a more or less complex issue related to sustainability, to people with varying educational background.

Judgement and approach
For a passing grade the student must

- be able to demonstrate an insight into the possibilities and limitations of Physics - especially in relation to the development of future technologies
- be able to indentify his/her further need of knowledge also within other areas.
- 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

Experimental methodology: Management, analysis and presentation of data and models.

Gases and liquids: Pressure. Ideal and real gases. Fluids.

Energy: Temperature and heat. The laws of thermodynamics, changes of state and cyclic processes. Meat machines, refrigerators and heat pumps. Statistical description of thermodynamics. Entropy. Heat transfer; conduction, convection, thermal radiation. Greenhouse effect. Climate models. Ionizing radiation - x-rays and radioactivity - origin and interaction with matter. Activity, absorbed dose and dose equivalent. Applications.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Mandatory presence and active participation in laboratory exercises and workshops. Approved written lab reports, approved written and oral project presentation. Written exam.

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: 0117. **Name:** Laboratory Sessions and Project Work.
Credits: 2,5. **Grading scale:** UG. **Assessment:** Passed laboratory sessions, written assignments, workshops and project.
Code: 0217. **Name:** Energy and Environmental Physics.
Credits: 5. **Grading scale:** TH. **Assessment:** Written exam.

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: FAFA15, FAF220, FAFA05, FAFA30, FAFA35, FAFA45, FAFF25, FAFA20, FAFA65, FAFA75

Reading list

- Jönsson, Göran: Fysik i vätskor och gaser. Teach Support, 2016, ISBN: 9789163798269.
- Jönsson, Göran: Utdrag ur Atomfysikens grunder. Teach Support, 2012, ISBN: 9789163389580. Only parts of this book will be used. The chapters are available through live@lund.
- Kurslaboratoriet för fysik, LTH: Laborationshandledningar. 2017. Instructions for laboratory exercises are available through live@lund.
- Kevin Fissum: FAFA70 Kursmodul Kärnfysik. 2020. Compendium written by Kevin Fissum.

Contact and other information

Course coordinator: Elias Kristensson, elias.kristensson@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.