



Faculty of Health, Science and Technology
Environmental and Energy Systems

Syllabus

Fundamental Energy Technology

Course Code:	EMGA99
Course Title:	Fundamental Energy Technology <i>Grundläggande energiteknik</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has only upper-secondary level entry requirements (G1N)

Major Field of Study:
MEI (Environmental and Energy Systems)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2024-09-11, and is valid from the Spring semester 2025 at Karlstad University.

Prerequisites

General admission requirements and upper secondary level Mathematics 3c, Physics 2, and Chemistry 1

Learning Outcomes

The aim of the course is to provide basic methods and concepts of energy engineering, and to give an orientation in central aspects of energy systems. The course also aims to expand and deepen the students' understanding of the field of energy through factual knowledge. The course provides important basic knowledge of energy engineering, but not in-depth specialised competence.

Upon completion of the course, students should be able to:

- give an account of the Swedish energy system as regards supply, conversion, and use of energy,

- give an account of renewable energy sources,
- explain the concepts of system, system boundary, and efficiency for the energy technology applications covered in the course,
- establish mass, power, and energy balances for systems,
- explain the difference between the concepts of power and energy,
- explain the concepts of calorific value, conduction, radiation, convection, k-value, U-value, cooling and heating factor,
- calculate heat transfer through planar and circular layers,
- give an account of the function of compressor-driven refrigeration systems,
- calculate cooling and heating effects in compressor-driven refrigeration systems,
- explain the concepts of static, dynamic, and total pressure,
- interpret and use the continuity equation and Bernoulli's equation in calculations,
- describe different ways to measure the pressure and flow of fluids,
- calculate pressure drops in simple pipe and duct systems, and
- describe different types of applied heat transfer and be able to use the basic calculation methods for heat exchangers.

Content

Mass, energy, and power balances.

Energy systems.

Renewable energy production.

The Swedish energy system.

Static and dynamic pressure.

The continuity equation.

Bernoulli's equation.

Heat transfer.

Pumps and fans.

Refrigeration systems.

Reading List

See separate document.

Examination

Assessment is based on a written exam and oral presentations of laboratory sessions.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Pass with Distinction (5), Pass with Some Distinction (4), Pass (3), or Fail (U) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.