



Faculty of Health, Science and Technology  
Environmental and Energy Systems

# Syllabus

## Energy systems

<b>Course Code:</b>	EMGB16
<b>Course Title:</b>	Energy systems <i>Energisystem</i>
<b>Credits:</b>	7.5
<b>Degree Level:</b>	Undergraduate level
<b>Progressive Specialisation:</b>	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

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

### Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2018-02-07, and is valid from the Autumn semester 2018 at Karlstad University.

### Prerequisites

Mechanics with Applications 1, 7.5 ECTS cr., Applied Thermodynamics, 7. ECTS cr., and Thermal and Fluid Sciences, 7.5 ECTS cr, or equivalent

### Learning Outcomes

The aim of the course is that students develop and apply basic knowledge in the field of thermodynamics and heat and mass transfer. Students are also expected to widen and deepen their knowledge base with facts and develop skills in using standard problem-solution methods and systems analysis for energy engineering systems and energy technology for sustainable development. Students also become familiar with the group dynamic processes through working in groups.

#### Knowledge and understanding

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

- describe the function of energy engineering systems and its main components and peripheral equipment,
- describe how district heating nets/distribution of heat can be adapted to varying effect needs,
- describe how an energy engineering system works in terms of automatic control engineering,
- relate their own contributions to the group project using groupdynamic concepts,

#### Competence and skills

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

- apply knowledge of thermodynamics in dimensioning components in energy engineering systems,
- apply knowledge of thermal and fluid sciences in dimensioning components in energy engineering systems,
- calculate basic combustion and carburation reactions,

- interpret and describe energy engineering systems with the help of a process chart,
- write a report according to a technological template,

#### Judgement and approach

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

- assess energy effectivity projects in terms of thermodynamic limitations and sustainability principles,
- create systems solutions for sustainable energy engineering systems,
- assess the total effect of renewable sources,
- argue for the choice of components such as pumps, control equipment and heat exchangers in energy engineering systems.

#### **Content**

Students work individually and in groups with project tasks which are presented orally and in writing.

The following areas are treated:

- thermodynamics
- heat and mass transfer
- combustion
- non-dimensional numbers
- district heating systems
- cooling towers
- steam boiler and turbines
- power plants
- process charts
- group dynamics

#### **Reading List**

See separate document.

#### **Examination**

Assessment is based on an oral presentation, a written project report, and an individual report reflecting on their own and the group's performance.

#### **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. Engineering students are awarded on of the grades Pass with Distinction (5), Pass with Some Distinction (4), Pass (#), or Fail (U).

#### **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.