



Faculty of Health, Science and Technology
Environmental and Energy Systems

Syllabus

Energy and Environmental Systems Analysis

Course Code:	EMG311
Course Title:	Energy and Environmental Systems Analysis <i>Energi- och miljösystemanalys</i>
Credits:	30
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

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

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2017-08-24, and is valid from the Spring semester 2018 at Karlstad University.

Prerequisites

Master of Science programme in Environmental and Energy Engineering:
Completed courses in EMG121 Sustainable Development for Engineers 7.5 ECTS cr, MAGA51 Foundation Course in Mathematics 7.5 ECTS cr, MAGA52 Analysis and Geometry 7.5 ECTS cr, EMGB15 Environmental Technology II 7.5 ECTS cr, EMGB16 Energy Systems 7.5 ECTS cr, EMGB17 Heat and Mass Transfer 7.5 ECTS cr, EMGB12 Building Services Engineering 15 ECTS cr.

Bachelor of Science programme in Environmental and Energy Engineering:
Completed courses in EMG121 Sustainable Development for Engineers 7.5 ECTS cr, MAGA44 Mathematics for Engineers I 7.5 ECTS cr, MAGA46 Mathematics for Engineers II 7.5 ECTS cr, EMGA14 Environmental Chemistry 7.5 ECTS cr, EMG211 Energy for Sustainable Development 30 ECTS cr, EMGB12 Building Services Engineering 15 ECTS cr.

Learning Outcomes

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

- describe the principles of life cycle analysis and apply them in relation to environmental impacts of energy consumption,
- describe the need of societal control instruments in the energy sector,
- estimate the scope and level of instruments needed to reach the desired effect,
- produce a systems description (model) in the form of block diagram,
- transform a systems description in the form of a block diagram into a mathematical model and implement it through a calculation tool,
- produce systems descriptions (models) with different time and space scales as well as different levels

of detail depending on what is required in the problem solving,

- identify the properties of a non-stationary system in terms of feedbacks and time constants,
- use simple control functions to affect a system's behaviour,
- identify and mathematically describe the properties of a system with the help of regression analysis,
- make correct assumptions and simplifications in producing systems descriptions,
- analyse an environmental and energy system with regard to energy consumption, environmental effects and life cycle costs,
- interpret a problem description and in cooperation with a client develop a suitable method to solve the problem,
- identify uncertainties in data input and systems description and assess the usefulness of the calculation result with consideration of the uncertainties,
- present their work orally,
- present their work in a written, complete report.

Content

The course deals with methods for systems analysis applied to energy and environmental systems.

One area treated is environmental systems analysis with a focus on life cycle analysis and assessment of the impact of energy consumption on the environment, including investment analysis with life cycle cost calculation and environmental economy and control instruments.

Another area treated is model building and simulation, including production of systems descriptions (modelling) of energy and environmental technology systems with a focus on describing energy and mass balances and flows of energy and mass. Systems descriptions in block diagrams are transformed into mathematical models and implemented in computer-based calculation tools (simulation programs)

A third area treated is applied systems analysis of a complex problem, including analysis of energy consumption, environmental impact and economy. The aim is to develop command of a system analytical approach as a tool in problem solving.

Instruction is in the form of lectures, supervision and project work.

Reading List

See separate document.

Examination

Assessment is based on a written exam, written hand-in assignments, and an oral exam.

Grades

One of the grades Fail, 3 (Pass), 4 (Some Distinction), or 5 (Distinction) 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

EMG311 cannot be included in the same degree as EMGC10.

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