



Faculty of Health, Science and Technology  
Environmental and Energy Systems

# Syllabus

## Methods for sustainability assessment

<b>Course Code:</b>	EMAD27
<b>Course Title:</b>	Methods for sustainability assessment <i>Teknik för hållbarhetsbedömning</i>
<b>Credits:</b>	10
<b>Degree Level:</b>	Master's level
<b>Progressive Specialisation:</b>	Second cycle, has only first-cycle course/s as entry requirements (A1N)

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

### Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2024-02-22, and is valid from the Autumn semester 2024 at Karlstad University.

### Prerequisites

Registered for Energy and Environmental Systems Analysis, 30 ECTS credits, in the Master of Science programme in Energy and Environmental Engineering, or registered for Life Cycle Assessment, 7.5 ECTS credits, in the Master of Science programme in Industrial Engineering and Management, plus upper secondary level Swedish 3 or Swedish as a second language 3 and English 6, or equivalent

### Learning Outcomes

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

- identify and follow flows of materials and substances in the ecospheres and anthroposphere of the Earth,
- analyse different systems regarding environmental impact and various perspectives on economic feasibility and social impact by applying LCA (Life Cycle Assessment), MFA (Materials Flow Analysis), LCCA (Life Cycle Cost Analysis), and S-LCA (Social Life Cycle

Assessment),

- analyse the components of an anthropogenic system to aggregate and understand the whole system,
- analyse problems and solutions in the area of engineering for sustainable development from different perspectives, and
- carry out a project in the area of engineering for sustainable development by defining research questions, collecting relevant information, and analysing and communicating results according to instructions.

## **Content**

Module I Environmental assessment:

(a) Materials Flow Analysis (MFA)

1. Analysis, evaluation and design of anthropogenic systems (companies, cities, countries, the world)
2. Use materials flow analysis to:
  - predict changes in the system regarding demand and emissions
  - interpret changes regarding the consequences for the environment, resource protection, employment rate or geopolitical conditions
  - identify possibilities to change systems in the desired direction
3. Terminologies, system definition, choice of indicators, vulnerability analysis, data harmonisation, dynamic modelling
4. MFA as precursor to Environmental Impact Assessment

b) Life Cycle Assessment (LCA)

1. Modelling of different environmental effects of products and services (for example climate change, toxicity, land use)
2. Use of different methods for environmental impact assessment

Module II Socioeconomic analysis:

(a) Life Cycle Cost Analysis (LCCA)

1. Cost categories, income categories, current value calculations, discounts and their importance
2. Differences in setting repayment periods pertaining to projects based on current value, introducing environment costs to integrate environmental and economic aspects in decision-making

(b) Social Life Cycle Assessment (S-LCA)

1. Introduction to S-LCA methodology
2. Criteria and indicators
3. Case studies in the literature

Module III Group project:

Students apply the theories of the first two modules and work in groups with an assigned project. Project content can be adjusted to departmental research, industrial examples, or the students' own choices.

## **Reading List**

See separate document.

## **Examination**

Assessment is based on:

- Individual written exam (5 ECTS cr)
- Written and oral presentations of the group project (5 ECTS cr)

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 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) 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.