



Faculty of Health, Science and Technology
Environmental and Energy Systems

Syllabus

Wastewater treatment and industrial symbiosis, Environmental technology II

Course Code:	EMGB22
Course Title:	Wastewater treatment and industrial symbiosis, Environmental technology II <i>Rening av avloppsvatten samt industriell symbios, Miljöteknik II</i>
Credits:	10
Degree Level:	Undergraduate level
Progressive Specialisation:	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 2023-09-11, and is valid from the Spring semester 2024 at Karlstad University.

Prerequisites

Registered for Sustainable Development for Engineering, 7.5 ECTS credits, and Environmental Technology I, Air and Flue Gas Treatment, 7.5 ECTS credits, or equivalent

Learning Outcomes

General aims:

Upon completion of the course, students should understand the principles of cleaning technology and be able to use cleaning-technological processes in wastewater treatment; be able to read, comprehend, and summarise scientific literature in the field; give an account of and understand various transport processes and separation methods; and work with

cleaning-technological issues from circular economy perspectives.

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

- Describe the effects of municipal sewage and industrial wastewater on the environment,
- Give an account of the chemical processes in watercourses affected by oxygen-depleting substances and eutrophication,
- Give an account of aerobic and anaerobic biological processes for water purification and sludge processing,
- Give an account of chemical precipitation and flocculation and what types of pollution can be reduced,
- Give an account of various types of mechanical separation,
- Calculate mass balances for water, organic material (C), and nutrients (N and P),
- Estimate the energy required for cleaning technologies,
- Dimension mechanical, biological, and chemical processes for municipal sewage and industrial wastewater,
- Dimension sludge processing methods,
- Give an account of methods for recycling wastewater and waste into products in order to contribute to a circular economy, and
- Describe results clearly through figures.

Content

The course covers cleaning technologies for municipal sewage and industrial wastewater, and the industrial symbiosis of systems based on recycling waste into new products.

Instruction is in the form of lectures, laboratory sessions, and project assignments.

The course includes an in-depth assignment focused on how cleaning technologies in industrial symbiosis can contribute to sustainable development.

Students learn how to find scientific literature, use referencing systems, and provide peer review of the reports of others.

Reading List

See separate document.

Examination

Assessment is based on a written exam and written reports on project tasks.

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.