



Faculty of Health, Science and Technology  
Environmental and Energy Systems

# Syllabus

## Forest bioeconomy - processes, energy and products

<b>Course Code:</b>	EMAD35
<b>Course Title:</b>	Forest bioeconomy - processes, energy and products <i>Skoglig bioekonomi - processer, energi och produkter</i>
<b>Credits:</b>	15
<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:

KTA (Chemical Engineering)

MEI (Environmental and Energy Systems)

### Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2025-02-05, and is valid from the Autumn semester 2025 at Karlstad University.

### Prerequisites

Registered for 180 ECTS credits in the Master of Science programme in Energy and Environmental Engineering, Chemical Engineering, or Industrial Management, plus Sustainable development, 7.5 ECTS credits, and Thermal fluid sciences, 7.5 ECTS credits, plus upper secondary level Swedish 3 or Swedish as a second language 3 and English 6, or equivalent

### Learning Outcomes

The aim of the course is for students to acquire in-depth knowledge of the structure of biomass, bioenergy, and existing and emergent forest industry processes.

Upon completion of the course students should be able to:

- explain the concept of bioeconomy and give an account of different perspectives on the forest as a resource,
- give an account of sustainability aspects of industrial processes for biomass,
- give an account of the structure of wood in terms of its macro-molecular components,
- explain and give examples of bioindustrial processes, and
- give an account of and explain selected unit operations within the area of bioindustrial processes.

## **Content**

The course comprises the following components:

- The concepts of bioeconomy and circularity
- The forest as a resource and biological diversity
- Policy instruments in bioeconomy
- Forestry and harvesting techniques
- Resource management in industrial processes
- The development of biomass from the perspective of evolution
- Wood and fibre morphology
- The chemical structure of biomass
- The environmental impact of forest industry processes

The course provides knowledge of the following processes:

- Sawmilling
- Wooden construction
- Mechanical and chemical pulp production
- Paper production technology
- Solid biofuels
- Biorefineries
- New materials and processes
- Selected unit operations in bioindustrial processes, such as for instance drying, pelleting, and extrusion.

A laboratory project concludes the course. Students plan, conduct, and evaluate an experiment in bioenergy or purification technology that addresses a research question, according to instructions and within given time frames. This involves analysis of results and presentation of findings with visual aids (such as diagrams, graphs, and images) to support and enhance their presentation.

## **Reading List**

See separate document.

## **Examination**

Assessment is based on:

- Active participation in seminars (1.5 ECTS cr)
- An individual written exam (7.5 ECTS cr)
- Written and oral project presentations (6 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 Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the

course. For Engineering students, 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.