Faculty of Health, Science and Technology
Environmental and Energy Systems

Syllabus

Bioeconomy, processes and products

Course Code:	EMAD18
Course Title:	Bioeconomy, processes and products *Bioekonomi, processer och produkter*
Credits:	15
Degree Level:	Master's level
Progressive Specialisation:	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 2018-02-06, and is valid from the Autumn semester 2018 at Karlstad University.

Prerequisites
Attended courses of a total 180 ECTS credits for the programmes Master of Science in energy and environmental engineering, chemical engineering, or industrial management, and completed courses in cleaning technologies 15 ECTS cr and environmental chemistry 7.5 ECTS cr, or equivalent. Upper secondary school level Swedish 3 or B/Swedish as a second language 3 or B, and English 6 or A, or equivalent.

Learning Outcomes
The aim of the course is that students acquire deeper knowledge of adaptable biomass and international bioenergy. Great emphasis is on implementing approaches preparing for research.

Upon completion of the course students should be able to
- exemplify industrial processes for biomass used nationally and internationally,
- give an account of sustainability aspects of industrial processes for biomass,
- explain selected unit operations and unit processes in bioindustrial processes,
- give an account of the production processes for manufacturing fibre based packaging materials,
- give an account of the anatomy of wood from the individual macro molecular components,
- analyse industrial processes for biomass environmental influence,
- conduct system analysis of industrial processes for biomass,
- give an account of reactions in biomass incineration,
- give an account of possibilities to extract biomaterials from cleaning processes,
- plan, conduct and evaluate laboratory work in bioenergy or cleaning engineering according to instructions and within given time frames,
- present their project orally and in writing and defend it orally.

Content
In this course, bioeconomy, processes and products refer to how biomass from the forest can be transformed in industrial processes.

The course comprises the following components:
Basic industrial processes for biomass nationally and internationally.
Historical development of industrial processes for biomass.
Sustainability aspects of industrial processes.
Forest as a source of raw materials for fibre based products.
Selected unit operations in industrial processes for biomass are treated. Examples of unit operations treated in the course are the following: pelleting, drying, cleaning and biogas production.
The environmental impact of a factory is discussed. Questions answered are: How does the cleaning process work? In what ways have the environmental requirements impacted on the development of process engineering? How are energy systems affected? How are work environments affected?
Resource management in industrial processes for biomass are discussed with a perspective on energy, materials, economy, health, environment and engineering and circular economy.
Students treat one area in depth in aproject which presented orally and in writing.

Reading List
See separate document.

Examination
Assessment is based on:
- written exam
- written and oral presentation of their own projects.

Grades
One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. Engineering students are awarded one of the grades Fail, 3 (Pass), 4 (Some Distinction), or 5 (Distinction) 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.