Faculty of Health, Science and Technology
Environmental and energy system

Syllabus

Sustainable Resource Utilization and Circular Systems Analysis

Course code:	**7MIE002**
Course Title:	Sustainable Resource Utilization and Circular Systems Analysis
	Hållbar resursanvändning och cirkulär systemanalys
Subject:	Environmental and energy system
Credits:	3 ECTS
Degree Level:	Doctoral

Course approval
The syllabus was approved by the Faculty of Health, Science and Technology, 25, September, 2024 and is valid from the autumn semester 2024 at Karlstad University.

Language of instruction
Teaching is in English or in Swedish.

Prerequisites and selection
Admission to research education in subjects of science or technology is required. The course is primarily intended for research education students admitted to Karlstad University, but is also open to students admitted to other universities.

Learning outcomes
After completed course the research education student should be able to:
- Identify a system with relevant system boundaries and resource flows for a given research question.
- Calculate energy and mass flows for the selected system.
- Reflect on how the system is affected by various future scenarios and external factors such as time variables, energy, and climate policies.
- Justify the choice of system boundaries and reflect on their impact on the results.

- Reflect on how a given research question can contribute to sustainable development.

Course content

In the course, the doctoral candidate evaluates their own research question from a systemic perspective. The course emphasizes system analysis, including system descriptions of stationary and non-stationary systems, and feedback mechanisms at different spatial and temporal scales. Sustainable development is a key concept discussed throughout the course.

The course discusses environmental impacts of different resource flows and future scenarios for flows of, including forests, energy, water, or other resources relevant to the doctoral candidate.

Sensitivity analyses are used to asses, the effects of external factors such as time variables, energy, and climate policies.

Literature search within the research question is included.

The work is conducted individually as well as in seminar form with other doctoral candidates.

Reading list

Articles and other types of literature will be presented before the course starts.

Examination

For a Pass grade, doctoral students are required to actively participate in the seminars. The student must also submit written assignment and give a presentation that summarizes the studies and the key findings in a seminar.

Grades

One of the grades Fail (U) or Pass (G) is awarded in the examination of the course.

Quality assurance

A written evaluation is carried out at the conclusion of the course. The result of the evaluation is collated in accordance with *The Higher Education* Ordinance, Chapter 1, § 14.

Course Certificate

Course certificate is issued on request.

Goal matrix

Goals that, after completing the course, are fulfilled for the doctoral or licentiate degree are marked with an X.

	Doctoral			Licentiate	
	Knowledge and understanding			**Knowledge and understanding**	
1a	- demonstrate broad knowledge and systematic understanding of the research field and	x	1a	demonstrate knowledge and understanding in the field of research including	x
1b	advanced and up-to-date specialised knowledge in a limited area of this field, and	x	1b	current specialist knowledge in a limited area of this field as well as	x
1c	familiarity with research methodology in general and the methods of the specific field of research in particular.		1c	specialised knowledge of research methodology in general and the methods of the specific field of research in particular	
	Competence and skills			**Competence and skills**	
2a	- demonstrate capacity for scholarly analysis and synthesis as well as	x	2a	demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively and to	x
2b	to review and assess new and complex phenomena, issues and situations autonomously and critically		2b	plan and use appropriate methods to undertake a limited piece of research and other qualified tasks within predetermined time frames in order to contribute to the formation of knowledge	
3a	- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to	x	2c	as well as to evaluate this work	
3b	plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work		3a	demonstrate the ability in both national and international contexts to present and discuss research and research findings in speech and writing and in dialogue with the academic community and	x
4	- demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research		3b	society in general	

5a	- demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and	x	4	demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.	
5b	society in general				
6	- demonstrate the ability to identify the need for further knowledge and	x			
7	- demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.				
	Judgement and approach			**Judgement and approach**	
8a	- demonstrate intellectual autonomy and disciplinary rectitude as well as	x	5	demonstrate the ability to make assessments of ethical aspects of his or her own research	
8b	the ability to make assessments of research ethics, and		6	demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used	x
9	- demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.		7	demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.	