Faculty of Health, Science and Technology

Chemical Engineering

Course syllabus

Regenerated cellulose and cellulose derivatives

Course code:	7KET003
Course title:	Regenerated cellulose and cellulose derivatives *Regenererad cellulosa och cellulosaderivat*
Subject:	Chemical Engineering
Credits:	4.5 credits
Education cycle:	Third (doctoral level)

Syllabus approval

The syllabus was approved by the Faculty of Health, Science and Technology on 11 December 2024 and is effective from the spring semester 2025 at Karlstad University.

Language of instruction

The language of instruction is Swedish or English. If there are students who do not speak Swedish, English will be the language of instruction.

Entry requirements and selection

Admitted to the doctoral programme in chemical engineering, chemistry or equivalent. Knowledge in cellulose technology, cellulose chemistry and basic chemistry equivalent to a master's level. The course is aimed primarily at doctoral students at Karlstad University, and secondarily at doctoral students at other universities.

Learning outcomes

Upon completion of the course, the third-cycle student should be able to:

- discuss important cellulose derivative and viscose technology aspects using correct terminology
- relate the results of measured parameters to different product quality aspects
- describe the most important processes for manufacturing of regenerated cellulose and cellulose derivatives, and
- demonstrate an understanding of the pros and cons of regenerated cellulose and cellulose derivatives compared with other materials.

Course content

The aim of the course is to give the students a broad overview of the global dissolving pulp capacities and the market for cellulose derivatives and regenerated cellulose. The cellulose structure is discussed in detail and the students will get a deep insight into the characteristics of dissolving pulps. This is followed by process techniques for producing cellulose derivatives. Process technology for viscose processes and the Lyocell process is also presented, including fibre spinning technologies. The course includes lectures, a visit to a viscose manufacturer, group assignments and a written examination.

- Cellulose structures
- Dissolving pulps
- Viscose- and Lyocell processes, fibre spinning
- CMC-chemistry, process and market
- Other cellulose derivatives
- Current development and research

Reading list

The Ljungberg Textbook, Pulp and Paper Chemistry and Technology
Publication date: October 2009 ISBN: 978-3-11-021570-0, selected parts, available online for course participants. Distributed material from lectures.

Examination

To receive a passing grade, the doctoral student must pass a written take-home exam and a group assignment, as well as actively participate in a seminar.

Grades

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

Quality assurance

A written evaluation is performed after the end of the course. The result of the evaluation is collated and made available in accordance with The Higher Education Ordinance, Chap. 1, Sect. 14.

Course certificate

Course certificates are issued upon request.

Goal matrix

The course contributes to partial fulfilment of the goals marked with an X below.

	Doctor			**Licentiate**	
	Knowledge and understanding			**Knowledge and understanding**	
1a	Broad knowledge and systematic understanding of the research field	X	1a	demonstrate knowledge and understanding of the research field	X
1b	Advanced and up-to-date specialised knowledge in a limited area of this field	X	1b	Up-to-date specialised knowledge in a limited area of this field	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	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	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,	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	
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		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				
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		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, and	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.	X	7	demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.	