

SYLLABUS

Transnational course in Biomaterials and Chemistry (TCiBC) 7.5 credits T0025T

Gränsöverskridande kurs i biomaterial och kemi

Course syllabus admitted: Autumn 2018 Sp 1 - Spring 2020 Sp 4

**DECISION DATE
2018-06-15**

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Gränsöverskridande kurs i biomaterial och kemi

First cycle, T0025T

Education level	Grade scale	Subject	Subject group (SCB)
First cycle	G U 3 4 5	Materialteknik	Materials Technology

Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language +

Swedish upper secondary school courses Physics 2, Chemistry 1, Mathematics 3c (specifik entry A8).

Or:

Swedish upper secondary school courses Physics B, Chemistry A, Mathematics D (specifik entry 8)

Selection

The selection is based on final school grades or Swedish Scholastic Aptitude Test.

Examiner

Kristiina Oksman

Course Aim

After successful completion the student will be able to:

- Describe and classify different biobased polymers and natural fibres and suitable manufacturing methods for these biobased materials using current scientific literature.
- Show how current scientific literature on biobased polymers and fibres, appropriate design parameters and models are used in material selection
- Integrate embodied energy or other eco impact assessments in biomaterial selection process including being able to use the eco-design process to draw conclusion on the merits of different material in applications
- Explain organic chemistry fundamentals, basic concepts and terminology and use them for the description of organic chemistry phenomena.
- Name organic structures, explain their properties, deduce basic reaction types and explain their mechanisms.
- Explain several chemical applications in process and environmental technology. In particular, the student will be able to demonstrate novel applications in which chemistry is used.
- Understand and explain chemical reactions and bonding, display formulas
- Remember and identify material categories, classify their effects
- Transfer knowledge to/from other disciplines and select and use appropriate methods and tools in these different disciplines as well gain further digital skills
- Use new information sources, independently deepen knowledge and reflect over skills level and knowledge in order to increase this were necessary
- Coordinate work within groups of national and international, interdisciplinary students and take opportunities to establish their own international network and so doing communicate in a foreign language with greater competence and raise intercultural competence

Contents

The course will contain

- Essential ideas of atoms, molecules, ions, electronic structure and periodic properties of elements, chemical bonding and molecular geometry, gases, acid-base equilibria, electrochemistry, kinetics, representative metals, metalloids, and nonmetals and nuclear chemistry
- Basic reactions of organic compounds, modification of biomass containing natural polysaccharides, such as starch or lignocellulose, e.g. to biofuels, biochemicals, biosorbents and utilization of the functionalized materials in various applications.
- Aspects and the practise of ecodesign with embedded energy, LCA, corporate responsibility, design parameter theory and simple composite model theory. All of these contributing to the evaluation and selection biomaterials.

The course will also contain:

- An intensive study period that will be carried out where an in-depth study of one of the goals of the course will be done including workshops and hands-on applications of theory.
- A structure process that can be used to guide students through how biobased material can be selected appropriately
- Online work on a module basis as well as group work including presentation and report writing
- Relevant new research from current staff, including PhD student
- Opportunities for international networking and the possible career paths where the course is relevant will be discussed

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

Self-study e-tutorials and assessment and online study group. Teacher and student contact will be mainly through distance-learning tools. In the course is a mandatory period of 10 days (5 working days) at a campus either in Lulea, Sweden, Oulu, Finland or in Karlsruhe, Germany.

Any travel and accommodation costs associated with student not travelling abroad are paid for by each individual student.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

Written examination with individual grades. Successful completion of a biomaterial selection assignment, lab work, exercises and online test modules.

Remarks

This course has self-study modules with e-tutorials and assessment and online study group. Teacher and student contact will be mainly through distance-learning tools. In the course is a mandatory period of 10 days (5 working days) at a campus either in Lulea, Sweden, Oulu, Finland or in Karlsruhe, Germany.

There are only a limited number of places available hence a selection process will be applied for those students wishing to go. Those student going abroad will be funded by the ERAMUS program.

Student should have access to their own computer on which they can install programs. Also an internet connection (min. 0.5 Mbps), headset, microphone and web camera will be necessary.

Literature. Valid from Autumn 2017 Sp 1

Materials- Engineering, Science, Processing and Design; Michael Ashby, Hugh Shercliff and David Cebon. Elsevier, ISBN: 978-0-08-097773-7

Oksman, K., Mathew, A. P., Bismarck, A., Rojas, O., & Sain, M. (Eds.). (2014). Handbook of Green Materials: Processing Technologies, Properties and Applications (in 4 volumes) (Vol. 5). World Scientific.

Hart, H., Craine, L., Hart, D., Hadad, C. (2007). Organic Chemistry: A Short Course, 12. edition, Houghton Mifflin, Boston.

Scientific articles.

Course offered by

Department of Engineering Sciences and Mathematics

Items/credits

Number	Type	Credits	Grade
0001	Written exam	3	TG G U 3 4 5
0002	Biomaterial selection assignment	2.5	TG U G#
0003	Laboratory report	1	TG U G#
0004	Online modules	1	TG U G#

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Mats Näsström 2018-06-15

Syllabus established

by Mats Näsström 2017-02-13