HÖGSKOLAN I BORÅS

Master Programme (Two Years) in Textile Engineering

Masterutbildning i textilteknik

120 credits

Ladok Code: TAMTE
Version: 4.0
Level: Second cycle
Approved by: Research and Education Board 2023-12-22
Valid from: Autumn 2024
Valid for: Admitted autumn 2025

General Objectives

Second level education shall essentially build on the knowledge that students acquire in first level education or corresponding knowledge. Second level education shall involve a deepening of knowledge, skills and abilities relative to first level education and, in addition to what applies to first level education, shall

- further develop the students' ability to independently integrate and use knowledge,
- develop the students' ability to deal with complex phenomena, issues and situations, and
- develop the students' potential for professional activities that demand considerable independence or for research and development work.

(The Higher Educations Act, Chapter 1, Section 9)

Objectives

This two-year textile science and engineering program is intended for students with a bachelor's degree in domains that allow the student to apply textile engineering methods and develop textile science competences. The program aims to provide skillful graduates on advanced textile engineering methods or taking developments into textile innovations. For that a multi-itinerary syllabus program will be provided and the program will be open for both domestic and international admissions. In order to take full advantage of the syllabus customized for advanced textile engineering applicants shall be skilled in math, materials physics and chemistry as well as textile materials, structures and methods. During four semesters, divided into discrete courses, the admittee's will further develop their knowledge, skills and judgement in textile technology. The advanced level courses, with particular focus on textile materials technology, textile chemistry and textile product design follow an order and pedagogic means that enables both gradual and incremental inherent progression. The syllabus is designed to follow courses planned for a specialization track that will provide graduates with competences and skills in advanced textile engineering. It is often that in the courses, students work on their hand-on skills by assignments that involve experiments and characterization techniques. Also, the student's academic communication abilities are stressed as the requirements increase by every assignment.

The essence of textile technology is to maintain the textile nature, while adding functionality and smartness by various processes. These processes have to handle the requirements posed by the textiles. Hence, the course contents emphasize the process context and also their sustainability issues and opportunities. Innovation and digitalization in textiles are important aspects that graduates should master after the completion of the program. Environmental concern is a major driver for the department's research activities. In particular during the second year the connection between program students and departmental research activities is pronounced.

After completing the program, students shall meet the learning outcomes for a master's degree set out in the Swedish Higher Education Ordinance (1993:100), which in a textile engineering context reads.

1. Knowledge and understanding

For a master's degree, the student shall independently be able to:
1.1 demonstrate and apply comprehensive technical knowledge of textile materials, processes and applications, including both fundamental materials and manufacturing engineering theories and methods, and significantly deeper knowledge of the design,

construction, manufacture and adaptation of advanced and smart textile products, and
1.2 demonstrate profound technological and methodological knowledge within at least one such field of textile engineering, as well as a deepened insight into current textile technology research and development work, and
1.3 demonstrate in-depth understanding of sustainable development aspects including equality and diversity aspects of textile materials selection, design and textile processes with an articulated cradle-to-cradle perspective, and
1.4 demonstrate practical understanding of the impact of digitalization in textile functionalization, manufacturing and the supply value chain.

2. Skills and abilities

For a master's degree, the student shall independently:
2.1 demonstrate an ability to critically and systematically integrate knowledge and to analyze, assess and deal with complex textile engineering phenomena, issues and situations, even in cases where limited information is available,
2.2 critically and creatively plan and employ appropriate methods to carry out advanced tasks within given timeframes, quickly obtain new technical knowledge and apply this to textile-related challenges,
2.3 demonstrate an ability to create, analyze and critically evaluate different technical solutions, and to develop and design textile products, processes and systems, considering individual's different needs and society's goals for economically, socially and ecologically sustainable development into account,
2.4 demonstrate abilities to communicate in good English research and development results to laymen, industry and international scholars both orally, in writing and by other means,
2.5 demonstrate methodological skills required to participate in research and development work or to work independently in other advanced activities, and
2.6 Able to design or adapt textile functionalization and manufacturing processes for circular economy incorporating advanced textile methods.

3. Judgment and approach

For a master's degree, the student shall independently:
3.1 demonstrate abilities to work in a social and organizational context, which involves being able to make assessments, taking into account relevant scientific, social and ethical aspects, and demonstrate an awareness of ethical aspects of research and development work,
3.2 demonstrate insights into the opportunities, limitations and problems offered/posed to society and individuals by science and technology, and take responsibility for how they are used, and
3.3 demonstrate an ability to identify individual needs for and take responsibility of further knowledge development.

Content

The program starts out with two textile materials technology courses that run in parallel. In the Polymer Technology course the students move their knowledge and skills in polymer physics, polymer chemistry, structure-property relations, processing and applications to advanced level. Knowledge in polymer melt and solution flow properties are essential ingredients to understand man-made fiber and filament production covered in the Advanced Fiber and Yarn Technology course. students will get deep knowledge about the man-made and natural sustainable textile fiber, advanced analysis about the spinning methods and the challenging of new sustainable and recycled fiber spinning will be done associated with laboratory assignment, the effect of different parameters on the production of mechanical recycled fiber by tearing process will be analyzed.

In the Textile Chemistry course the students are provided with strong insights into surface chemistry, topics that are related to textile processing such as surface treatment, bleaching, dying and printing. Moreover, the students are faced by a number of basic yet extensive textile chemistry task assignments that address incrementally complex methods to accomplish the desired effect Textile Product Development where the students have a chance to employ their materials and construction knowledge and skills. Based on user needs they work according to standard protocol to develop product concepts that may be both wearable and technical textiles. The textile chemistry courses not only deal with minimized environmental impact of the processes per se but also explores the conditions needed to reverse dying, printing and functionalization to enable materials recycling.

To complete the autumn semester, the course Ethics in the Textile Value Chain contains a problematization of the textile value chain, including usage and waste phase, from the perspective of exploration of human, material and natural resources and the sustainable development goals including gender equality and societal norms.

The course Advanced Textile Structures embraces advanced weaving, advanced knitting, 3D weaving and 3D knitting, braiding, narrow textiles and nonwoven processes. Further on characterization and modeling of these fabrics. Included is a study visit to a factory. Course assignments include textile structure and recycling of fabrics.

During the spring semester the course in Wearable and Textile Electronics discovers the possibilities to integrate electronic functionality and logic into textile and wearable constructions. Principles behind textile resistors, conductors and capacitors are

discovered and embedded in interactive systems. Basic knowledge in embedded systems will be provided also in that course. The Project Course in Advanced Textiles provide the student with the possibility to put into practice core knowledge and competences learnt in previous curses while learning a methodology to work in teams developing technical solutions to real life challenges performing literature studies, producing technical documents supported with relevant data analytics and presenting the results to their peers.

Through the autumn semester of the second year melt spun fibers are utilized for integration into structures in the following courses Textile-based Composite Technology and Additive Manufacturing. The students are provided with knowledge for the use of textile fibers and textile structure in composites and they will learn about different composite material production with focus on the production of Bio-composites, the effect of using recycled textile material in the composite will be elaborated. In parallel runs the course Advanced Textile Chemistry -the course develops further based on Textile Chemistry, focusing on the functionality and recent development in nanotechnology in textile. The themes in the course covers water repellency, catalytic property etc. The autumn semester of the second year continues with two parallel courses exploring what functionalized and smart textiles have to offer society. Advanced Finishing and Printing with a starting point in the printing explores what functionality and smartness that may be accomplished by 3D-printing, inkjet printing and supercritical CO2 finishing. The reason to apply more sophisticated processes is the potential for achieving more sustainable and flexible textile production. In the Smart Textiles course the students explore applications of embedded sensors of different textile electronic principles.

At this stage the program students should be well prepared for their Thesis Project course that runs through the spring semester. The ideal subject is one that has come up during the course of the program, which has scientific relevance and relate to the current research performed at the department.

Below follows titles of the courses, their extension and what learning outcomes they address, thereby constitute a progression matrix.

Year one (minor adjustments between study periods and years may occur)
Study period 1:
Polymer Technology (7,5 credits) Learning outcomes 1.1, 1.3, 2.1-2.4, 3.3
Advanced Fibre and Yarn Technology (7,5 credits) Learning outcomes 1.1-1.3, 2.1, 2.3,2.4, 2.6

Study period 2:
Textile Chemistry (7.5 credits) Learning outcomes 1.1, 1.3, 2.1-2.4
Textile Product Development (6 credits) Learning outcomes 1.1 - 1.4, 2.2, 2.4-2.5, 3.1-3.2
Ethics in the Textile Value Chain (1,5 Credits) Learning outcomes 1.3, 3.1,3.2

Study period 3-4:
Advanced Textile Structures (7.5 credits) Learning outcomes 1.1 - 1.3, 2.1, 2.3, 2.4, 2.6
Textile and Wearable Electronics (7.5 credits) Learning outcomes 1.1, 1.3, 2.4, 2.5
Project Course in Advanced Textiles (15 credits) Learning outcomes 1.1, 1.2, 2.4-2.6, 3.2

Year two (minor adjustments between study periods and years may occur)
Study period 1:
Advanced Textile Chemistry (7.5 credits) Learning outcomes 1.1, 1.3, 2.1-2.4
Textile-based Composite Technology and Additive Manufacturing (7.5 credits) Learning outcomes 1.1, 1.3, 2.1, 2.2, 2.4

Study period 2:
Advanced Finishing and Printing (7.5 credits) Learning outcomes 1.1, 1.4, 2.4, 3.1, 3.2
Smart Textiles (7.5 credits) Learning outcomes 1.1- 3.3

Study periods 3-4:
Thesis Project (30 credits) Learning outcomes 1.1- 3.3

Student already examined from a 15 credit thesis course, as part of a one year master textile engineering program, will do another 15 credit thesis project instead of the prescribed 30 credit thesis course.

Admission Requirements

Bachelor of Science in Engineering or applied science with enough science competence as described below,
all of at least three years duration including no less than the following courses: 15 credits in mathematics, 7.5 credits in chemistry (with at least half in organic chemistry), 7.5 credits in materials engineering (with at least 3 in polymeric materials) and a total of at least 15 credits in yarn, weaving, knitting, textile joining and/or non-woven technology.
In addition, proficiency in English equivalent to Swedish upper secondary course English 6 is required.

Degree

Following completion of the Program, fulfilling the requirements contained in this syllabus, the student can be awarded the following degree upon application to the University:
Master of Science (120 credits) with a major in Textile Engineering.

The degree certificate is bilingual (Swedish/English). A Diploma Supplement (in English) will accompany the degree certificate. Degree certificates are issued upon application using the special form. Further information is available at the University's website.

Degree certificates are issued upon application in Ladok for students. More information is available at www.hb.se.

Student Influence and Evaluation

In order to assure the overall quality of the program, the program's individual courses and the program are assessed. Course assessment procedures follow policies set by the University of Borås regarding course assessment and are shared on the course student- staff interface software. Annual program assessment results are shared with students IRL-meetings and by the interface. software. Assessments are essential for a continuous course and program improvement, together with steady protocol improvement, are highly appreciated quality improvement tools.
Students have every possibility to influence their education by direct representation in the board for educations in technology and at the program council board meetings. Together with textile engineering professionals the students are offered a platform to discuss their education, its connection to the needs of society evolvement in general and more specifically related to the domain of textile engineering.

Miscellaneous

This syllabys is a translation from the Swedish written original.

The language of instruction is English.