



JÖNKÖPING UNIVERSITY
School of Health and Welfare

PROGRAMME SYLLABUS

Master of Product Development - Specialisation in Assistive Technology (MASTech) for Engineers, 120 credits

Programmestart: Autumn 2021



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Reg number: Department of Rehabilitation

Programmestart: Autumn 2021

Education Cycle: Second-cycle level

Title of qualification

Degree of Master (120 credits) with a major in Product Development specialisation Assistive Technology

Programme overview

Background

Assistive devices and technologies are used as a means of maintaining or improving an individual's function and independence and are often key factors in facilitating participation and overall well-being. The range of assistive devices is vast, and examples include wheelchairs, prostheses, orthoses, hearing aids, visual aids and communication devices. Given that many of these devices need to be modified or manufactured to accommodate for individual differences in body function and structure, the process of assessing, manufacturing and fitting assistive devices can be time intensive and costly. Due to a rise in global ageing and an increase in non-communicable diseases (e.g. diabetes), the World Health Organization anticipates that the number of individuals in need of assistive devices will rise beyond 2 billion by 2050.

In order to address the increasing need for assistive technologies it will be necessary to develop new sustainable technologies and to improve the manufacturing efficiency and design of current technologies. This requires a unique combination of knowledge and skills from both the medical and engineering sectors.

Post-graduation employment areas

The programme will provide knowledge and skills to work in a number of positions within the assistive technology sector, nationally and internationally. Potential areas of employment could include research and development departments of companies involved in the production of assistive technologies or production management for departments involved in the clinical provision of assistive technologies (including hospitals or private companies).

Research

In addition to the aforementioned employment areas, the program also serves as a preparation for scientific research. Graduates will be eligible for enrollment as Ph. D students at universities or institutes within the areas of product development, health and care sciences or disability research. Examples of research areas include assistive technology product development, materials and manufacturing for assistive technologies, clinical trials of new technologies,

biomechanical evaluations of technologies.

Programme Supportive Research

Scientific research from both the School of Health and Welfare and the School of Engineering will support the MASTech. From the School of Health and Welfare, research areas that will be represented with the programme include Prosthetics and Orthotics, The Aging Research Network (ARN-J) and the Children, Health, Intervention, Learning and Development (CHILD) research area. From the School of Engineering, research areas that will be represented in the programme include Product Development and Materials and Manufacturing.

Objectives

General objectives

This Master in Assistive Technology program comprises of 120 credits (ECTS) and has a major focus on innovative product development and/or manufacturing of assistive devices for individuals with disabilities. The programme is aimed at contributing knowledge related to product development, design and manufacturing and is specifically targeted towards preparing graduates for a career within the assistive technology industry.

Graduates from the MASTech will have an understanding of medical conditions which typically result in disability and the interactions between people with disabilities and their environment. They will have knowledge and skills required to evaluate the needs of individuals with disability as they participate in their daily lives and to apply this information in the design and manufacture of high quality, robust and sustainable products. Further to this, graduates will also have knowledge and skills to perform clinical trials to evaluate the function and performance of assistive technologies.

According to the Swedish Higher Education Act (SFS 1992:1434 revised 2006:173 1 Ch. 9 §), second cycle education (60-120 credits) should build on the knowledge students acquire in first cycle education (0-60 credits) or corresponding knowledge. Second cycle education should involve a deepening of knowledge, skills and abilities relative to first cycle education; in addition to what applies to first cycle education, it should:

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

Common learning outcomes

After the completion of the programme, students must meet the intended learning outcomes, as described in The Higher Education Ordinance by Degree of Master (1-9), and also the intended learning outcomes.

Knowledge and Understanding

A student will be able to:

1. Demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work.
2. Demonstrate specialised methodological knowledge in the main field of study.

Skills and Abilities

3. Demonstrate the ability to critically and systematically integrate knowledge as well as analyse, assess and deal with complex phenomena, issues and situations even with limited information.
4. Demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work.
5. Demonstrate the ability in speech and writing to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences both nationally and internationally.
6. Demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.
7. Demonstrate an ability to apply acquired knowledge in practical work.
8. Demonstrate an ability to collaborate effectively in teams, especially in the presence of a strong multicultural dimension.

Judgement and Approach

9. Demonstrate the ability to make judgements and assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work.
10. Demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.
11. Demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.
12. Demonstrate an understanding of future professional roles, including a sound awareness of ethical responsibilities towards society and the need for economic, social and ecological sustainable development.
13. Demonstrate an ability to embrace interdisciplinary approaches through the application of a system perspective.

Programme-specific learning outcomes

Upon completion of the program, the intended learning outcomes provided for the programme must also be met.

Knowledge and Understanding

A student will be able to:

1. Argue for the importance of maintaining a user perspective in the design and prescription of assistive technologies and explain how design characteristics of devices may change in different contexts and for individuals with differing impairments.
2. Compare and contrast various manufacturing processes relevant to the assistive technology industry.
3. Explain the principles of design theory with special consideration of assistive technologies.

Skills and Abilities

4. Assess individuals to determine their needs for an assistive device and apply appropriate tools to evaluate clinical outcomes associated with use of a device.
5. Identify problems in device usability and/or productivity and develop innovative solutions to improve manufacturability and sustainability related to the production of assistive technologies.
6. Determine if assistive devices and manufacturing processes comply with performance and safety standards and implement mechanisms to monitor and evaluate quality.

Judgement and Approach

7. Understand and respect the importance of professional working relationships and the professional expertise of others.
8. Demonstrate the ability to evaluate a system based on market demands, societal and social demands and ethical issues.

Contents**Programme principles**

The development of assistive technologies requires a unique combination of medical and engineering knowledge. The majority of courses will be taken together with students from the MASTech prosthetics and orthotics program. Students from both disciplines are encouraged to work and learn together throughout the programme.

The MASTech will consist of 4 semesters of study (2 years full-time). Courses within the first year of study are campus-based while some courses in the second year of study are web-based and may be completed by distance education.

A fundamental principle of the programme is for students to have the opportunity to link theory to industrial practice. It is particularly important that students apply the knowledge they have acquired during their studies and throughout the programme students will be required to complete a number of projects which require that they solve real-world problems using the theories, models and tools that are introduced in the curriculum. An Industrial placement in the third semester of study will also provide opportunities for students to work closely with industry partners solving real-world problems. To be granted a Master degree (120 credits) students must complete an independent project (thesis) corresponding to at least 30 credits. It is anticipated that students will identify a topic for their independent project in collaboration with industry partners.

Courses within the program*Semester 1:*

Fundamentals in Assistive Technology, 7.5 credits
Introduction to Medical Sciences – bridging course, 15 credits
Product Realisation, 7.5 credits

Semester 2:

Materials and Production Processes, 6 credits
Assistive Technology design, 9 credits
Co-production in Health and Welfare, 7.5 credits
Innovation Project, 7.5 credits

Semester 3:

Quality improvement in health and engineering, 7.5 credits

Management and Innovation in the health sector, 6 credits
Research methods and evidence-based practice, 7.5 credits
Industrial placement, 9 credits

Semester 4:

Master Thesis, 30 credits

Teaching and examination

The programme is conducted and examined in English. Each course is assessed separately using a range of assessment methods including oral presentations, reports, projects and written examinations. In a single course one of these methods, or a combination of them, may be used. Examinations may be carried out individually or in groups. Detailed criteria for grading of examinations is described in each course syllabus. Those who have passed an exam are not allowed to retake it. To pass a course, the student must fulfill all the course requirements. The student shall be offered three examination occasions per course and academic year.

Web-based courses in semester 3 will be distributed via the internet and the universities web-platform. Internet access with a bandwidth sufficient for watching streaming video is required (recommended minimum download speed 1 Mbps).

Prerequisites

The applicant must hold a minimum of a Bachelor degree (i.e. the equivalent of 180 ECTS credits at an accredited university) in Mechanical Engineering or equivalent. Proof of English proficiency is required.

Credit Transfer

A student who has completed part of their higher education, with passing grades, at another Swedish or foreign college/university, or obtained equivalent knowledge and skills in another way can, after undergoing an evaluation, receive credits toward his or her educational programme at the School of Health and Welfare. When the student has produced the necessary documentation, the Head of Department for the course in question will decide if credits can be granted. The student shall be notified in writing of the decision.

Continuation Requirements

In order to proceed to the second year (third semester) of the program students must have successfully completed a minimum of 30 credits during the first year. To proceed to the fourth semester of the program students must have successfully completed all courses in the first year of study (60 credits) and successfully completed a minimum of 7.5 credits from the third semester of study.

Qualification Requirements

To obtain the Degree of Master (120 credits) with a major in Product Development specialisation in Assistive Technology, the student must complete course requirements of at least 120 credits at the higher education level. These credits may not have been used for a previous degree. At least 90 credits must be in second-cycle courses with at least 60 of these second-cycle credits in product development, including a 30-credit master's thesis.

Requirements to complete the programme are (1) completion of the requirements for the Degree of Master (120 credits) with a major in Product Development specialisation Assistive Technology and (2) successful completion of all courses listed under "Contents", or their equivalent.

The degree certificate will be issued after formal application from student.

Quality Development

The program is evaluated at the end of the second semester as well as at the end of the fourth semester. The evaluation is carried out as a collaboration between students and the program coordinator. Each course is also evaluated according to the regulations and guidelines for first, second and third cycle education at Jönköping University.

Other Information

If formal qualifications are lacking, the applicant's competence is evaluated to determine if they have acquired equivalent knowledge in some other way. The aim is to assess the collective competence and if the applicant has met the prerequisites for the programme via a different pathway. Substantial competence can be reflected in knowledge and experience from working life or other relevant courses.

Courses included in the MASTech can be read as standalone courses, subject to availability. Prerequisites are stated in the syllabus. The opportunity exists to complete select courses abroad.

This syllabus is based on the "Regulations and guidelines for education at Jönköping University".

Study Intermission and Resumption of Studies

A study intermission can only be applied for and approved for an educational programme, not for a single course. Study intermission is to be applied for by the student and is to be handed in to the programme coordinator. Study intermission may be granted for a maximum of one year. An extension may be granted if exceptional circumstances apply. The decision whether or not to approve a study intermission will be made by the Head of Department. The Head of Department must give the decision in writing and, in consultation with the student, plan their resumption of studies. The student should notify the programme coordinator when he or she wishes to resume studying. The decision regarding the resumption of studies is to be made by the Head of Department. The student is to be informed in writing of the decision.

Discontinuation of Studies

The request to discontinue a program or course is to be handed in, on the relevant form, to the programme coordinator. Before a decision is made regarding discontinuation of studies, the student has the right to educational guidance. The decision regarding discontinuation of studies will be made by the Head of Department, who is also responsible for de-registration of the student from the course.

Temporary interruption of industrial placement

The School of Health and Welfare may suspend a student's participation in their industrial placement or any other practical element of an ongoing course if the student has shown gross incompetence/unsuitability in the practical application of their studies on people. A student whose industrial placement or any other practical element has been suspended due to gross incompetence/unsuitability is not permitted to resume participation in the course until the course coordinator or examiner has performed checks and ascertained that the student possesses the necessary knowledge and skills. The reasons for the suspension must be stated in the decision to suspend the student's participation. Following the decision, an individual plan must be established for the student which shall state the shortcomings in knowledge and/or skills, the support that the student can expect to receive, how the checks shall proceed, when the first check shall take place and when any further checks shall be made.