

General syllabus for third-cycle studies in Rehabilitation Engineering TETNSF00

The syllabus was approved by the Board of the Faculty of Engineering/LTH 24 September 2007 and most recently amended 8 September 2020 (reg. no U 2020/679).

1. Subject description

Rehabilitation and habilitation engineering (referred to as Rehabilitation Engineering below) is focused on people with disabilities. It is an interdisciplinary subject at the interface of such epistemologically heterogeneous fields as technology, science, humanities, social sciences and medicine.

Rehabilitation Engineering starts from the needs/wishes/dreams of individuals and measures results against the experienced enjoyment and benefit of users and their environments. The research trajectory starts and ends with the human being. Simultaneously, however, the methods and discourse of the discipline are those of technology, and it is through technological solutions and their design that it is made manifest how the problem has been interpreted and how solutions are implemented by the use of technological and educational possibilities.

Rehabilitation Engineering is more clearly focused on human needs than is usually the case for engineering subjects. The need to adapt technology to people rather than the opposite is highlighted in the case of people with disabilities. Unlike people without disabilities, they are unable to compensate for shortcomings in the technology. Research on functionality and user value is therefore highly prioritised.

Theory, methodology and ethics place high demands on logical reasoning and awareness in the subject. This is due to the fact that research in the subject is strongly related to both people and technology and is why it has to base itself in diverse disciplines in the humanities, behavioural science, medicine, science and engineering. However, the different approaches of the disciplines cannot simply be put side by side, so continuous work is carried out to establish a general theoretical and methodological base for the subject and to arrive at a visible variation of the general base in specific research projects.

The position of Rehabilitation Engineering

Our aim is to create user-worthy technology designed side by side with the intended users. Usually this has to take its time, including continuous development of theories and methods. On a day-to-day basis, however, we allow the products and solutions to speak for themselves.

A position requires established boundaries and boundaries may become barriers to participation, not least for people with disabilities. From a general perspective, problems can rarely be divided into medical, social or technical/pedagogical problems – they are just problems that need to be solved. To clarify the role of Certec in this context we will look at alternative models to Rehabilitation Engineering before presenting the latter in itself.

The social model

There are two different previously established models of disability research. One is the social model which focuses on the whole human being concerned and regards disability as above all a normative concept socially defined and maintained. Research based on the social model has not generated any

technical solutions; on the contrary, the approach is keen to distance itself from design and technology.

Certec works in the spirit of the social model, using research to design user-worthy technology that can satisfy the dreams, wishes and needs of people while enabling people to develop their image of themselves. The major difference from the social model and the major contribution of Rehabilitation Engineering (like all technological research) is that it uses action research, aiming not only to understand a phenomenon but to do something about it. The real and, not least, potential impact of artefacts on people and culture is undeniable today. For the situated individual human being in his or her total context, technological assistance must not become the opposite of human assistance. The most personalised form of assistance is in all likelihood a tailor-made and smooth combination of human and technological assistance.

The medical model

The second previously established model is the medical model, which focuses on diagnosis and treatment and generates technical solutions. Our approach is focused on the experienced rather than the diagnosed needs, so our links to the medical model are weak but present. Moreover, in cases when the solution is surgically inserted electrodes, the links between medical engineering and Rehabilitation Engineering become firm indeed.

Rehabilitation Engineering – a field of its own

The medical and social models cannot provide us with the required solutions in design, pedagogy and technology. These solutions demand specific theories and models that cannot be reached through the social and medical models. Our main contribution is a *Rehabilitation Engineering model, a model for designing user-worthy technology*.

For more information, please see:

- “Situating Research and Design for Everyday Life”, Internal report Certec no 2:2004, www.certec.lth.se/doc/situatedresearch
- “Människonära design”, Studentlitteratur 2005, www.certec.lth.se/dok/manniskonaradesign
- “Ethics in the making”, Design Philosophy Papers no 4:2005, www.desphilosophy.com

2. Objective of third-cycle studies at LTH

The Board of LTH established the following objective for third-cycle studies on 15 February 2007.

The overall objective of third-cycle studies at LTH is to contribute to social development and prosperity by meeting the needs of business and industry, academia and wider society for staff with third-cycle qualifications. LTH shall primarily provide education leading to a PhD or licentiate in the fields of LTH's professional degrees. The programmes are first and foremost intended for the further training of engineers and architects. The programmes are designed to encourage personal development and the individual's unique qualities.

Third-cycle graduates from LTH shall demonstrate:

- proficiency in research theories and methods and in a critical, scientific approach
- both breadth and depth of knowledge within the subject of his or her third-cycle studies

The programmes aim to develop:

- creativity and independence with the ability to formulate advanced research issues, solve problems and plan, carry out and evaluate projects within a set time frame
- openness to change

- personal networks, both national and international
- social skills and communication skills
- teaching ability
- innovation skills, leadership and entrepreneurship

In order to enable students to achieve these skills and abilities, LTH provides:

- high-quality supervision and good conditions for study in a creative environment
- a good balance between basic and applied research, with openness to wider society
- a range of advanced third-cycle courses at both departmental and faculty level
- a good balance between courses and thesis work
- opportunities to present research findings at national and international conferences and in internationally recognised journals, or by another equivalent method which leads to wide exposure and circulation
- opportunities to spend time in international research environments for short or extended periods

3. Learning outcomes for third-cycle studies

The learning outcomes for third-cycle studies are given in the Higher Education Ordinance.

3.1 Licentiate

Knowledge and understanding

For a Licentiate the third-cycle student shall:

- demonstrate knowledge and understanding in the field of research including current specialist knowledge in a limited area of this field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular

Competence and skills

For a Licentiate the third-cycle student shall:

- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to 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 as well as to evaluate this work
- 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 society in general
- demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.

Judgement and approach

For a Licentiate the third-cycle student shall:

- demonstrate the ability to make assessments of ethical aspects of his or her own research
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning

3.2 Doctor of Philosophy

Knowledge and understanding

For the degree of Doctor of Philosophy the third-cycle student shall:

- demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field
- demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular

Competence and skills

For the degree of Doctor of Philosophy the third-cycle student shall:

- demonstrate the capacity for scholarly analysis and synthesis as well to review and assess new and complex phenomena, issues and situations autonomously and critically
- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work
- demonstrate through a thesis the ability to make a significant contribution to the formation of knowledge through his or her own research
- 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 society in general
- demonstrate the ability to identify the need for further knowledge
- 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

For the degree of Doctor of Philosophy the third-cycle student shall:

- demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics
- 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

Midway Review

A midway review, with the aim of reviewing the doctoral student's education in relation to the learning outcomes for the degree in the Higher Education Ordinance, is to be implemented at least once during the doctoral student's programme for all doctoral students whose education is to conclude with a doctoral degree.

4. General and specific admission requirements

A person meets the general admission requirements for third-cycle courses and study programmes if he or she:

1. has been awarded a second-cycle qualification, or
2. has satisfied the requirements for courses comprising at least 240 credits of which at least 60 credits were awarded in the second cycle, or
3. has acquired substantially equivalent knowledge in some other way in Sweden or abroad.

The higher education institution may permit an exemption from the general entry requirements for an individual applicant, if there are special grounds. Ordinance (2010:1064).

A person meets the specific admission requirements if he or she has:

1. at least 50 credits in subjects of relevance to the field, including at least 25 second cycle credits, or
2. a one- or two-year Master's degree or a MSc in Engineering of relevance to the field.

Finally, the student must be judged to have the potential to complete the programme.

Exemptions from the admission requirements may be granted by the Board of LTH.

5. Selection

Selection for third-cycle studies is based on the student's potential to profit from such studies.

The assessment of potential in accordance with the first paragraph is made primarily on the basis of academic results from the first and second cycle. Special attention is paid to the following:

1. Knowledge and skills relevant to the thesis project and the subject of study. These may be demonstrated through documents appended to the application and at a possible interview.
2. An assessment of ability to work independently and to formulate and tackle research problems. The assessment could be made on the basis of the student's degree project and a discussion of this at a possible interview.
3. Written and oral communication skills
4. Other experience relevant to the third-cycle studies, e.g. professional experience

6. Degree requirements

Third-cycle studies lead to a PhD or, if the student wishes or if it has been specified in the decision on admission, to a licentiate. The student also has the right to complete a licentiate as a stage in his or her third-cycle studies, but is not obliged to do so.

The requirements for a licentiate are:

- passed courses of at least 30 credits, and
- a passed thesis of a scope corresponding to studies of at least 60 credits

The thesis and courses shall comprise at least 120 credits in total.

The requirements for a PhD are:

- passed courses of at least 60 credits, and
- a passed thesis of a scope corresponding to studies of at least 120 credits

The thesis and courses shall comprise at least 240 credits in total.

6.1 Degrees awarded

The programme can lead to the following degrees:

Teknologie licentiatexamen/Licentiate in Engineering

Teknologie doktorsexamen/Doctor of Philosophy in Engineering

or:

Filosofie licentiatexamen/Licentiate of Philosophy

Filosofie doktorsexamen/Doctor of Philosophy

7. Course component

The programme is to include courses. For each course, an examiner shall be appointed at the department that delivers the course. The examiner shall draw up a written syllabus which states the course title in Swedish and English, the learning outcomes of the course, the course content and the number of credits.

The individual study plan is to include details of which courses the individual student shall or may include in his or her studies and how many credits for each course may be included in the degree. Courses taken at other faculties or higher education institutions may also be included in the study plan.

It is compulsory to participate in and pass the course Introductory Workshop for Newly Admitted Doctoral Students at LTH (*Introduktionskurs för nyantagna doktorander vid LTH*) GEM056F or the equivalent.

It is also compulsory to attend and earn a Pass grade on the course Research Ethics, GEM090F.

8. Thesis

The programme shall include a research project documented in a licentiate or doctoral thesis.

Normally, the thesis is to consist of articles meeting the requirements for publication in academic journals.

Furthermore, the research student is to publish in publications for the disabled as part of their research studies and be able to make themselves understood by the people concerned.

The research students are to be encouraged to invite review of their work by representatives of the disciplines involved in or associated with the project.

The thesis is to include one part specifically addressing people with disabilities and their contexts. This part is to analyse the reasons for examining the area in question, and to clearly explain the project and how its findings can ameliorate or (wholly or partly) compensate for the consequences of the relevant disability.

Some research projects may be primarily focused on developing absolutely new technology of relevance to rehabilitation and new methods and paying less attention to the impact on users, whereas other projects may have the opposite priorities.

8.1 Licentiate thesis

To be awarded a degree of licentiate, the research student must have presented his or her research at one international academic conference at least.

The thesis is to be presented at a public seminar, where the thesis is also to be available for scrutiny. An informal reviewer of the thesis is to be appointed by the principal supervisor. The reviewer is to be highly knowledgeable about the thesis topic, to review the thesis in detail and present his or her assessment of the thesis at the seminar. The defence of the thesis may be carried out in Swedish, Danish, Norwegian or English.

8.2 PhD thesis

To be awarded a degree of Doctor, the research student must have presented his or her research at two international academic conferences at least.

If the student has already obtained a degree of licentiate, the licentiate thesis is normally to be a part of the PhD thesis.

The thesis is to be defended at a public event, where the thesis is also to be available for scrutiny. Prior to the defence, the relevant research studies board is to appoint an examining committee, an external

reviewer and a chair of the defence. The chair decides on the formal arrangement of the defence. The defence of the thesis may be carried out in Swedish, Danish, Norwegian or English.

9. Transitional provision

For doctoral students with an admission date of 1 January 2019 or later, it is compulsory to participate in and pass the course Introductory Workshop for Newly Admitted Doctoral Students at LTH (*Introduktionskurs för nyantagna doktorander vid LTH*) GEM056F or the equivalent in order to fulfil the requirements for the degree.

For doctoral students admitted on or after 1 January 2021, it is compulsory to attend and earn a Pass grade on the course Research Ethics, GEM090F.

The midway review is compulsory for doctoral students admitted on or after 1 January 2019.