REGULATION	Valid from 2017-04-05	Reference number V-2023-0325 3.2.3
Decision-maker President	Revised as of 2023-09-19	Entity responsible for supervision and questions School of Engineering Sciences

General syllabus for education at third-cycle level in Solid Mechanics

This regulatory document has been decided by the President (V-2023-0325 3.2.3) pursuant to chapter 6 sections 26-27 of the Higher Education Ordinance. The regulatory document is valid with effect from 5 April 2017 and was last modified on 19 September 2023 (V-2023-0325). The regulatory document regulates the main content of the education, requirements for special qualifications and the other regulations that are needed. The School of Engineering Sciences is responsible for review and questions about the governing document.

1 Content of the education

1.1 The name of the subject in Swedish and in English translation

The subject is called *Hållfasthetslära*. Its English-language name is Solid Mechanics.

1.2 Subject description

Solid Mechanics is an engineering science whose questions are often of a basic research nature. The applied part of the research is characterised by great breadth and often takes place at the interface with other engineering sciences. Research in Solid Mechanics today includes all situations where a deformable solid is involved. This deformation is not necessarily due to mechanical stress alone, but may have other causes. The research often aims to formulate criteria for dimensioning or conditions for the validity of a theory and to point out the need for more advanced theorising. The research methods consist of experimental investigations, theoretical modelling and numerical analysis. The development of analytical, experimental or numerical methods is also part of the subject.

Solid Mechanics is a third-cycle subject area where new areas are developed in line with societal needs and new discoveries both within and outside the subject. At the Unit for Solid Mechanics, the research programme is broad, but most research projects usually belong to one of the domains of biomechanics, fracture mechanics, contact mechanics, material mechanics, paper mechanics or fatigue.

1.3 Specialisations

The subject has no specialisations.

1.4 Organisation of the education

Third-cycle studies in the subject of Solid Mechanics consist of a course component and a thesis project carried out in the research area of Solid Mechanics. A doctoral student is usually employed at KTH but may also be employed at another university, research institute, government agency or industrial company. The doctoral student has at least two supervisors. One is the main supervisor, with whom the doctoral student determines the individual study plan and the organisation of the research work. An individual study plan must be established in connection with admission to the third-cycle programme. The individual study plan must be approved by the director of third-cycle studies at the School of Engineering Sciences. The

doctoral student's progress shall be assessed at least once a year in the context of the revision of the individual study plan.

The thesis shall result in the presentation of an independently conducted scientific project in the subject area. The course component of the third-cycle programme in Solid Mechanics consists of participation and summative assessment in three compulsory courses and several elective courses. The courses shall be chosen in consultation with the principal supervisor to provide a good basis for the doctoral student's own thesis work and for his/her general knowledge of the field. It is also presupposed that, in addition to the compulsory elements included in the course syllabus, the doctoral student actively participates in seminars and similar activities at KTH and keeps abreast of scientific and technological developments in general, e.g., by participating in national and international conferences in the field.

1.4.1 Activities for fulfilment of outcomes for the education according to the Higher Education Ordinance (HF)

Below are described activities for the doctoral student's fulfilment of the learning outcomes for third-cycle education according to the Higher Education Ordinance (HF) and KTH's goals. The individual study plan specifies the activities for each individual doctoral student.

Below are *general suggestions* on how the goals can be achieved. Also note that more *suggestions* can be found in the appendix (taken from the KTH template) which can be found at the end of this document. Students are encouraged to use these in the annual updating of the eISP document.

Learning outcomes: Knowledge and understanding

For the Degree of Doctor the doctoral student shall:

- Demonstrate broad knowledge and a systematic understanding of the research field as well as advanced and up-to-date specialist knowledge in a limited area of this field.

This outcome can be achieved by the doctoral student continuously training and developing their ability to plan and carry out their own research; acquiring both broad and specialised knowledge from scientific literature relevant to the research domain; actively presenting their own research results in the form of scholarly publications, and at national and international conferences, seminars or workshops; being assessed in courses and participating in workshops and scientific seminars relevant to the subject and the research domain; and writing and defending a doctoral thesis.

- Demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.

This outcome can be achieved by the research student continuously training and developing the ability to identify and justify relevant issues and the choice of appropriate methods; being assessed in courses and participating in workshops and scientific seminars with a methodological focus relevant to the subject and research area; acquiring knowledge and thoroughly and critically reviewing scientific work in their own research area.

For a Degree of Licentiate, the doctoral 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 in particular.

This outcome can be achieved by the doctoral student continuously training and developing the ability to plan and carry out their own research; acquiring knowledge from scientific literature relevant to the research domain; actively presenting their own research results in the form of scholarly publications, and at national and international conferences, seminars or workshops; participating in courses relevant to the research domain; and writing and defending a licentiate thesis.

Learning outcome: Competence and skills

For the Degree of Doctor the doctoral student shall:

- Demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues and situations autonomously and critically.

Having identified previously unobserved phenomena and proposed new research questions, contributed a scientific explanation and drawn relevant conclusions in the scientific articles and conference contributions authored by the doctoral student alone or with others.

- 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.

Critical review of previous work in the area, which is summarised in the scientific articles authored/co-authored by the doctoral student and in the doctoral thesis; and, based on this knowledge, solving the research questions posed through choice of appropriate solution methodology.

- Demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research.

This outcome can be achieved by the doctoral student: independently planning and carrying out experimental or theoretical studies on a sound and proven scientific basis and with scientific research methodology relevant to the research subject; analysing and critically reviewing his/her own results and compiling these in written form for publication in peer-reviewed international scientific journals or in manuscript or monograph form of sufficient quality that they can be considered published in peer-reviewed international scientific journals; summarising their own research results in a doctoral thesis where these are related to existing knowledge in the research domain; and defending and discussing the results in a meritorious manner at a public defence of their doctoral thesis.

- 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.

Presenting at scientific conferences and/or in an industrial context. Presenting a thesis to be discussed at the public defence.

- Demonstrate the ability to identify the need for further knowledge.

In the scientific articles and thesis, identifying the need for new knowledge and proposing new research.

- 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.

Teaching first- and second-cycle education or giving company presentations. Assisting in the supervision of theses or through knowledge transfer to potential industrial partners.

For a Degree of Licentiate, the doctoral 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.

Critical review of previous work in the area, which is summarised in the scientific articles authored/co-authored by the doctoral student and in the licentiate thesis; and, based on this knowledge, solving the research questions posed through choice of appropriate solution methodology.

- Demonstrate ability in both national and international contexts to present, discuss research, and research findings in speech and writing and in dialogue with the academic community and society in general.

Presenting at scientific conferences and/or in an industrial context, and presenting a licentiate thesis that is discussed at a licentiate seminar.

- Demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.

This outcome can be achieved by the doctoral student continuously training and developing their ability to communicate their own research results in writing in the form of scientific publications and a licentiate thesis; pedagogically present to and discuss with other researchers within or outside academia; and discuss and critically review their own and others' research results, e.g., within the framework of courses where this is included as a course objective.

Learning outcomes: Judgement and approach

For the Degree of Doctor the doctoral student shall:

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

For goal attainment, assessment in the obligatory breadth-course is included (see section 1.4.3 which includes an ethics component). In addition, other courses with specific intended learning

outcomes in ethics can contribute to further progression towards achievement of the outcome. Progression towards this outcome is also achieved by the doctoral student continuously training and developing their ability to independently formulate and critically review their own and others' research; carry out research tasks in an honest and ethical manner; make ethical assessments by reflecting on and dealing with any ethical dilemmas that may arise in their own research domain and in research in general; demonstrate intellectual integrity by critically justifying and defending their own positions based on experience and science.

- 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.

This outcome can be achieved by the doctoral student continuously training and developing their ability to deeply reflect on both expected and unexpected results and to handle the results adequately; to reflect on the opportunities and limitations of their own research project; reflect on the opportunities and limitations of their own research in a broader social science perspective.

For a Degree of Licentiate, the doctoral student shall:

- Demonstrate the ability to make assessments of ethical aspects of his or her own research.

Where relevant, ethical aspects are assessed and discussed with the supervisor in the selection and design of the research problem, and the impact of the research results on society at large is discussed with the supervisor. Completing and being assessed in the compulsory breadth-course (course component), including research ethics, which is discussed in section 1.4.2.

- Demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.

This outcome can be achieved by the doctoral student continuously training and developing their ability to reflect on both expected and unexpected results and to handle the results adequately; to reflect on the opportunities and limitations of their own research project, as well as on the opportunities and limitations of their own research in a broader social science perspective.

- Demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

This outcome can be achieved by the doctoral student continuously training and developing their ability to stay informed and updated about national and international developments in their research domains and neighbouring domains; reflect critically on how their own theoretical and methodological approaches relate to the overall knowledge base and frontier research and whether their own knowledge and methodology are adequate or require development; identify and formulate questions requiring investigation in order to further develop their own research project from a basic-or applied-research perspective, and which methods are suitable for that purpose; and develop the ability to adapt their own perceptions based on the acquisition of new knowledge.

KTH's outcome in sustainable development

For both the Degree of Licentiate and the Degree of Doctor, the doctoral student shall:

- Demonstrate with knowledge and skills the ability to be able to contribute to sustainable societal development towards an equal, inclusive and climate-neutral society.

Discussing the importance of the research topic (in relevant cases) for sustainable development in scientific publications and in the thesis. Discussing the importance of the research topic for sustainable development in *(i)* a general academic context and *(ii)* in first- and second-cycle education.

1.4.2 Compulsory courses

- Course FSE3111 Continuum Mechanics (12 credits), or an equivalent third-cycle course, is compulsory for both licentiate and doctoral degrees.
- Third-cycle course or course component totalling at least 4.5 credits in Research Ethics, Sustainable Development and Gender Equality, Diversity and Equal Conditions. Compulsory for both licentiate and doctoral degrees.
- Course FSE3161 Testing Techniques in Solid Mechanics (6 credits), or an equivalent third-cycle course, is compulsory for the doctoral degree.

1.4.3 Recommended courses

Regarding recommended areas for third-cycle courses, please see the Solid Mechanics website for current course offerings in the third-cycle programme. Examples of areas for third-cycle courses are: fracture theory, constitutive modelling, finite element method, paper mechanics and mechanics of materials.

For recommended areas for second-cycle courses, please refer to the Unit's website for current course offerings at first- and second-cycle level. A maximum of 15 credits may be taken at these levels. Courses at third-cycle level are primarily to be chosen.

A doctoral student who is to teach in first- or second-cycle education must undergo relevant higher education pedagogical training before teaching. The higher education pedagogical training shall be documented in the individual study plan. A doctoral student who is not going to teach can also undergo higher education pedagogical training.

1.4.4 Conditional elective courses

In addition to the courses offered by the Unit, there are a large number of third- and second-cycle courses at other departments (or universities) which can also be included in the individual study plan, such as courses in aerospace engineering, physics, machine design, mathematics, materials science, mechanics, and numerical analysis and computer science. Again, it must be emphasised that third-cycle courses are primarily to be chosen.

1.4.5 Requirements for the degree

Degree of Doctor

A Degree of Doctor comprises 240 credits. At least 120 credits must consist of the doctoral thesis

Thesis

Quality requirements and possible other requirements for the thesis.

The term 'thesis' here refers to a doctoral thesis. These are normally written in English with a summary in Swedish. Theses in the subject of Solid Mechanics are normally compilation theses but can also be produced as monographs. The scope of the thesis is discussed in consultation with the supervisor and usually includes three to five scientific articles published or intended for publication in international scientific journals and a summary introduction. The doctoral student must be the main author of a majority of the articles. The doctoral student must make a distinct contribution to co-authored texts included in the thesis.

Both compilation theses and monographs must be of such quality that the content of the thesis can be published in high-quality international scientific journals and, regardless of whether the thesis is intended to be a compilation thesis or a monograph, international publication of the results achieved shall be sought during the doctoral period. In both cases, an advance reviewer is appointed to assess whether the thesis fulfils the requirements for public defence. In cases where a doctoral thesis is based solely on work that has not yet been published or accepted for publication in peer-reviewed international scientific journals, the director of third-cycle education should request prior opinions from the examining committee regarding the scientific depth of the work. This extra review of the thesis is in addition to the review by the supervisor and the mandatory advance reviewer. A monograph is a relatively comprehensive coherent scientific publication. A monograph may also include previous publications as appendices. Monographs must be of such scientific quality that all or most of their content can be considered suitable for publication in peer-reviewed scientific journals of high international quality. A monograph is written by the doctoral student and must cover a scientific work of four years less the time corresponding to the course component. This assessment is made relative to similar work in the research domain.

Courses

The doctoral student shall have completed courses of at least 60 credits, of which 45 credits must be at third-cycle level and no more than 10 credits can be at first-cycle level.

Degree of Licentiate

A Degree of Licentiate comprises at least 120 credits. At least 60 credits must consist of the academic paper.

Thesis

Quality requirements and possible other requirements for the licentiate thesis.

The term ‘thesis’ here refers to a licentiate thesis. These are normally written in English with a summary in Swedish. Theses in the subject of Solid Mechanics are normally compilation theses but can also be produced as monographs. The scope of the thesis is discussed in consultation with the supervisor and usually includes two to three scientific articles published or intended for publication in international scientific journals and a summary introduction. The doctoral student must be the main author of a majority of the articles. The doctoral student must make a distinct contribution to co-authored texts included in the thesis.

Both compilation theses and monographs must be of such quality that the content of the thesis can be published in high-quality international scientific journals and, regardless of whether the thesis is intended to be a compilation thesis or a monograph, international publication of the results achieved shall be sought during the doctoral period. In both cases, an advance reviewer is appointed to assess whether the thesis fulfils the requirements for public defence. In cases where a licentiate thesis is based solely on work that has not yet been published or accepted for publication in peer-reviewed international scientific journals, the director of third-cycle

education should request prior opinions from the examining committee regarding the scientific depth of the work. This extra review of the thesis is in addition to the review by the supervisor and the mandatory advance reviewer. A monograph is a relatively comprehensive coherent scientific publication. A monograph may also include previous publications as appendices. Monographs must be of such scientific quality that all or most of their content can be considered suitable for publication in peer-reviewed scientific journals of high international quality. A monograph is written by the doctoral student and must cover a scientific work of four years less the time corresponding to the course component. This assessment is made relative to similar work in the research domain.

Courses

The doctoral student shall have completed courses of at least 30 credits, of which 15 credits must be at third-cycle level and no more than 10 credits can be at first-cycle level

1.4.6 Other elements in the education to promote and ensure goal fulfilment

Monitoring of the individual study plan: It is mandatory for supervisors and doctoral students to jointly monitor the individual study plan regularly and at least once a year. The individual study plan shall be designed to ensure that the qualitative targets of the Higher Education Ordinance and KTH's outcomes can be fulfilled within the specified time. Progression towards achievement of the outcomes and targets shall be evaluated by supervisors and doctoral students at the mandatory monitoring of the individual study plan.

Mid-term seminar: Third-cycle students pursuing a doctoral degree are recommended to present their results at a mid-term seminar after approximately half of the study period has elapsed. However, in the doctoral programme in Solid Mechanics, doctoral students are often recommended to obtain a licentiate degree as a step towards the doctoral degree.

Scientific exchange and communication: Active participation in scientific exchange by presenting one’s own research results at international conferences, major national conferences, workshops, summer schools or gatherings organised by companies.

Interviews with the programme director and doctoral students: Once a year, doctoral students are offered a longer interview with the programme director. During this dialogue, all possible aspects of the doctoral student's studies are discussed. The interviews are not mandatory, but practically all active doctoral students participate.

1.4.8 Admission to education at third-cycle level (qualification etc.)

Admission to education at third-cycle level is regulated in Chapter 7, Section 40 of the Higher Education Ordinance and in the admission regulations at KTH. KTH’s regulations on specific prerequisites and such abilities in other respects as are needed to assimilate the education in the relevant subject at the doctoral level are set out below.

1.5 Specific prerequisites

In order to be admitted to third-cycle education in Solid Mechanics, the applicant must have knowledge of English equivalent to English 6.

1.6 Assessment criteria for testing the ability to assimilate the education

The following assessment criteria apply for testing the ability to assimilate the education:

Selection for third-cycle education is based on assessed ability to assimilate such education. The ability assessment is primarily based on having passed courses and programmes that satisfy the entry requirements. Particular consideration is given to the following:

1. Knowledge and skills relevant for thesis work and the subject.
   These can be shown through attached documents and a possible interview
2. Assessed ability to work independently
   a. ability to formulate and tackle scientific problems
   b. ability to communicate well in speech and writing
   c. maturity, judgement and ability to analyse critically and independently

   The assessment may be based, for example, on degree projects and discussion of these at a possible interview.
3. Other experience relevant for third-cycle education, e.g. professional experience.
   These can be demonstrated through attached documents and, potentially, an interview.

2 The other regulations needed

2.1 Transitional regulations

Third-cycle students admitted under a previous programme syllabus have the right to switch to the most recently adopted and valid general syllabus. Requests to change syllabi are made in writing to the school's director of third cycle education. However, changing syllabi requires that the new syllabus can be achieved in time.

KTH Appendix: Goals for qualification and assessment criteria

Goals according to Appendix 2 of the Degree Ordinance to the Higher Education Ordinance, including requirements specified by KTH with examples of assessment criteria that can determine whether the doctoral student has achieved the goals. *The assessment criteria in the table are examples and developed as a support and inspiration for activity descriptions in part 1.4.*

Degree of Doctor

Knowledge and understanding	
Intended learning outcomes	**Assessment criteria with reference to numbering in eISP**
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.	The outecome has been achieved through the doctoral student having **A1.1:** authored original scientific works where their own contributions are significant and identifiable. The works are of such quality that they have been published, or are expected to be published, in international scientific journals or conferences that apply peer review. **A1.2:** demonstrated both broad and specialised knowledge in the research area by writing a thesis in which the research results were placed and discussed in a broader perspective, and presented a reference list of others' research results that spans the relevant breadth of the research area. **A1.3:** demonstrated, at a seminar, a course or in the thesis or its public defence, a good ability to account for how their own research results relate to the research front within the research area, and justify how their own results advance this. **A1.4:** actively participated in seminar activities where their own results were presented and discussed, as well as asked questions and provided feedback on other students' and researchers' presentations.
Demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.	The outcome has been achieved through the doctoral student having **A2.1:** been examined with an approved result regarding intended learning outcomes in scientific methodology, which may be a course or equivalent learning element at third-cycle level. **A2.2:** described basic theories in scientific theory and correctly applied one or more of these in their own research. **A2.3:** practically applied to the research area appropriate methods and developed the ability to independently perform, interpret and critically examine the results in order to clarify whether the method and its execution were appropriate to obtain credible results that answer the scientific question. **A2.4:** justified their choice of method and execution in relation to the issue and to alternative methods. **A2.5:** described the advantages and disadvantages of different scientific methods used in their own research area, as well as the methods used in the broader definition of the research area

Competence and skills	
Intended learning outcomes	**Assessment criteria with reference to numbering in eISP**
Demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues and situations autonomously and critically.	The outcome has been achieved through the doctoral student having **B1.1:** demonstrated the ability to independently formulate and critically analyse both existing and new complex phenomena. **B1.2:** presented concrete examples of scientific questions and problems of a complex nature from their own research and described how these were tested and how the results were analysed. **B1.3:** described the interpretation of the results and how these were combined with existing knowledge to give rise to a new explanatory model. **B1.4:** in cases where it is applicable, presented concrete examples of results that have given rise to falsification of a hypothesis and revision of the hypothesis.
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.	The goal has been achieved through the doctoral student having **B2.1:** presented examples of independently performed experiments / simulations / tasks that were preceded by detailed time planning. **B2.2:** in cases where it is applicable, presented examples of their own hypotheses that have been tested within the framework of their own research project and described the choice of method and outcome. In cases where the result did not turn out as expected, the research student shall have reported on possible sources of error and what measures were taken to move forward in the project. **B2.3:** presented examples of and described and argued for the choice of methods for individual research tasks. **B2.4:** described how it was ensured that the education could be completed on time and whether there were obstacles to staying within the time frame, as well as what measures were taken and their outcome.
Demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research.	The goal has been achieved through the doctoral student having **B3.1:** authored original scientific works where their own contributions are significant and identifiable. The works are of such quality that they have been published, or are expected to be published, in international scientific journals or conferences that apply peer review. **B3.2:** authored a thesis, based on the scientific work, of good scientific and linguistic quality that was authoritatively defended and discussed in a public defence of the doctoral thesis and been examined with a pass grade by an independent examining committee.
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.	The goal has been achieved through the doctoral student having **B4.1:** in cases where it is applicable, participated in national and international conferences and presented their own research results in poster form or verbally, as well as participated in scientific discussions with other researchers in the research field. **B4.2:** described how experience from conference or seminar presentations contributed to developing their own ability to

	communicate and defend scientific results, as well as how the presentations were received by other participants and whether valuable information could be obtained that helped their own studies progress. **B4.3:** been examined with a pass grade for intended learning outcomes in communication or presentation technology in a suitable compulsory or optional course at third-cycle level. **B4.4:** described basic concepts, tools and methods in presentation or communication technology, as well as demonstrated the ability to put the knowledge into practice by formulating different types of scientific presentation material of good quality. **B4.5:** presented their research results in a pedagogical way for other students and researchers at academic seminars, for a general audience or for another category of recipients, where the formulation of presentation material and speech was based on pedagogical knowledge adapted to the audience's knowledge level and also answered questions at an adequate level for the audience. **B4.6:** participated in outreach activities related to their own research in order to contribute to the dissemination of knowledge and exchange of knowledge with relevant stakeholder groups such as other universities, companies, authorities, schools etc.
Demonstrate the ability to identify the need for further knowledge.	The outcome has been achieved through the doctoral student having **B5.1:** by means of concrete examples, described how the lack of essential knowledge needed to carry out a task was rectified and how this affected the possibility of carrying out the task. This may involve widely differing tasks and knowledge, with the proviso that the third-cycle students themselves must have realised that knowledge was lacking and handled this with measures relevant to the purpose. **B5.2:** demonstrated insight that the knowledge front in higher education and research is in constant change and development and that definitive answers cannot always be obtained, as well as the ability to determine whether certain knowledge already exists, for example by means of thorough and critical examination of existing scientific literature. **B5.3:** demonstrated the ability to question, evaluate and adapt their perception of their own level of knowledge and ability in relation to the prevailing knowledge front.
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.	The outcome has been achieved through the doctoral student having **B6.1:** presented their research results in a pedagogical way for other students and researchers at academic seminars, for a general audience or for another category of recipients, where the formulation of presentation material and speech was based on pedagogical knowledge adapted to the audience's knowledge level and also answered questions at an adequate level for the audience. **B6.2:** participated in outreach activities related to their own research in order to contribute to the dissemination of knowledge and exchange of knowledge with relevant stakeholder groups such as other universities, companies, authorities, schools etc. **B6.3:** actively supervised other students in theoretical and / or practical projects. Third-cycle students should, with examples,

	account for and reflect on various aspects of their own input, for example how the supervision was structured, whether pedagogical methodology was applied, how it was ensured that the person who was supervised understood the instructions etc. Third-cycle students should also reflect on different roles of teachers and students and how personal dynamics and supervision techniques can affect the outcome of learning and interaction. **B6.4:** been examined with a pass grade for intended learning outcomes in teaching and learning in higher education in a suitable compulsory or optional course at third-cycle level. The third-cycle student is thus assumed to be able to describe basic concepts, materials and methods, as well as conditions for teaching and learning in higher education, as well as to analyse, evaluate and develop teaching and learning. Third-cycle student is thus also assumed to be able to show the ability to evaluate and analyse different methods and approaches in higher education and to show the ability to take a student perspective into account. **B6.5:** demonstrated the ability to collaborate and communicate in writing and speech, undertaken tasks and assignments that were planned and completed on time and demonstrated the ability to comply with applicable rules and directives and thereby acquired general knowledge and skills required in different societal functions.
Judgement and approach	
Intended learning outcomes	**Assessment criteria with reference to numbering in eISP**
Demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics.	The outcome has been achieved through the doctoral student having **C1.1:** demonstrated intellectual integrity in the sense that their own choices and positions have been justified and defended on the basis of independent critical thinking in relation to proven experience and scientific basis. **C1.2:** described how they ensured that their own scientific procedure in theory and practice was carried out in an honest and ethical manner. **C1.3:** reflected on possible existing or hypothetical ethical dilemmas related to their own research area or to scientific research in general, and reported on their own ethically independent stance in the existing or hypothetical situation. **C1.4:** been examined with a pass grade for intended learning outcomes in ethics in a suitable compulsory or optional course at third-cycle level. The research student is thus assumed to be able to describe basic theories in research ethics and relate these to their own approach and research work.
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	The outcome has been achieved through the doctoral student having **C2.1:** presented concrete examples of how their own research results, and the research area in general, can contribute new knowledge to the research front in the area and justify its societal relevance. **C2.2:** critically reflected on limitations of their own research results, and the research area in general, in order to contribute to solving

	societally relevant problems, as well as identify possible situations where their own research results can be used in both a positive and negative way. **C2.3:** demonstrated good ability to reflect on how their own research results can contribute to sustainable societal development and can, where relevant, also link these to the prioritised global sustainable development goals. **C2.4:** described how their own actions and approach take into account the concept of sustainability. **C2.5:** been examined with a pass grade for intended learning outcomes in sustainable development in a suitable compulsory or optional course at third-cycle level. The research student is thus assumed to be able to describe basic theories in sustainability and relate these to their own approach and research work.

Degree of Licentiate

Knowledge and understanding	
Intended learning outcomes	**Assessment criteria with reference to numbering in eISP**
Demonstrate knowledge and understanding in the field of research including current specialist knowledge in his or her artistic field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular.. *Main differences in relation to the doctoral degree: For the licentiate degree, it is enough to be able to show "knowledge and understanding", as opposed to "broad and systematic understanding". Also, "deep up-to-date specialist knowledge" is replaced by "up-to-date specialist knowledge".*	The outcome has been achieved through the doctoral student having **A1.1:** authored original scientific works where their own contributions are significant and identifiable. The works are of such quality that they have been published, or are expected to be published, in international scientific journals or conferences that apply peer review. **A1.2:** demonstrated both broad and specialised knowledge in the research area by writing a licentiate thesis in which the research results were placed and discussed in a broader perspective, and presented a reference list of others' research results that spans the relevant breadth of the research area. **A1.3:** demonstrated, at a seminar, a course or in the licentiate thesis and its public defence, a good ability to account for how their own research results relate to the research front within the research area, and justify how their own results advance this. **A1.4:** actively participated in seminar activities where their own results were presented and discussed, as well as asked questions and provided feedback on other students' and researchers' presentations.
Competence and skills	
Intended learning outcomes	**Assessment criteria with reference to numbering in eISP**
Demonstrate the ability to identify and formulate issues with scholarly precision	The goal has been achieved through the doctoral student having

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 *Main differences in relation to the doctoral degree: For the licentiate degree, it is emphasized that this is "limited research work" that will contribute to the development of knowledge, in contrast to the doctoral degree where one must be able to show the ability to "conduct research".*	**B1.1:** demonstrated the ability to independently formulate and critically analyse both existing and new complex phenomena. **B1.2:** presented examples of their own questions that were tested within the framework of their own research project, as well as described the choice of method and outcome. In cases where the result did not turn out as expected, the research student shall have reported on possible sources of error and what measures were taken to move forward in the project. **B1.3:** presented examples of independently performed experiments / simulations / tasks that were preceded by detailed time planning. **B1.4:** presented examples of and described and argued for the choice of methods for individual experiments. **B1.5:** described how it was ensured that the education could be completed on time and whether there were obstacles to staying within the time frame, as well as what measures were taken and their outcome.
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. *Main differences in relation to the doctoral degree: The licentiate degree requires the student to communicate their research "clearly", as opposed to communicating "with authority".*	The goal has been achieved through the doctoral student having **B2.1:** in cases where it is applicable, participated in national and international conferences and presented their own research results in poster form or verbally, as well as participated in scientific discussions with other researchers in the research field. **B2.2:** described how experience from conference or seminar presentations contributed to developing their own ability to communicate and defend scientific results, as well as how the presentations were received by other participants and whether valuable information could be obtained that helped their own studies progress. **B2.3:** been examined with a pass grade for intended learning outcomes in communication or presentation technology in a suitable compulsory or optional course at third-cycle level. **B2.4:** described basic concepts, tools and methods in presentation or communication technology, as well as demonstrated the ability to put the knowledge into practice by formulating different types of scientific presentation material of good quality. **B2.5:** presented their research results in a pedagogical way for other students and researchers at academic seminars, for a general audience or for another category of recipients, where the formulation of presentation material and speech was based on pedagogical knowledge adapted to the audience's knowledge level and also answered questions at an adequate level for the audience. **B2.6:** participated in outreach activities related to their own research in order to contribute to the dissemination of knowledge and exchange of knowledge with relevant stakeholder groups such as other universities, companies, authorities, schools etc.
Demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.. *Main differences in relation to the doctoral degree: The doctoral student's future contribution to society through research and*	The goal has been achieved through the doctoral student having **B3.1:** authored original scientific works where their own contributions are significant and identifiable. The works are of such quality that they have been published, or are expected to be published, in international scientific journals or conferences that apply peer review. **B3.2**: authored a licentiate thesis based on their own studies of good

education is toned down and the focus is on the doctoral student being able to work on activities that require skills in research work but not a doctoral degree.	scientific and linguistic quality that have been defended and discussed at a licentiate seminar and examined and given a pass grade by an independent examiner.
Judgement and approach	
Intended learning outcomes	**Assessment criteria with reference to numbering in eISP**
Demonstrate the ability to make assessments of ethical aspects of his or her own research. *Main differences in relation to the doctoral degree: The ability to make ethical research assessments is limited to their own research and not in general.*	The goal has been achieved through the doctoral student having **C1.1:** demonstrated intellectual integrity in the sense that their own choices and positions have been justified and defended on the basis of independent critical thinking in relation to proven experience and scientific basis. **C1.2:** described how they ensured that their own scientific procedure in theory and practice was carried out in an honest and ethical manner. **C1.3:** reflected on possible existing or hypothetical ethical dilemmas related to their own research area or to scientific research in general, and reported on their own ethically independent stance in the existing or hypothetical situation. **C1.4:** been examined with a pass grade for intended learning outcomes in ethics in a suitable compulsory or optional course at third-cycle level. The research student is thus assumed to be able to describe basic theories in research ethics and relate these to their own approach and research work.
Demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used. *Main differences in relation to the doctoral degree: For the licentiate degree, only "insight" is required, as opposed to "in-depth insight" for the doctoral degree.*	The goal has been achieved through the doctoral student having **C2.1:** presented concrete examples of how their own research results, and the research area in general, can contribute new knowledge to the research front in the area and justify its societal relevance. **C2.2:** critically reflected on limitations of their own research results, and the research area in general, in order to contribute to solving societally relevant problems, as well as identify possible situations where their own research results can be used in both a positive and negative way. **C2.3:** demonstrated good ability to reflect on how their own research results can contribute to sustainable societal development and can, where relevant, also link these to the prioritised global sustainable development goals. **C2.4:** described how their own actions and approach take into account the concept of sustainability.
Demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning. *Main differences in relation to the doctoral degree: The same requirement to be able to identify the need for additional knowledge with the addition of being able to take responsibility for their own knowledge*	**C3.1:** by means of concrete examples, described how the lack of essential knowledge needed to carry out a task was rectified and how this affected the possibility of carrying out the task. This may involve widely differing tasks and knowledge, with the proviso that the third-cycle students themselves must have realised that knowledge was lacking and handled this with measures relevant to the purpose. **C3.2:** demonstrated insight that the knowledge front in higher education and research is in constant change and development and

development, which may be considered to be implied for a doctoral degree.	that definitive answers cannot always be obtained, as well as the ability to determine whether certain knowledge already exists, for example by means of thorough and critical examination of existing scientific literature. **C3.3:** demonstrated the ability to question, evaluate and adapt their perception of their own level of knowledge and ability in relation to the prevailing knowledge front.