REGULATION

Valid from
2017-04-05

Reference number
V-2022-0369 3.2.3

Decision-maker
President

Revised as of
2023-05-09

Entity responsible for supervision and questions
The School of Engineering Sciences

General syllabus for education at third-cycle programmes in the subject **Engineering Mechanics**

This regulatory document has been decided by the President (V-2022-0369) pursuant to chapter 6 sections 26-27 of the Higher Education Ordinance. The regulatory document is valid with effect from 05042017 and was last modified on 09052023 (V-2022-0369). The regulatory document regulates the main content of the education, requirements for special qualifications and the other regulations that are needed. The School of X 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

Teknisk mekanik/Engineering Mechanics

1.2 Subject description

Mechanics is one of the four classical fields of physics, with optics, electromagnetism and thermodynamics being the others, and is therefore an essential part of science and engineering education. Engineering mechanics traditionally covers the scientific basis of an industrial design process (design, construction, material selection and manufacturing) based on an advanced mechanical analysis of product properties and functionality. Lifetime, strength, function, noise, flow, environmental effects, operation and maintenance at different system levels, from individual components to complex technical systems, are examples of product properties and phenomena that are described, calculated and measured. Predicting and optimising function and resources is becoming increasingly important as performance requirements from various perspectives become more stringent. Examples of the latter are the increasingly important inclusion of sustainable-development aspects, such as the life-cycle impact of products, energy efficiency and recycling aspects.

Although research in general retains a focus on fundamental issues of a traditional nature related to basic industries (aerospace, automotive, construction, metals, forestry and process industries, engineering and electromechanical industries), the subject area is constantly being expanded and renewed. Research can be characterised as multidisciplinary and its expansion provides the basis for a number of new applied-research domains in, for example, materials technology, chemical technology, process technology, environmental technology, meteorology, climate, combustion and biotechnology. Other important research domains include medical and biological applications (biomechanics), where, for example, organ function and longevity, prostheses and implants, musculoskeletal systems, extracorporeal cardiac and pulmonary support and dialysis, drug administration (e.g., inhalers), etc., can be analysed using methods from engineering mechanics. This applies to health as well as diseases and accidents, including possibilities to understand and optimise movements for better ergonomics in work and sport, as well as reducing the risk of injury in road accidents. Future acoustics research is driven by complex problems related to environmental engineering aspects such as noise, minimisation of emissions and energy consumption. Energy conversion processes and climate modelling are also important areas. All the above examples are supported by and require research and training of new researchers in the field of engineering mechanics.

The achievements of engineering mechanics rely on combining the rapid development of computational capabilities for advanced physical models with new experimental methodologies and techniques. Today, computational research in this field utilises the largest existing research computers, enabling us to understand and describe complex systems and structures in more detail than ever before. The availability of optical measurement methods based on advanced camera technology and laser light sources has also opened up entirely new opportunities for experimental research.

1.3 Specialisations

The subject has no specialisations.

1.4 Organisation of the education

The third-cycle programme in Engineering Mechanics consists of a course component and a thesis project carried out in one of the research domains of acoustics, mechanics or biomechanics that are represented among the groups associated with the programme. 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 he/she 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 Engineering Mechanics consists of participation and summative assessment in one compulsory course and several conditional 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.

  Third-cycle courses, seminars, reading and following relevant scientific literature. Presentation and participation in conferences in the research domain. Read and critique doctoral colleagues' theses and give feedback on their oral presentations. Writing introductions to scientific articles and the doctoral thesis. Participation in regular research-group meetings where interim results and further planning of research tasks are discussed and critiqued within the group.

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

  Third-cycle courses, seminars and workshops in the specific research domain, reading and following relevant scientific literature. Evaluation, application and explanation of relevant methods for specific thesis papers. Collaboration with research colleagues in advanced experimental and/or computerised laboratory environments to continuously develop one's own scientific competence. Writing methodological descriptions in scientific articles and thesis. Participation in regular research-group meetings where interim results and further planning of research tasks are discussed and critiqued within the group.

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.

  Third-cycle courses, seminars, reading and following relevant scientific literature. Presentation at and participation in conferences. Writing introductions to scientific articles and the licentiate thesis.

  Application of relevant methods for specific thesis papers. Collaboration with research colleagues in advanced experimental and/or computerised laboratory environments. Writing methodological descriptions in scientific articles and thesis. Participation in regular research-group meetings where interim results and further planning of research tasks are discussed and critiqued within the group.

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.

  Completion of thesis work including the progressive development of one’s own contributions to analysing unresolved research questions and describing these in scientific

articles, writing results and conclusions in scientific articles and presenting one's own research critically reviewed in relation to other research

- 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.

  Completion of thesis work including the progressive development of one's own contributions to the formulation of unresolved research questions and the description of these in scientific articles. Critical review of doctoral colleagues' articles and theses (part of the compulsory course). Critical review of previous work in the field, summarised in the scientific articles authored/co-authored by the doctoral student and in the licentiate/doctoral thesis, scheduling and compilation of research results for an upcoming conference presentation and deadline for abstract/manuscript.

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

  Publication of research results in peer-reviewed scientific journals. Writing a licentiate thesis as a preparation for the 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.

  Presentations at scientific international conferences and/or in an industrial context, presentations at national research centres and in-house seminars, detailed feedback from research colleagues at in-house seminars and prior to the doctoral defence.

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

  Formulation of the doctoral student's individual study plan to be updated annually. This is also continuously documented in scientific articles and must be discussed in the thesis.

- 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.

  First- and second-cycle education or company presentations, by assisting in the supervision of theses or by transferring knowledge to potential industrial partners as well as transferring specialised knowledge to new doctoral students within the research team.

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.

Reporting of a qualified paper with a disciplinary foundation, the licentiate thesis, which can either constitute the first complete part of a doctoral thesis or part of a compilation thesis.

Critical review of previous work in the field, summarised in the scientific articles authored/co-authored by the doctoral student and in the licentiate/doctoral thesis, scheduling and compilation of research results for an upcoming conference presentation and deadline for abstract/manuscript.

- 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.

  By assessing and discussing relevant ethical aspects with supervisors in the selection and design of research problems. Application for ethical approval, if necessary. The impact of the research results on society at large is discussed with supervisors and fellow researchers. Clear account of the research student's own contributions to the thesis. Plagiarism-check of the thesis.

  Presentations at scientific international conferences and/or presentations in an industrial context, presentations at national research centres and in-house seminars, detailed feedback from research colleagues at in-house seminars and for the licentiate seminar.

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

  By identifying the need for new knowledge and proposing new research accordingly and by knowledge transfer to potential industry partners. Documented in the scientific articles and in the licentiate thesis.

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.

  By assessing and discussing relevant ethical aspects with supervisors in the selection and design of research problems. Application for ethical approval, if necessary. The impact of the research results on society at large is discussed with supervisors and fellow researchers. Clear account of the research student's own contributions to the thesis. Scientific integrity is promoted by a compulsory assessment module on research integrity in the compulsory course of the doctoral programme (under the supervision of an actor independent of the local research environment), as well as plagiarism-check of the thesis.

- 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.

  By participating in and following discussions and debates in the academic environment, both locally (the departmental level) and in a wider context. The impact of the research results on society at large is discussed with supervisors and fellow researchers.

For a Degree of Licentiate, the doctoral student shall:

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

  By assessing and discussing relevant ethical aspects with supervisors in the selection and design of research problems. Application for ethical approval, if necessary. The impact of the research results on society at large is discussed with supervisors and fellow researchers. Clear account of the research student's own contributions to the thesis. Plagiarism-check of the thesis.

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

  By participating in and following seminars, discussions and debates in the academic environment, both locally (the departmental level) and in a wider context. Collaboration across subject boundaries, either in courses or research tasks.

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

  Documented to some extent in scientific articles and should be discussed in the licentiate thesis. Formulation of the doctoral student's individual study plan to be updated annually.

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.

  By giving the doctoral/licentiate student the opportunity to influence how sustainable development issues are addressed in the programme. By participating in and following seminars, discussions and debates in the academic environment, both locally (the departmental level) and in a wider context.

Participation in relevant courses on sustainable development. Collaboration across subject boundaries, either in courses or research tasks. The doctoral/licentiate student is encouraged to participate in external conferences with a focus on sustainable development. Reporting of this ability (pursuant to the outcome) with the publication of scientific articles, the introduction to the thesis and at the public defence of the thesis/licentiate seminar. Through compulsory assessment elements in sustainability and DEI within the compulsory course of the third-cycle subject area.

1.4.2 Compulsory courses

FSG3119 Integrated Course in Engineering Mechanics 7.5 credits

1.4.3 Recommended courses

See Appendix A.

1.4.4 Conditional elective courses

At least two of the conditional elective courses listed in Appendix A must be included in the Degree of Doctor in Engineering Mechanics.

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.

A doctoral thesis must include new scientific research results in the chosen subject area that the doctoral student has developed through scientific research. It must also include an introductory chapter describing previous research in the chosen subject area. Third-cycle courses and study programmes are planned so that thesis work can begin as early as the first semester. The doctoral student's research results are to be presented regularly at informal seminars and should also be reported at appropriate milestones in the form of publications, conference contributions or similar.

The quality of the doctoral thesis must be such as fulfils reasonable requirements to be accepted for peer-reviewed, international scientific publication.

A compilation thesis is often preferred and is standard at KTH. However, a doctoral thesis may also be written as a monograph. The quality requirements placed on the scientific work for a monograph thesis are the same as those for a compilation thesis.

If there are peer-reviewed international journal publications of the thesis work, further advance quality review is done only by the supervisors and the mandatory advance reviewer, after which the director of third-cycle education decides whether a public defence of the thesis can take place.

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 also request advance statements from the examining committee regarding the scientific depth of the work, and only then decide whether a public defence of the thesis should be attempted. This extra statement on the thesis is in addition to those made by the supervisor and the mandatory advance reviewer.

Final assessment of the quality of the thesis and its defence as a whole is made by the members of the examining committee immediately after the defence.

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.

In the third-cycle subject area of Engineering Mechanics, it is possible to obtain an engineering licentiate degree. This type of degree requires the student to have completed and presented in writing a qualified paper with a disciplinary foundation, a licentiate thesis. A compilation licentiate thesis is often preferred, but a monograph thesis is also possible. The quality requirements for the assessment of both types of thesis are the same.

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

2 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.

2.1 Specific prerequisites

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

To be admitted to third-cycle courses and study programmes in the subject of Engineering Mechanics, the applicant must have earned at least 60 higher-education credits at no less than

second-cycle level in the subject of Engineering Mechanics or other subjects deemed to be directly relevant to the specialisation in question. These requirements are also considered to be fulfilled by those who have acquired substantially equivalent knowledge through other means.

2.2 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.

3 The other regulations needed

3.1 Transitional regulations

Doctoral students admitted to a previous general syllabus are entitled to follow either the new syllabus or the syllabus under which they were admitted. Requests to pursue a previous general syllabus, or requests to follow a new general syllabus, are made to the director of third-cycle education at the School of Engineering Sciences. 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 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 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 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".*	The goal 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 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.	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.

Main differences in relation to the doctoral degree: The doctoral student's future contribution to society through research and 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.	**B3.2**: authored a licentiate thesis based on their own studies of good 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*	**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.

identify the need for additional knowledge with the addition of being able to take responsibility for their own knowledge development, which may be considered to be implied for a doctoral degree.	**C3.2:** 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. **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.