



General syllabus for third-cycle subject

Subject	Adopted	Registration number	Ks-kod
Energy technology	1 Feb 2012	V-2018-0671	3.2.3
	<i>Revised 13 Jun 2018</i>		

General syllabus

Adopted by the faculty council/education committee: 1 Feb 2012

Revised: 13 Jun 2018

Subject title in Swedish (and English translation)

State also whether the subject has specialisations.

Energiteknik (Eng. Energy Technology)

Subject description – Main content of the programme

Scientific area

Energy supplies have become a crucial issue in human existence. Over the past 150 years, there has been a vast change. Energy is no longer supplied by the muscles of animals and beasts of burden. Instead, it is sourced from stored, finite resources in the form of fossil fuels and uranium. This has resulted in fantastic improvements in living conditions for large parts of the world's population. However, it has also led to problems.

Along with other human activities, the use of fossil fuels has increased the level of carbon dioxide in the atmosphere and, thereby, led to climate warming. Finite resources that can be extracted cheaply are now also becoming exhausted. This will inevitably lead to higher prices for all forms of energy. Consequently, both the production (conversion) and the use of energy will have to be more efficient.

The overall objective of research at the Department of Energy Technology is to contribute to solving the above problems. Embracing both general system studies (e.g. the development of components for energy systems) and studies of the phenomena and processes involved in energy conversion, our research can cover a wide field.

The third-cycle subject area includes:

- Technical and socioeconomic studies of energy systems at both wide (international, national) and local levels.
- Methods, systems and components for energy conversion – not only from primary energy into work, electricity and heat, but also from work, electricity and heat into the utilities demanded by society.
- Physical phenomena arising in energy conversion processes.
- Methods for limiting the environmental impact of energy conversion processes. These include the exploitation of “flowing energy sources” (sun, wind, water) and methods for increasing the efficiency of energy use.

Programme objectives based on Sweden's Higher Education Ordinance, Annex 2 – Qualifications Ordinance

Each doctoral student's individual study plan shall be designed to guarantee the possibility of attaining the qualitative targets in the Higher Education Ordinance and KTH's objectives. Attainment shall be evaluated for each individual doctoral student. This shall be done annually by monitoring the individual study plan. The latter shall comment on how, vis-à-vis the goals (i.e. targets and objectives), the programme's courses and thesis work achieve progression. Other activities (e.g. supervision and outward-oriented operations in line with education and public outreach) shall also be factored into this.

State the programme elements for promoting goal attainment. Other details are to be given in an appendix to the subject's study plan.

Knowledge and understanding

For a Degree of Doctor, the doctoral student shall demonstrate:

- Wide expertise in, and a systematic understanding of, the research domain; and, deep and current specialist knowledge in a delimited part of the research domain.

- Familiarity with scientific methodology in general and the specific research domain's methods in particular.

Demonstrate: wide expertise in, and a systematic understanding of, the research domain; and, deep and current specialist knowledge in a delimited part of the research domain. It is considered that this goal is attained by, for example: taking part in third-cycle courses; and, reading and following relevant scientific literature. Goal attainment can be checked via, for example: the writing of scientific papers (in the form of submissions for conferences and journals) and the doctoral thesis; and, the presentation and discussion (at conferences and seminars) of own and others' research results.

Demonstrate familiarity with scientific methodology in general and the specific research domain's methods in particular. It is considered that this goal is attained and checked via, for example: taking part in relevant third-cycle courses; and, in thesis work and scientific papers, identifying and using current (for the area) methods in solving proposed research issues.

Skills and abilities (communication ability included therein)

For a Degree of Doctor, the doctoral student shall:

- Demonstrate an aptitude for scientific analysis and synthesis, as well as for independent critical examination and assessment of new and complex phenomena, issues and situations.

- Demonstrate an ability to critically, independently, creatively and with scientific precision identify and formulate issues as well as plan and use appropriate methods to conduct research and other advanced assignments within given time frames and examine and evaluate this work.

- Via a thesis, demonstrate an ability to significantly contribute, through own research, to knowledge development.

- Demonstrate an ability, in both national and international contexts, to authoritatively present and discuss, orally and in writing, research and research results in dialogues with the scientific community and society in general.

- Demonstrate an ability to identify further knowledge needs.

- Demonstrate the potential (within research, education and other advanced, professional contexts) to contribute to societal development and others' learning.

Demonstrate an aptitude for scientific analysis and synthesis, as well as for independent critical examination and assessment of new and complex phenomena, issues and situations. It is considered that this goal is attained and checked via, for example, having: identified not previously observed phenomena and, as a result thereof, proposed new research issues; contributed a scientific explanation; and, drawn relevant conclusions in scientific papers and conference submissions that the doctoral student has written/co-written.

Demonstrate an ability to critically, independently, creatively and with scientific precision identify and formulate issues as well as plan and use appropriate methods to conduct research and other advanced assignments within given time frames and examine and evaluate this work. It is considered that this goal is attained and checked via, for example: critical examination of work in the domain (summarised in the scientific papers that the doctoral student has written/co-written and in the licentiate/doctoral thesis); and, based on the foregoing knowledge, appropriate choice of methodology for solving proposed research issues. The final assessment of goal attainment here is made by the examining committee at the public defence of the thesis.

Via a thesis, demonstrate an ability to significantly contribute, through own research, to knowledge development. It is considered that this goal is attained and checked via a thesis approved by an

examining committee.

Demonstrate an ability, in both national and international contexts, to authoritatively present and discuss, orally and in writing, research and research results in dialogues with the scientific community and society in general. It is considered that this goal is attained via, for example: presentations at scientific conferences; and/or presentations in an industrial context; and/or, the transferring of knowledge to industrial partners. It is considered that it is attained and checked via a thesis that is defended in public and approved by an examining committee.

Demonstrate an ability to identify further knowledge needs. It is considered that this goal is attained via, for example, the need for new knowledge having been identified and having led to proposals for new research. To a certain extent, this is documented in scientific papers and should be discussed in the thesis.

Demonstrate the potential (within research, education and other advanced, professional contexts) to contribute to societal development and others' learning. It is considered that this goal is attained via, for example: teaching in first and second-cycle education or in company presentations; contributing to supervision of degree projects; or, transferring knowledge to any industrial partners.

Judgement and approach

For a Degree of Doctor, the doctoral student shall:

- Demonstrate intellectual independence and scientific probity as well as an ability to assess research ethicality.

- Demonstrate specialised insight into the possibilities and limitations of the discipline, its societal role and the responsibility people bear for how it is used.

Demonstrate intellectual independence and scientific probity as well as an ability to assess research ethicality. It is considered that this goal is attained via ethical aspects having been assessed and discussed with the supervisor (to the extent that this has been relevant in selecting and framing research problems). A case in point is collaborations with the military industry. The impact the research results will have on society in general should be discussed when selecting a research project. Intellectual independence is made evident through the research student's own initiatives being clearly explained in the thesis. Scientific probity is checked via, for example, the plagiarism check to which the thesis is subjected.

Demonstrate specialised insight into the possibilities and limitations of the discipline, its societal role and the responsibility people bear for how it is used. By taking part in and monitoring discussions and debates in the local scientific environment (the department) and in a wider context.

Sustainable development

For a Degree of Doctor, the doctoral student shall:

- Demonstrate knowledge of, and an ability to make, relevant environmental and ethical decisions in order to be able to contribute to sustainable societal development.

Demonstrate knowledge of, and an ability to make, relevant environmental and ethical decisions in order to be able to contribute to sustainable societal development. Doctoral students shall be made aware of how knowledge in the energy field (the Energy Technology third-cycle subject area) can be used to contribute to the development of an ecologically, technically, socially and economically sustainable society. As an element in third-cycle education, all the doctoral programme's doctoral students shall acquire knowledge and insights of and into sustainability issues, in particular: questions regarding the definition and implications of sustainability; and, the links to economic and institutional issues when planning, financing and managing various energy systems. It shall be possible for doctoral students to have sustainable development as a main or subsidiary theme of their thesis projects. All doctoral students shall be examined on course components relating to

sustainability issues. Additionally, opportunities for further specialisation in the field shall be reinforced by sustainability issues being taken up in the programme's standard course offerings. Doctoral students shall be encouraged, and offered opportunities, to participate in external conferences and seminars where sustainable development issues are discussed. Doctoral students shall be given the opportunity to influence how sustainable development issues are taken up in their programme.

No specialisation

(If the subject offers specialisations, the content below is to be repeated, as necessary, in its entirety for each specialisation.)

Specific entry requirements

Subject knowledge requirements and any language requirements are to be entered here.

In accordance with § 40 of chap. 7 of the Higher Education Ordinance, the imposed specific entry requirements shall be absolutely essential for the student to be able to benefit from the programme. The requirements may relate to:

1. Knowledge from higher education study courses and programmes (or equivalent).
2. Special professional experience.
3. Necessary language ability or anything else made necessary by the programme.

At KTH, specific entry requirements relate to the requirement for prior knowledge of specific importance to the third-cycle subject in question. Specific entry requirements may be successful completion of the first and second-cycle study courses and programmes necessary (in a certain subject and at a certain level or of a certain scope) for it to be possible to undertake third-cycle education. Additionally, the student may be required to have a level of English that enables assimilation of the compulsory literature in English and, if necessary, writing and defending of a thesis in English. Requirements in respect of Swedish may be imposed. At selection, applicants are assessed on the basis of the specific project's requirements.

The programme is primarily directed towards recruiting Swedish and foreign graduate engineers (MSc level) specialising in energy technology (or equivalent). Owing to the programme's multidisciplinary nature, students from other technical or non-technical backgrounds may be considered for certain projects.

Selection rules

Admission of students to third-cycle education is decided by the dean/head of the school. The selection basis is the degree of ability to benefit from third-cycle education. In the first instance, selection is based on documented material cited by the applicant. Other decision inputs such as applicant interviews and contacts with previous higher education institutions may also be important. Suitability for third-cycle education is determined by considering: grades; earlier activities; interests; and, capacity for independent judgement and critical analysis. At admission, a finance plan shall be presented. This shall be approved by a head of department and for the full length of the doctoral student's programme (licentiate or doctorate).

General entry requirements

Under § 39 of chap. 7 of the Higher Education Ordinance, the general entry requirements are satisfied by those who have:

1. a second-cycle qualification;
2. fulfilled course requirements for at least 240 higher education credits (HECs), at least 60 of these being second-cycle; or,
3. in some other way, at home or abroad, acquired largely equivalent knowledge.

Foreign higher education

When assessing applicants with foreign higher education qualifications, the study courses and programmes that satisfy general entry requirements for entry to third-cycle education in the country in question should, in most cases, also satisfy general entry requirements for entry to third-cycle

education at KTH. Where the educational system differs so significantly from Sweden's, or where there is doubt as to the quality of the educational system, the admissions group of the Swedish Council for Higher Education and/or KTH should be approached. Knowledge of, amongst other things, the university or university college where the applicant gained a first-cycle qualification is of great value in determining equivalence.

Content and examination of the course component

A Degree of Doctor requires 240 HECs, the course component providing at least 60 of these. Courses and thesis work included in a Degree of Licentiate may also have their credits transferred to a Degree of Doctor.

Higher education requirements

Degree of Doctor

The award of a Degree of Doctor requires 240 HECs. The thesis shall provide at least 120 HECs in this.

Thesis

Quality and any other thesis requirements.

Thesis work is a compulsory part of third-cycle education. Said work is aimed at the doctoral student developing an ability to make independent contributions to research and the scientific community. The thesis can be written either as a monograph or as a compilation of scientific papers. In this latter case, the thesis shall have a separately edited, introductory summary. Irrespective of form, the thesis is assessed as an entirety.

A doctoral thesis can build on a licentiate dissertation.

The thesis shall normally be written in English or Swedish (Swedish theses require special permission from the School of Industrial Engineering and Management).

Doctoral thesis

A Degree of Doctor requires 240 HECs, the course component providing at least 60 of these. Courses and thesis work included in a Degree of Licentiate may also have their credits transferred to a Degree of Doctor. The doctoral thesis shall be presented and defended publicly in accordance with KTH's regulations. The thesis is assessed by a KTH appointed examining committee comprising three or five members.

A thesis for a Degree of Doctor shall include new theoretical or empirical research results that, in the chosen subject area, the doctoral student has developed via theoretical or empirical research projects. It shall also include an overview of earlier research in the chosen subject area and shall position the doctoral student's contribution in relation to earlier research. Regardless of whether the doctoral thesis is presented as a monograph or as a compilation of scientific papers, it shall be of such quality that it is assessed to contain at least four publishable, peer-reviewed scientific papers.

Besides a summarising and introductory chapter of, as a rule, 50 – 80 pages, a compilation thesis shall normally include at least four scientific papers of a quality allowing publication in internationally recognised, scientific journals. The doctoral student shall normally be the first author of at least four publishable scientific papers. Additionally, by the time of the public defence, at least three papers must have been published/accepted for publication.

Quality review

The programme includes active participation in the research seminars at the Department of Energy Technology. During his/her programme, each doctoral student shall, besides participating in internal working seminars, also present his/her research at a minimum of two official programme seminars:

1. Licentiate seminar or the "midway" seminar (roughly halfway).
2. "Final" seminar (when it is assessed there are 3 – 6 months to the public defence).

All doctoral students and researchers associated with the subject study plan are invited to participate

in these seminars. At each seminar, the manuscript is reviewed by an expert, external reviewer who is not involved in the doctoral student's work. Each seminar is chaired by someone from the supervisor assembly (but not the doctoral student's principal or assistant supervisor). The invitees shall have received copies of written documentary input at least one week before the seminar. At licentiate and final seminars, the reviewer shall have a Degree of Doctor (and, preferably, docent qualifications).

Midway seminar

Even if a Degree of Doctor is the ultimate goal, research students are expected to normally take a Degree of Licentiate. Where the principal supervisor and the doctoral student agree that a Degree of Licentiate shall not be taken, a midway seminar shall be held when the doctoral student has satisfied half the requirements for a Degree of Doctor. An external expert reviewer shall be invited to this seminar. Achieved results and the planned direction of further work shall both be presented at the seminar. The external reviewer shall give a written opinion of the work that has been done and a recommendation as regards the planned continuation.

Final seminar

Before finalising the doctoral thesis, the doctoral student shall present his/her manuscript at a final seminar. This final seminar is part of the quality review of the subject study plan and aims to ensure that the doctoral thesis is of a high scientific quality. The final seminar uses what is judged to be the next last version of the thesis manuscript. This means that the thesis is entire, if not yet finalised. The seminar is held when the principal supervisor assesses that there is 3 – 6 months' work before the public defence. An internal or external, independent reviewer who has not previously been involved in the doctoral student's thesis work is invited to the seminar. The reviewer should, preferably, have docent qualifications.

The final seminar shall be announced to all supervisors and doctoral students in the programme.

The seminar is to be chaired by someone from the programme's supervisor assembly (but not the doctoral student's principal or assistant supervisor).

After thesis presentation and questioning, the group of supervisors (at least three in addition to supervisor and assistant supervisor) comes together. The content and quality of the thesis is discussed at this meeting. The principal supervisor speaks in favour of the thesis being ready for defence. As the internal/external quality reviewer, the expert reviewer give his/her approval, possibly with certain reservations regarding changes in the thesis. If the group finds that the thesis satisfies the quality standards, the supervisor is urged to continue the process towards defence.

Courses

A Degree of Doctor in the subject requires 60 HECs from courses.

Degree of Licentiate

The award of a Degree of Licentiate requires at least 120 HECs. An academic paper shall provide at least 60 HECs in this.

Academic paper

Quality and any other academic paper requirements.

Work on an academic paper is a compulsory part of third-cycle education. Said work is aimed at the doctoral student developing an ability to make independent contributions to research and the scientific community.

The academic paper can be written either as a monograph or as a compilation of scientific papers. In this latter case, the academic paper shall have a separately edited, introductory summary. Irrespective of form, the academic paper is assessed as an entirety.

The academic paper shall normally be written in English or Swedish (Swedish academic papers require special permission from the School of Industrial Engineering and Management).

Licentiate dissertation

A Degree of Licentiate requires 120 HECs, the course component providing at least 30 of these.

An academic paper for a Degree of Licentiate shall include an application of existing scientific knowledge that, via theoretical or empirical research projects, the student has developed in a new area. It shall also include an overview of earlier research in the chosen subject area and shall position the doctoral student's contribution in relation to earlier research.

Regardless of whether the licentiate dissertation is presented as a monograph or as a compilation of scientific papers, it shall be of such quality that it is assessed to correspond to at least two publishable, peer-reviewed scientific papers.

After approval by the principal supervisor, the academic paper is to be presented at a public seminar with an external reviewer in accordance with KTH's regulations. The doctoral student shall normally be the first author of at least two publishable scientific papers. Additionally, by the time of the presentation, at least one paper must have been published/accepted for publication.

Courses

A Degree of Licentiate in the subject requires 30 HECs from courses.

Appendix

Qualitative targets (KTH's objectives included therein), as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance) for concretising the subject and how the programme is structured to support the attainment of goals (targets and objectives) by doctoral students.

Degree of Doctor

<p>Qualitative targets as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance)</p> <p><i>For a Degree of Doctor, the doctoral student shall:</i></p>	<p>Concretisation and adaptation of targets to the third-cycle subject area</p>	<p>Programme elements for promoting goal attainment</p>
<p><i>Demonstrate wide expertise in, and a systematic understanding of, the research domain; and, deep and current specialist knowledge in a delimited part of the research domain.</i></p>	<p>It is considered that this goal is attained by taking part in third-cycle courses and reading and following relevant scientific literature. Goal attainment can be checked via, for example: the writing of scientific papers (in the form of submissions for conferences and journals) and the doctoral thesis; and, the presentation and discussion (at conferences and seminars) of own and others' research results.</p>	<p>Participation in: third-cycle courses; the literature survey course (MJ3118); the research seminar course (MJ3122); and, specialisation courses. Writing conference and journal submissions.</p>
<p><i>Demonstrate familiarity with scientific methodology in general and the specific research domain's methods in particular.</i></p>	<p>It is considered that this goal is attained and checked via, for example: taking part in relevant third-cycle courses; and, in thesis work and scientific papers, identifying and using current (for the area) methods in solving proposed research issues.</p>	<p>Participation in relevant third-cycle courses regarding research methodology, e.g. "theory of knowledge and research methodology" (AK3014) or equivalent. The "persevering researcher" course (AK3015).</p>
<p><i>Demonstrate an aptitude for scientific analysis and synthesis, as well as for independent critical examination and assessment of new and complex phenomena, issues and situations.</i></p>	<p><i>It is considered that this goal is attained and checked via, for example, having: identified not previously observed phenomena and, as a result thereof, proposed new research issues; contributed a scientific explanation; and, drawn relevant conclusions in scientific papers and conference submissions that the doctoral student has written/co-written.</i></p>	<p>Writing for, and taking part in, international conferences. Writing journal submissions. Taking part in research seminars at the Department of Energy Technology. Presenting research results in the midway and final seminars.</p>
<p><i>Demonstrate an ability to critically, independently, creatively and with scientific precision identify and formulate issues as well as plan and use appropriate methods to conduct research and other advanced assignments within given time frames and examine and evaluate this work.</i></p>	<p>It is considered that this goal is attained and checked via, for example: critical examination of work in the domain (summarised in the scientific papers that the doctoral student has written/co-written and in the licentiate/doctoral thesis); and, based on the foregoing knowledge, appropriate choice of methodology for solving proposed research issues. The final assessment of goal attainment here is made by the examining committee at the public defence of the thesis.</p>	<p>Writing conference and journal submissions. Reading the course literature survey. Presenting research results in the midway and final seminars. Writing a doctoral thesis.</p>
<p><i>Via a thesis, demonstrate an ability to significantly contribute, through own research, to knowledge development.</i></p>	<p>It is considered that this goal is attained and checked via a thesis approved by an examining committee.</p>	<p>It is considered that this goal is attained and checked via a thesis approved by an examining committee.</p>

<p>Qualitative targets as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance)</p> <p><i>For a Degree of Doctor, the doctoral student shall:</i></p>	<p>Concretisation and adaptation of targets to the third-cycle subject area</p>	<p>Programme elements for promoting goal attainment</p>
<p><i>Demonstrate an ability, in both national and international contexts, to authoritatively present and discuss, orally and in writing, research and research results in dialogues with the scientific community and society in general.</i></p>	<p>It is considered that this goal is attained via, for example: presentations at scientific conferences; and/or, presentations in an industrial context. It is considered that it is attained and checked via a thesis that is defended in public and approved by an examining committee.</p>	<p>Writing and presenting conference submissions nationally and internationally. Writing popular science papers in relevant national journals.</p>
<p><i>Demonstrate an ability to identify further knowledge needs.</i></p>	<p>It is considered that this goal is attained via, for example, the need for new knowledge having been identified and having led to proposals for new research. To a certain extent, this is documented in scientific papers and should be discussed in the thesis.</p>	<p>In connection with writing scientific papers and a thesis.</p>
<p><i>Demonstrate the potential (within research, education and other advanced, professional contexts) to contribute to societal development and others' learning.</i></p>	<p>It is considered that this goal is attained via, for example: teaching in first and second-cycle education or in company presentations; contributing to supervision of degree projects; or, transferring knowledge to any industrial partners.</p>	<p>Teaching in first and second-cycle education. Supervising bachelor and master degree projects. Transferring knowledge to industrial partners. Writing popular science papers in relevant national journals.</p>
<p><i>Demonstrate intellectual independence and scientific probity as well as an ability to assess research ethicality.</i></p>	<p>It is considered that this goal is attained via ethical aspects having been assessed and discussed with the supervisor (to the extent that this has been relevant in selecting and framing research problems). A case in point is collaborations with the military industry. The impact the research results will have on society in general should be discussed when selecting a research project. Intellectual independence is made evident through the research student's own initiatives being clearly explained in the thesis. Scientific probity is checked via, for example, the plagiarism check to which the thesis is subjected.</p>	<p>Discussion of the structuring of research projects. The research student's input is presented in the thesis. The thesis is checked for plagiarism.</p>

<p>Qualitative targets as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance)</p> <p><i>For a Degree of Doctor, the doctoral student shall:</i></p>	<p>Concretisation and adaptation of targets to the third-cycle subject area</p>	<p>Programme elements for promoting goal attainment</p>
<p><i>Demonstrate specialised insight into the possibilities and limitations of the discipline, its societal role and the responsibility people bear for how it is used.</i></p>	<p>By taking part in and monitoring discussions and debates in the local scientific environment (the department) and in a wider context.</p>	<p>Discussing, in research seminars, the discipline’s possibilities and limitations and monitoring debates at national and international levels.</p>
<p><i>(KTH’s objectives for ESD) Demonstrate knowledge of, and an ability to make, relevant environmental and ethical decisions in order to be able to contribute to sustainable societal development.</i></p>	<p>Doctoral students shall be made aware of how knowledge in the energy field (the Energy Technology third-cycle subject area) can be used to contribute to the development of an ecologically, technically, socially and economically sustainable society. As an element in third-cycle education, all the doctoral programme’s doctoral students shall acquire knowledge and insights of and into sustainability issues, in particular: questions regarding the definition and implications of sustainability; and, the links to economic and institutional issues when planning, financing and managing various energy systems. Several doctoral students shall have sustainable development as a main or subsidiary theme of their thesis projects. All doctoral students shall be examined on course components relating to sustainability issues. Additionally, opportunities for further specialisation in the field shall be reinforced via the programme’s course offerings. Doctoral students shall be encouraged, and offered opportunities, to participate in external conferences and seminars where sustainable development issues are discussed. Doctoral students shall be given the opportunity to influence how sustainable development issues are taken up in their programme.</p>	<p>All doctoral students shall study at least one course on sustainable development. Doctoral students shall be encouraged, and offered opportunities, to participate in external conferences and seminars where sustainable development issues are discussed. Doctoral students shall be given the opportunity to influence how sustainable development issues are taken up in their programme.</p>

Degree of Licentiate

<p>Qualitative targets as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance)</p> <p><i>For a Degree of Licentiate, doctoral students shall:</i></p>	<p>Concretisation and adaptation of targets to the third-cycle subject area</p>	<p>Programme elements for promoting goal attainment</p>
<p><i>Demonstrate knowledge and understanding in the research domain (current specialist knowledge in a delimited part of this included therein) and specialised knowledge of scientific methodology in general and the specific research domain's methods in particular.</i></p>	<p>It is considered that this goal is attained via: taking part in third-cycle courses; studying and monitoring relevant scientific literature; and, identifying and using current (for the area) methods in solving proposed research issues. Goal attainment can be checked via: the writing of scientific papers, conference submissions and licentiate dissertations; and, the ability to present and discuss (at conferences and seminars) own and others' research results.</p>	<p>Participation in third-cycle courses (e.g. specialisation courses, research skills courses and complementary courses). Participation in relevant third-cycle courses regarding research methodology, e.g. "theory of knowledge and research methodology" (AK3014), or equivalent, and the "persevering researcher" course (AK3015).</p>
<p><i>Demonstrate an ability to critically, independently, creatively and with scientific precision identify and formulate issues as well as plan and use appropriate methods to conduct a limited research project and other advanced assignments within given time frames and, thereby, to contribute to knowledge development and to evaluate this work.</i></p>	<p>It is considered that this goal is attained and checked via: critical examination of earlier work in the area (as summarised in literature studies written/co-written by the doctoral student and in the licentiate dissertation); new research issues proposed; and, based on the foregoing knowledge, continuation recommendations.</p>	<p>Studying the literature survey course and writing conference and journal submissions. Writing the licentiate dissertation.</p>
<p><i>Demonstrate an ability, in both national and international contexts, to present and discuss, orally and in writing, research and research results in dialogues with the scientific community and society in general.</i></p>	<p>It is considered that this goal is attained via, for example: presentations at scientific conferences; and/or, presentations in an industrial context. It is considered that it is attained and checked via an academic paper that is discussed at a licentiate seminar and approved by an examiner.</p>	<p>Writing for, and presenting at, scientific conferences and/or presenting own research results to industrial partners (or in an industrial context) and presenting the licentiate dissertation at the licentiate seminar.</p>
<p><i>Demonstrate the skills necessary to independently participate in research and development work and to work independently in other advanced operations.</i></p>	<p>It is considered that this goal is attained via, for example: the need for new knowledge having been identified and having led to proposals for new research; and, the transferring of knowledge to any industrial partners. To a certain extent, this is documented in scientific papers and should be discussed in the licentiate dissertation.</p>	<p>Writing for, and presenting at, scientific conferences and/or presenting own research results to industrial partners (or in an industrial context) and presenting the licentiate dissertation at the licentiate seminar.</p>

<p>Qualitative targets as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance)</p> <p><i>For a Degree of Licentiate, doctoral students shall:</i></p>	<p>Concretisation and adaptation of targets to the third-cycle subject area</p>	<p>Programme elements for promoting goal attainment</p>
<p><i>Demonstrate an ability to assess research ethicality in own research.</i></p>	<p>It is considered that this goal is attained via ethical aspects having been assessed and discussed with the supervisor (to the extent that this has been relevant in selecting and framing research problems), e.g. research collaborations with the military industry.</p> <p>The impact the research results will have on society in general should be discussed with the supervisor.</p>	<p>Discussion and structuring of research projects, e.g. to what extent we may work with the military industry.</p>
<p><i>Demonstrate insight into the possibilities and limitations of the discipline, its societal role and the responsibility people bear for how it is used.</i></p>	<p>By taking part in and monitoring discussions and debates in the local scientific environment (the department) and in a wider context.</p>	<p>By taking part in and monitoring discussions and debates in the local scientific environment (the department) and in a wider context. Recommending that doctoral students study courses on research skills, e.g. “theory of knowledge and research methodology” or equivalent.</p>
<p><i>Demonstrate an ability to identify his or her need for further knowledge and take responsibility for his or her own knowledge development.</i></p>	<p>It is considered that this goal is attained via, for example: the need for new knowledge having been identified and having led to proposals for new research; or, participation in third-cycle courses or workshops. To a certain extent, this is documented in scientific papers and should be discussed in the licentiate dissertation.</p>	<p>Through presentations of his/her research results at conferences and internal seminars, the need for new knowledge can be identified and lead to proposals for new research.</p>

<p>Qualitative targets as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance)</p> <p><i>For a Degree of Licentiate, doctoral students shall:</i></p>	<p>Concretisation and adaptation of targets to the third-cycle subject area</p>	<p>Programme elements for promoting goal attainment</p>
<p><i>(KTH's objectives for ESD)</i> <i>Demonstrate knowledge of, and an ability to make, relevant environmental and ethical decisions in order to be able to contribute to sustainable societal development.</i></p>	<p>Doctoral students shall be made aware of how knowledge in the energy field (the Energy Technology third-cycle subject area) can be used to contribute to the development of an ecologically, technically, socially and economically sustainable society. As an element in third-cycle education, all the doctoral programme's doctoral students shall acquire knowledge and insights of and into sustainability issues, in particular: questions regarding the definition and implications of sustainability; and, the links to economic and institutional issues when planning, financing and managing various energy systems. Several doctoral students shall have sustainable development as a main or subsidiary theme of their thesis projects. All doctoral students shall be examined on course components relating to sustainability issues. Additionally, opportunities for further specialisation in the field shall be reinforced via the programme's course offerings. Doctoral students shall be encouraged, and offered opportunities, to participate in external conferences and seminars where sustainable development issues are discussed. Doctoral students shall be given the opportunity to influence how sustainable development issues are taken up in their programme.</p>	<p>All doctoral students shall study at least one course on sustainable development.</p> <p>Doctoral students shall be encouraged, and offered opportunities, to participate in external conferences and seminars where sustainable development issues are discussed. Doctoral students shall be given the opportunity to influence how sustainable development issues are taken up in their programme.</p>