General syllabus for third-cycle subject

Subject	Adopted	Registration number	Ks-kod
Technology and Learning	**10 May 2017** *Revised 8 March 2019*	**V-2019-0257**	**3.2.3**

General syllabus

Established by the Faculty Council/Education Committee: 10/05/2017

Revised: 08/03/2019

The name of the subject in Swedish and translated into English

Also indicated whether the subject has any specialisations.

Teknik och lärande (Technology and Learning)

The subject has no specialisations.

Subject description Main content of the programme

The subject is included in the third-cycle programme in Education and Communication Studies.

Technology and Learning is a cross-disciplinary, practice-- and policy-related subject. Research methods, theories and empirical approaches are based on traditions and perspectives from the humanities, social sciences as well as from engineering and natural sciences. The subject comprises conditions for learning and communication, processes of learning, teaching and communication, as well as results and effects of learning and communication within Engineering Sciences. Important research areas include technology education, engineering education, learning, design and technology, policy, management and change processes, teaching and learning within professional education and the importance of technology in society.

Doctoral education structure

The doctoral education consists of a course component and a dissertation/thesis component. Courses may consist of activities such as lectures, literature studies and problem-solving, as well as active participation in seminars and conferences. Courses can be attended at KTH or at other Swedish or foreign research institutes. During the doctoral education, the doctoral student is required to participate in third-cycle seminars in the subject, which includes students regularly presenting their own texts. The doctoral student must also participate in national and international conferences and research networks within his/her research field.

The doctoral education is led by a main supervisor together with at least one assistant supervisor, in accordance with the individual study plan. The courses (of which one is a compulsory course comprising 10 HE credits) are to be completed as agreed by the student and the principal supervisor in the individual study plan. The doctoral student's individual study plan must be adapted to his/her prior knowledge and to the focus of the dissertation/thesis. The doctoral student's progress must be assessed at least once per year in conjunction with the review of the individual study plan that is to be done by the doctoral student and the principal supervisor. The principal supervisor is responsible for the individual study plan being established and revised at appropriate points in time. The study plan is adopted by the director of third-cycle studies.

Indented learning outcomes of Doctoral Education based on the Higher Education Ordinance, Annex 2, Qualifications Ordinance.

The doctoral student's individual study plan must 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 progression vis-à-vis the

objectives based on the courses and student's thesis work. Other activities, such as supervision and external activities in line with education and public outreach shall also be factored into this.

State the elements in the doctoral education 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 must
- demonstrate broad knowledge within and a systematic understanding of the research area as well as deep and up-to-date specialist knowledge within a defined part of the research area, and
- demonstrate familiarity with scientific methodology in general and with the methods of the specific research area in particular.

The overarching intended learning outcomes "knowledge and understanding" are attained primarily through participation in courses and one's own supervised research, especially in writing articles and a thesis.

Skills and abilities, including communication ability
For a Degree of Doctor, the doctoral student must
- demonstrate skills in scientific analysis and synthesis and ability to independently and critically consider and assess new and complex phenomena, questions and situations,
- demonstrate ability to critically, independently, creatively and with scientific meticulousness identify and formulate questions as well as plan and conduct research and other qualified tasks using adequate methods within given time frames and review and evaluate such work,
- write a thesis to demonstrate their ability to make significant contributions to knowledge development through their own research,
- demonstrate ability in both national and international contexts, verbally and in writing, to confidently present and discuss research and research findings in dialogue with the scientific community and society in general.
- demonstrate an ability to identify needs for further knowledge, and
- demonstrate ability, both in research and education and in other qualified professional contexts, to contribute to society's development and support the learning of others.

The overarching intended learning outcomes "competence and skills" are attained primarily through thesis work, but with support in the courses. Herein is included training in reading, understanding and criticising scientific texts and in arguing for or against findings and standpoints, both one's own and those of others. Communicating and discussing results to different target groups is specifically practiced in the recommended courses:

LS3107 Communicating Research beyond the Academy
LS3104 Visualize your Science

and at presentations given at conferences and internal seminars. Planning and conducting research tasks within given time frames is achieved primarily through work on the thesis.

Judgement and approach
For a Degree of Doctor, the doctoral student must
- demonstrate intellectual independence and scientific integrity as well as the ability to make ethical research assessments, and
- demonstrate a profound insight into the possibilities and limitations of the discipline, its societal role and the responsibility people bear for how it is used.

The overarching intended learning outcomes "judgement and approach" are attained in collegial contexts, such as seminars and conferences, and in courses and thesis work. Doctoral students are also recommended to take a course on research ethics. Intellectual independence is trained and assessed both through article publication and during the thesis work.

Sustainable development
For a Degree of Doctor, the doctoral student must
- demonstrate knowledge of, and an ability to make relevant environmental and ethical assessments in order to be able to contribute to sustainable societal development.

The overall objectives of "environmental and ethical assessments" are attained in collegial contexts, such as seminars and scientific discussions as well as in courses and thesis work. Doctoral students are especially recommended to take courses on research ethics and sustainable development.

Specific entry requirements

Subject knowledge requirements and any language requirements are specified here

The subject is cross-disciplinary and it is possible for students to have a background in different subjects. To be admitted to the third-cycle education within Technology and Learning, the applicant must have passed courses resulting in at least 60 higher education credits at minimum second-cycle level within subjects deemed directly relevant to the chosen focus of their thesis. These entry requirements can also be considered fulfilled by an applicant who has acquired essentially the equivalent knowledge in a different order.

Doctoral students are also expected to read and write scientific English proficiently and to speak English fluently.

Selection rules

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 demonstrated via attached documents and, potentially, an 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 the degree projects, a Master's thesis or equivalent, and discussion of these at a possible interview.

3. Other experience relevant for third-cycle education, e.g. professional experience.

Contents and examination of course element

The courses are to be taken as agreed by the doctoral student and the principal supervisor in the individual study plan. For a Degree of Licentiate, students are recommended to study the compulsory course for the Degree of Doctor. The compulsory course can be replaced by comparable courses following the recommendation of the programme coordinator and the approval of the director of third-cycle studies.

Compulsory course (for the Degree of Doctor):

LF3011 Introduction to Research Methods in Technology and Learning 10 credits

Recommended advanced courses

LF3002 Theory, Methods and History of Technology and Engineering Sciences 7.5 credits
LF3004 Literature Course; Education and Communication in Technology Sciences 7.5 credits Can also be taken as a complementary course.
LF3005 Literature Course; Education and Communication in Technology Sciences, I 3.0 credits Can also be taken as a complementary course.
LF3007 Theoretical Perspectives on Learning 7.5 credits
LF3009 Literature Course Research Seminars before dissertation 7.5 credits

Recommended courses relating to research skills

LF3008 Interview as Qualitative Research Method 4.5 credits
LF3001 Writing a Successful Grant Proposal in Learning 7.5 credits
1N5115 Introduction to Research Ethics 3.0 credits
DS3102 Writing Scientific Articles 5.0 credits
LS3107 Communicating Research beyond the Academy 5 credits
LS3104 Visualize your Science 4.0 credits

Recommended complementary courses

LF3003 Literature Course; Education and Communication in Technology Sciences, A 7.5 credits
LF3006 Literature Course; Research Seminars at ECE 7.5 credits
LH3000 Basic Communication and Teaching 3.0 credits

Qualification requirements

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 thesis is a compulsory part of the third-cycle education. This part of the education aims to allow the doctoral student to develop the ability to make independent contributions to research and an ability for scientific cooperation, inside and outside their own subject. The thesis must contain new research results that the doctoral student has developed independently or in collaboration with others. The scientific main results must meet the quality requirements for publication in internationally recognised peer-reviewed journals (or equivalent). The doctoral student's contribution to the texts with multiple authors included in the thesis must be distinguishable.

The doctoral thesis must normally be written in English. It must normally be designed as an aggregation of scientific articles, along with a separately written summary. A doctoral thesis must contain enough material for at least four regular articles that can be published in internationally recognised peer-reviewed journals. The doctoral thesis can be based on an earlier licentiate dissertation.

The Degree of Licentiate can be completed as part of the Degree of Doctor. Courses and dissertation work included in the licentiate degree may also be counted towards a Degree of Doctor.

Courses

A Degree of Doctor requires 90 HE credits obtained through courses.

Degree of Licentiate

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

Dissertation

Quality requirements and possible other requirements for the dissertation.

The dissertation is a compulsory part of the third-cycle education. This part of the education aims to allow the doctoral student to develop the ability to make independent contributions to research and an ability for scientific cooperation, inside and outside their own subject. The dissertation must contain new research results that the doctoral student has developed independently or in collaboration with others. The scientific main results must meet the quality requirements for publication in internationally recognised peer-reviewed journals (or equivalent). The doctoral student's contribution to the texts with multiple authors included in the dissertation must be distinguishable.

The licentiate dissertation must normally be written in English. It must normally be designed as an aggregation of scientific articles, along with a separately written summary. A licentiate dissertation must contain enough material for at least two regular articles that can be published in internationally recognised peer-reviewed journals.

Courses

A Degree of Licentiate requires 45 credits obtained through courses.

Appendix
Qualitative targets, including KTH's objectives, as per the Higher Education Ordinance (Appendix 2 – Qualifications Ordinance) for concretising the subject and information on how the education has been structured to help the doctoral student reach the targets.

Degree of Doctor

Objectives based on the Higher Education Ordinance, Annex 2 – Qualifications Ordinance *For a Degree of Doctor, the doctoral student must*	**Concretisation and adaptation of targets to the third-cycle subject area Technology and Learning**	**Education elements that promote attainment of the intended learning outcomes**
demonstrate broad knowledge in and a systematic understanding of the field of research and deep and up-to-date specialist knowledge in a delimited part of the field of research	Demonstrate broad knowledge in and a systematic understanding of **the field Technology and Learning** and deep and up-to-date specialist knowledge **in the delimited field of research that concerns the thesis work itself.**	Seminars within and between research groups. Complementary courses and advanced courses. Supervision. Department-wide researcher and doctoral student days. Presentation of own research in various contexts. Halftime and 90% seminar.
demonstrate familiarity with scientific methodology in general and with the methods of the specific research area in particular	Demonstrate familiarity with scientific methodology in general and with the methods of **Technology and Learning** in particular.	Compulsory methodology course (LF3011 Introduction to Research Methods in Technology and Learning) Advanced courses relating to research skills. Supervision. Seminars within and between research groups. Presentation of own research in various contexts. Halftime and 90% seminar.
demonstrate skills in scientific analysis and synthesis and ability to independently and critically consider and assess new and complex phenomena, questions and situations	Demonstrate skills in scientific analysis and synthesis and ability to independently and critically consider and assess new and complex phenomena, questions and situations within **Technology and Learning**.	Seminars within and between research groups. Complementary courses and advanced courses. Supervision. Department-wide researcher and doctoral student days. Presentation of own research in various contexts. Halftime and 90% seminar.
demonstrate ability to critically, independently,	Demonstrate ability to critically, independently, creatively and with	Compulsory methodology course (LF3011 Introduction to Research Methods in Technology and Learning)

Objectives based on the Higher Education Ordinance, Annex 2 – Qualifications Ordinance *For a Degree of Doctor, the doctoral student must*	**Concretisation and adaptation of targets to the third-cycle subject area Technology and Learning**	**Education elements that promote attainment of the intended learning outcomes**
creatively and with scientific meticulousness identify and formulate questions as well as plan and conduct research and other qualified tasks using adequate methods within given time frames and review and evaluate such work	scientific meticulousness identify and formulate questions relevant to the field of **Technology and Learning** as well as plan and conduct research and other qualified tasks using adequate methods within given time frames and review and evaluate such work	Advanced courses relating to research skills. Supervision. Seminars within and between research groups. Annual follow-up together with the supervisors and documentation of attained learning outcomes in the individual study plan. Halftime and 90% seminar.
write a thesis to demonstrate their ability to make significant contributions to knowledge development through their own research	Write a thesis to demonstrate their ability to make significant contributions, through their own research, to knowledge development within the field of Technology and Learning.	Supervision. Complementary courses, advanced courses and research skills Seminars within and between research groups. Presentation of own research in various contexts. Halftime and 90% seminar.
demonstrate ability in both national and international contexts, verbally and in writing, to confidently present and discuss research and research findings in dialogue with the scientific community and society in general.	Demonstrate ability in both national and international contexts verbally and in writing to with authority present and discuss research and research findings in dialogue with the scientific community and society in general.	Courses relating to research skills within scientific communication (LS3107 Communicating Research beyond the Academy, LS3104 Visualize your Science, DS3102 Writing Scientific Articles). Supervision. Seminars within and between research groups. Presentation of own research in various contexts. Halftime and 90% seminar.
demonstrate ability to identify needs for further knowledge	Demonstrate ability to identify needs for further knowledge.	Literature courses (both complementary and advanced courses) where doctoral students are encouraged to search for relevant literature. Supervision. Seminars within and between research groups. Annual follow-up together with the supervisors and documentation of attained learning outcomes in the

Objectives based on the Higher Education Ordinance, Annex 2 – Qualifications Ordinance *For a Degree of Doctor, the doctoral student must*	**Concretisation and adaptation of targets to the third-cycle subject area Technology and Learning**	**Education elements that promote attainment of the intended learning outcomes**
		individual study plan. Halftime and 90% seminar.
demonstrate ability, both in research and education and in other qualified professional contexts, to contribute to society's development and support the learning of others.	Demonstrate ability, both in research and education and in other qualified professional contexts, to contribute to society's development and support the learning of others.	Supervision. Courses focusing on communication and teaching (LH3000 Basic Communication and Teaching, LS3107 Communicating Research beyond the Academy) Seminars within and between research groups. Presentation of own research in various contexts.
demonstrate intellectual independence and scientific integrity as well as the ability to make ethical research assessments	Demonstrate intellectual independence and scientific integrity as well as the ability to make ethical research assessments.	Compulsory methodology course (LF3011 Introduction to Research Methods in Technology and Learning). Courses relating to advanced research skills which clearly feature elements of research ethics (1N5115 Introduction to Research Ethics, LF3008 Interview as Qualitative Research Method). Supervision. Seminars within and between research groups. Department-wide researcher and doctoral student days. Halftime and 90% seminar.
demonstrate a profound insight into the possibilities and limitations of the discipline, its societal role and the responsibility people bear for how it is used	Demonstrate a profound insight into the possibilities and limitations of the discipline, its societal role and the responsibility people bear for how it is used.	Compulsory methodology course (LF3011 Introduction to Research Methods in Technology and Learning). Complementary courses and advanced courses. Supervision. Seminars within and between research groups. Department-wide researcher and doctoral student days. Halftime and 90% seminar.
(KTH's objectives for MHU) demonstrate knowledge of, and an ability to make relevant environmental and ethical	Demonstrate knowledge of and ability to assess for example environmental or ethical questions so that they after the awarding of the	Supervision. Seminars within and between research groups. Department-wide researcher and

Objectives based on the Higher Education Ordinance, Annex 2 – Qualifications Ordinance *For a Degree of Doctor, the doctoral student must*	**Concretisation and adaptation of targets to the third-cycle subject area Technology and Learning**	**Education elements that promote attainment of the intended learning outcomes**
assessments in order to be able to contribute to sustainable societal development.	degree can contribute to sustainable development of society.	doctoral student days with special focus on sustainable development. Halftime and 90% seminar.

Degree of Licentiate

Objectives based on the Higher Education Ordinance, Annex 2 – Qualifications Ordinance *For a Degree of Licentiate, the doctoral student must*	**Concretisation and adaptation of targets to thethird-cycle subject areaTechnology and Learning**	**Programme elements that promote goal attainment**
demonstrate knowledge and understanding within the research field, including current specialist knowledge within a part thereof, as well as advanced knowledge of general scientific methods and the methods of the specific research field in particular	Demonstrate broad knowledge in and a systematic understanding of **the field Technology and Learning** and deep and up-to-date specialist knowledge **in the delimited field of research that concerns the thesis work itself.** Demonstrate familiarity with scientific methodology in general and with the methods of **Technology and Learning** in particular.	Seminars within and between research groups. Complementary courses and advanced courses. Supervision. Department-wide researcher and doctoral student days. Presentation of own research in various contexts. 90% seminar.
demonstrate ability to critically, independently, creatively and with scientific meticulousness identify and formulate questions as well as plan and conduct limited research and other qualified tasks using adequate methods within given time frames, thereby contributing to knowledge development, and review and evaluate such work.	Demonstrate the ability to critically, independently, creatively and with scientific meticulousness identify and formulate questions as well as plan and conduct research and other qualified tasks using adequate methods within given time frames, thereby contributing to knowledge development within the field of technology and learning, and review and evaluate such work.	Methodology course (LF3011 Introduction to Research Methods in Technology and Learning). Advanced courses relating to research skills. Supervision. Seminars within and between research groups. Annual follow-up together with the supervisors and documentation of attained learning outcomes in the individual study plan. 90% seminar.
demonstrate ability in both national and international contexts, verbally and in writing, to clearly present and	Demonstrate ability in both national and international contexts, verbally and in writing, to clearly present and discuss research and research	Courses relating to research skills within scientific communication (LS3107 Communicating Research beyond the Academy, LS3104 Visualize your Science, DS3102

Objectives based on the Higher Education Ordinance, Annex 2 – Qualifications Ordinance *For a Degree of Licentiate, the doctoral student must*	**Concretisation and adaptation of targets to thethird-cycle subject areaTechnology and Learning**	**Programme elements that promote goal attainment**
discuss research and research findings in dialogue with the scientific community and society in general	findings in dialogue with the scientific community and society in general.	Writing Scientific Articles). Supervision. Seminars within and between research groups. Presentation of own research in various contexts. 90% seminar.
demonstrate such skills as are required to independently participate in research and development work and to work independently in other qualified activities	Demonstrate such skills as are required to independently participate in research and development work within the field of technology and learning and to work independently in other qualified activities.	Compulsory methodology course (LF3011 Introduction to Research Methods in Technology and Learning). Complementary courses and advanced courses. Supervision. Seminars within and between research groups. Department-wide researcher and doctoral student days. 90% seminar.
demonstrate the ability to make research ethical assessments in their own research.	Demonstrate the ability to make research ethical assessments in their own research.	Courses relating to advanced research skills which clearly feature elements of research ethics (1N5115 Introduction to Research Ethics, LF3008 Interview as Qualitative Research Method). Supervision. Seminars within and between research groups. Department-wide researcher and doctoral student days. 90% seminar.
demonstrate an insight into the possibilities and limitations of the discipline, its role in society and the responsibility people bear for how it is used	Demonstrate an insight into the possibilities and limitations of the discipline, its role in society and the responsibility people bear for how it is used.	Compulsory methodology course (LF3011 Introduction to Research Methods in Technology and Learning). Complementary courses and advanced courses. Supervision. Seminars within and between research groups. Department-wide researcher and doctoral student days. 90% seminar.

Objectives based on the Higher Education Ordinance, Annex 2 – Qualifications Ordinance *For a Degree of Licentiate, the doctoral student must*	**Concretisation and adaptation of targets to thethird-cycle subject areaTechnology and Learning**	**Programme elements that promote goal attainment**
demonstrate the ability to identify their need for further knowledge and to take responsibility for their own knowledge acquisition.	Demonstrate the ability to identify their need for further knowledge relating to the research field and to take responsibility for their own knowledge acquisition.	Literature courses (both complementary and advanced courses) where doctoral students are encouraged to search for relevant literature. Supervision. Seminars within and between research groups. Annual follow-up together with the supervisors and documentation of attained objectives in the individual study plan. 90% seminar.
(KTH's objectives for MHU) demonstrate knowledge of, and an ability to make relevant environmental and ethical assessments in order to be able to contribute to sustainable societal development.	Demonstrate knowledge of and ability to assess for example environmental or ethical questions so that they after the awarding of the degree can contribute to sustainable development of society.	Supervision. Seminars within and between research groups. Department-wide researcher and doctoral student days with special focus on sustainable development. 90% seminar.