Chemical Engineering

Study plan for third-cycle subject

The subject plan was approved by Fakultetsnämnden (Faculty Board) November 30, 2010. Valid from Spring 11.

Subject title

Chemical Engineering (Kemiteknik)

Subject description and programme outcomes

Scientific field

There are joint provisions and regulations for postgraduate studies at KTH in the regulatory framework for KTH's postgraduate courses (intra.kth.se/regelverk/utbildning-forskning/forskarutbildning). This syllabus for postgraduate studies in the subject chemical engineering supplements the joint provisions and guidelines with the following subject-specific instructions.

Description of possible specialisation

The subject has no specialisations.

Specification of how the programme outcomes are to be achieved

Postgraduate studies in Chemical Engineering combine basic knowledge of chemistry, physics and mathematics with basic and applied engineering subjects in order to give the student a comprehensive technical and scientific expertise in areas which are of industrial and social relevance.

The objective of the postgraduate studies in chemical engineering is to provide the students with sound knowledge in the subject area and the ability to conduct independent research, development, teaching and research work in different areas of society.

The objective of the doctoral degree is also to provide the student with the ability to critically and independently initiate, plan and manage such work.

This means that upon completion of the education postgraduates should be able to:

1. describe and explain the theories and empirical results within their area of specialization
2. formulate concrete research issues in the field of chemical engineering
3. use scientific methods and develop new knowledge through their own scientific studies
4. critically analyze and evaluate the applied methods and results from both their own scientific studies and those of others
5. present and discuss research results in the scientific community
6. present research in a pedagogical manner outside the scientific community and in educational contexts
7. assess the ethical aspects of research in the field of chemical engineering and act based on these
8. identify needs for new knowledge and have knowledge of initiating and managing research and be aware of the mechanisms for obtaining funds to conduct research.

Current research

Research and postgraduate studies at the Department of Chemical Engineering and Technology are conducted in several areas. A common aspect is the use of a set of tools which are deemed to define the subject chemical engineering as it is portrayed in the Department of Chemical Engineering and Technology. This general set of tools, also known as "the chemical engineering tool box" is based on scientific evidence and consists of the following:

- Material and energy balances applied to all types of chemical and biochemical systems
- Transport phenomena (momentum, heat and mass transfer)
- Chemical engineering thermodynamics and kinetics
- Separation processes and phase equilibrium
- Chemical and electrochemical reaction engineering
- Process chemistry

Programme structure

Postgraduate studies consist of coursework and a thesis. The course stages may comprise lectures, literature studies and problem-solving as well as active participation in seminars, provided that a clear examination stage is included. Courses can be studied within the department or in collaboration with other Swedish or foreign research institutions.

Postgraduate studies are conducted under the management of a main supervisor, together with one or more deputy supervisors, in accordance with an individual syllabus approved by the Director of Graduate Studies. The individual syllabus of the student should be adjusted to the prior knowledge and the focus of the thesis. The postgraduate's progress should be assessed at least once a year in connection with the review of the individual syllabus which should be done by the student and main supervisor and it should be adopted by the Director of Graduate Studies.

As a part of the education active participation in research seminars at the department is required. Postgraduates should present his/her results at research seminars, preferably on occasions during the study period. Postgraduates should also participate in national and international conferences within the discipline.

Compulsory and recommended courses
The licentiate degree consists of coursework consisting of 30 credits and a thesis of 90 credits to give a total of 120 credits. The doctoral degree consists of coursework consisting of 60 credits and a thesis of 180 credits which gives a total of 240 credits.

The coursework for both the licentiate and doctoral degree consists of a compulsory course in Research Ethics, recommended courses and optional courses. The courses should be studied in accordance with the agreement between the student and the main supervisor which is reached as a part of the individual syllabus.

**Recommended courses**

It is recommended that students study a general course in philosophy of science and research methodology and second level courses as well as doctoral courses with specializations which correspond to the specialization of the research project.

Courses appropriate for postgraduate studies can be selected from, inter alia, the list on the website of the School of Chemical Science and Engineering at the following address: www.kth.se/che/internt/doktorandsida/doktorandkurser. If preferable, courses can also be selected from the range at other institutes of higher education.

**Optional courses**

Optional courses suitable for postgraduate studies may, for example, be selected from the list on the website of the School of Chemical Science and Engineering at the following address: www.kth.se/che/internt/doktorandsida/doktorandkurser. If preferable, courses can also here be selected from the range at other institutes of higher education.

Courses from other disciplines may be included depending on the specialization of the thesis. See KTH's regulatory framework for credit transfer. Courses from the first and second cycles may only be included if they cover relevant disciplines for postgraduate studies and they should not constitute prior knowledge or provide specific eligibility for admission to the postgraduate subject Chemical Engineering and Technology.

Additional course stages which the main supervisor and student jointly consider important for the thesis work may also be included in the coursework of the licentiate and doctoral degrees. Such accredited activities can take the form of individual literature courses with clear degree stages. Credit transfer for such activities requires a prior agreement between the main supervisor and student with credits established in the individual syllabus. Other activities which provide credits may include a maximum of 7.5 credits for the licentiate degree and 15 credits for the doctoral degree. Requirements for courses in teaching and learning in higher education may be included if teaching within first and second cycle courses can take place.

**Thesis**

The thesis is a compulsory part of the postgraduate studies. This part of the education aims to develop the students' ability to make independent contributions to research, scientific cooperation, within and outside their own field. The thesis shall contain new research findings which the student has developed independently or in cooperation with others. The main scientific results should fulfil the quality
requirements for publication in internationally recognized journals with reference systems. It should be possible to distinguish one postgraduate student's contribution to the texts comprised by the thesis from that of the other authors involved.

The thesis should normally be written in English. It should be designed as a compilation of scientific articles but in special cases it can be presented as a monograph thesis. In the former case there should be a specific written summary. Irrespective of whether the thesis is intended to be a monograph thesis or a compilation thesis the aim during the postgraduate studies should be international publication of the achieved results. Licentiate essay work should contain scientific material corresponding to at least two regular articles eligible for publication in internationally recognized journals with peer review. A doctoral thesis should contain scientific material corresponding to at least four such articles. The doctoral thesis is normally based on the licentiate thesis.

**Entry requirements and selection**

**General and special admission requirements and prior knowledge**

In accordance with Chapter 7, Section 39 of the Higher Education Ordinance a person has basic eligibility for third level education if he or she

1. has taken a second level qualification,
2. has completed course requirements of at least 240 higher education credits, including at least 60 higher education credits at second level, or
3. has acquired essentially corresponding knowledge in some other way in Sweden or abroad. The faculty board may permit an exemption from the requirement of basic eligibility in the case of an individual applicant, if there are special grounds.

**Special eligibility**

The education is based on the premise that the student has acquired knowledge equivalent to courses at second level in the subject area Chemical Engineering but he/she may have another background which is relevant for the individual syllabus if during the admission the student lacks the prior knowledge necessary for taking the education at second level, the main supervisor should ensure that the student assimilates this prior knowledge during the first year. Assimilation of this prior knowledge cannot be awarded credits in the education's coursework, but should be stated as an objective in the individual syllabus and should be evaluated after the first year. Postgraduates are expected to be able to read and write scientific English and speak English fluently.

**Selection rules and procedures**

Admission to postgraduate studies is determined by the Dean at the School of Chemical Science and Engineering following preparation by the main supervisor and, where appropriate, the Director of Graduate Studies (during assessment of eligibility to study). In addition to the assessment of eligibility, the applicant's level of knowledge, maturity and ability to independently review and critically analyze form the basis of selection. Past academic performance for courses of an in-depth nature in academic education at first and second cycle and the independent scientific work are central in this assessment. The applicants
are interviewed by the main supervisor in order to obtain a comprehensive basis for the decision. Contact is usually made with former lecturers of the applicant. Selection among applicants for postgraduate studies is done by the main supervisor in connection with admission.

The programme’s degrees and examinations

Degree of Licentiate and Degree of Doctor (PhD)

The licentiate degree consists of coursework consisting of 30 credits and an essay of 90 credits.

The essay should be presented and defended in accordance with KTH's general regulations. The doctoral degree consists of coursework consisting of 60 credits and a thesis of 180 credits. The thesis should be presented and defended in accordance with KTH's general regulations. Courses and thesis work included in the licentiate degree may also be credited in a doctoral degree.

The programme’s examinations

The courses at postgraduate level should include a written or verbal knowledge test. The structure of the examination should, in each case, be such that the examiner can ascertain that the student has assimilated all the course content.