

## Doctoral Programme Description

**Established by the Faculty Council/Education Committee: 01/02/2012**

*Revised: 26/09/2018*

### **The name of the programme in Swedish and translated into English**

*Also indicated whether the programme has any specialisations.*

Programme name: Energi- och miljösystem (Energy and Environmental Systems)

### **Short description of subject area and contents**

*Indicate which third-cycle subjects are included in the programme. General syllabuses for the subjects included are attached to the programme description.*

The energy supply has become a decisive issue in human existence. In the last 150 years, our energy supply has gone from being based on the muscle force of humans and animals, to being based on stored finite energy resources in the form of fossil fuels and uranium. This has facilitated an amazing improvement of living standards for large parts of the earth's population, but has also caused problems at the same time. The use of fossil fuels, along with other human activities, has led to increased amounts of carbon dioxide in the atmosphere and thereby to a warmer climate. The finite resources that can be extracted at a low cost are also on the verge of running out, which will inevitably lead to higher prices on all forms of energy, and thereby to demands for more efficient conversion and use of energy.

The overall aim of research within the subject of Energy Technology is to contribute to resolving the problems above. Research can span a broad spectrum, including general system studies as well as development of components for parts of the energy system and studies of phenomena and processes that appear in energy conversion.

#### **The third-cycle subject comprises:**

- technical as well as socioeconomic studies of energy systems at a general (international, national) and local level
- methods, systems and components for energy conversion, both from primary energy to production, electricity and heating and from production, electricity and heating to utilities needed in society
- physical phenomena that emerge in conjunction with energy transformation processes
- methods to limit the environmental impact caused by energy transformation processes, including use of fluid energy sources and methods for streamlining energy use

### **Programme organisation**

*Programme Council (indicate included functions, not individuals), programme director, student representation, etc.*

The program is led by a *programme director (DA)* together with a *programme council* consisting of the management team of the Department of Energy Technology, including a doctoral student representative. The programme council is responsible for the quality and development of the programme. The council convenes once per month.

All supervisors (principal supervisors and assistant supervisors) associated with the programme are part of the programme supervisory staff. The supervisory staff comprises the academic arena for peer discussions regarding supervision matters, research quality, final seminars, the progress of doctoral students, follow-up of study plans, third-cycle courses, etc.

## Courses

### Course selection

Describe the course selection for the programme, which subject areas must be covered and how a relevant course selection is ensured.

The doctoral programme recommends a mix of advanced courses, complementary courses and courses relating to research skills.

*Recommended courses:*

<b>CENTRAL LITERATURE COURSES</b>	Course designation	Credits
<b>1. Advanced courses</b> - Thermodynamics - Heat Transfer - Literature studies - Introduction to Polygeneration - Integrated Assessment of Climate, Land- Use, Energy and Water Systems - Energy data, balances and projections - Energy system economics, modelling and indicators for sustainable energy development - Transport phenomena - Computational fluid dynamics - CO <sub>2</sub> Capture and Storage - Energy Technology and Sustainability - Energy storage - Environmental Pathways	MJ3116 MJ3114 MJ3118 MJ3121 MJ3381  MJ3382 MJ3383  3C5701 SG3114 KE3040 MJ3387 MJ3386 MJ3384	7.5 7.5 6 3 6  6 6  9 7.5 7.5 6 6 5
<b>2. Advanced courses relating to research skills</b> - Philosophy of Science and Research Methodology (or equiv) - Writing Scientific Articles - The Sustainable Scientist - Theory and Methodology of Science for Energy Research	AK3014 DS3102 AK3015 MJ3410	3 5 2 6
<b>3. Complementary courses</b> - Science Communication - Communication Skills for Energy - The Economics of Climate Change - Industrial and Technical Implications - Energy and Geopolitics - Life Cycle Assessment, Advanced Course - Environmental Strategic Methods	EO3110 DS3104 ME3510  AK3102 AG3202 1N5008	5 5 10  7.5 7.5 7.5
<b>OTHER COURSES</b> <b>4. Seminar participation</b> Introductory course - Research seminars - Basic Communication and Teaching (GKU) (Compulsory for students involved in teaching)	 MJ3122 LH200V	 1 4.5 3
<b>5. Project courses</b> Educational Aspects in Energy Technology	MJ3336	7.5

The following courses are **strongly** recommended for all doctoral students within the subject of Energy Technology:

- LH200V Basic Communication and Teaching (GKU) 3 HE credits (compulsory for doctoral students who will participate in teaching at KTH's first-cycle and second-cycle programmes during their programme)
- AK3014 The Theory and Methodology of Science – Minor Course 3.0 credits
- AK3015 The Sustainable Scientist 2.0 credits
- DS3102 Writing Scientific Articles 5.0 credits

## **Accreditation of courses**

In order to transfer credits, documentation is required to show that the course is not included in the entry requirements for the third-cycle programme. This can be information regarding the course being examined after completing examination for qualifications or the Master's Degree including more credits than is required for admission to third-cycle studies.

Where appropriate, the course code, course designation, higher education institution, HE credits and end date are indicated for courses to be accredited (certified by a copy of study results from the higher education institution). Decisions regarding accreditation are made by the programme director (DA).

Decisions regarding accreditation of courses that were not taken at an academic higher education institution must be assessed and approved by the Director of Third Cycle Studies (FA).

Documentation for accreditation (certificate or equivalent) where the principal supervisor/examiner has noted what may be accredited in the third-cycle programme. A certificate must show the doctoral student's achievement. This can be in the form of an examination, assignment, participation etc., i.e. what performance is requested by the course provider. The performance must be certified by the course provider. Where appropriate, the course code, course designation, higher education institution, HE credits and end date are indicated for courses to be accredited.

## **Quality assurance and follow-up of the programme courses**

*Indicate how the programme courses are followed up and how their quality is assured.*

The programme council has decided that the Department of Energy Technology must guarantee courses comprising at least 60 HE credits over four years. For planning purposes, both for doctoral students and for the course coordinator, all courses will be scheduled. Third-cycle courses comprising at least 15 HE credits will be offered each year. Quality assurance of courses is carried out through course evaluation and course analysis.

## **Support for goal attainment for each course, in addition to courses**

*Organised activities outside of courses, such as seminar series and workshops.*

The programme involves active participation in research seminars at the Department of Energy Technology. In addition to internal work seminars, each doctoral student must also present their research at no less than two official programme seminars over the course of their doctoral studies:

1. Licentiate seminar or intermediate seminar (approx. halfway)
2. Final seminar (when 3–6 months are assessed to remain until the public defence).

Two workshops (training days) are arranged each year, with a poster presentation of all doctoral students around lunch.

## **Description of continuous, systematic quality management**

*Describe regular evaluation and development activities.*

The administrative processes are evaluated at programme level once per year at the initiative of the programme director (DA). The administrative processes that are in common with the other third-cycle programmes at ITM are evaluated once per year in the school's Postgraduate Education Committee. If necessary, the committee can also initiate a more comprehensive review of programme content and programme structure.