Programme syllabus

Master's Programme, Materials and Sensors System for Environmental Technologies, 120 credits
Masterprogram, material och sensorsystem för miljötekniska tillämpningar 120.0 credits

Valid for students admitted to the education from autumn 08 (HT - Autumn term; VT - Spring term).

This is a translation of the Swedish, legally binding, programme syllabus.

Programme objectives

The overall aim of this master course is to prepare highly-qualified researchers and professionals able to manage and control the development and implementation of integrated solutions to environmental problems of industrial processes, with new materials and regulation systems.

With this purpose, this Master program will cover topics on Chemistry, Materials Engineering and Electronic Engineering. During this Master programme, students will intensify and study in depth the knowledge that they may have previously acquired in these areas. The multidisciplinary and applied nature of this Master programme provides an original international higher education proposal in the area of Materials Science that can be considered as complementary to other Masters already implemented in this area.

The programme is approved by the European Commission as an Erasmus Mundus Masters Course. This full-time programme is offered by the Universidad Politécnica de Valencia (Valencia, Spain), Kungliga Tekniska Högskolan (Stockholm, Sweden) and Università di Bologna (Bologna, Italy). A recognised double Master degree is awarded by the two Universities that the student has attended. All successful students (European and third-country) receive the same final degree.

Knowledge and understanding

Master students will acquire simultaneously specific knowledge in Engineering and relevant knowledge in materials, sensors systems and industrial processes design that will allow them to analyse and design equipments and installations, fulfilling environmental requirements.

Master students will attain:

- knowledge in traditional and new materials, as well as in their properties, characterization, finished products, and waste management. This will allow them to design performing materials, more economical and environmentally-friendly than current ones.
- knowledge about control systems, as well as about the fundamentals of their physical, chemical and technological parameters for their application as evaluation methods in different environments, including mobile conditions. This will allow students to understand the function of microcomputers, to design the machines state, to recognize processing data techniques and to know the special requirements of signal processing.
- knowledge about production processes and products, which will allow students to develop their capacity to anticipate to and diagnose environmental problems related to industrial processes.

Skills and abilities

General competencies related to the subject contents
to analyse and solve complex problems on environmental issues of industrial processes
• to design, characterize and study materials and their properties
• to design and use any type of sensor systems
• to have critical understanding of technical and scientific tools

Competencies related to the teaching methodologies

• to work and manage teams
• to manage and perform projects
• to develop negotiation abilities
• well-developed decision-making
• well-developed leadership
• communication skills (both written and oral)

Competencies related to the organisation of the programme

• knowledge of different European languages
• knowledge of different cultures
• well-developed interpersonal relationships
• to work in an international context

Ability to make judgements and adopt a standpoint

The student will be able to:

• critically assess a problem and in an independent manner acquire the information and knowledge that is necessary to establish a qualified opinion.
• have the ability to identify the need for further knowledge in the field and take responsibility for keeping her/his personal knowledge up to date.

Complete information on the degree requirements can be found in the local degree policy of KTH, see http://www.kth.se/info/kth-handboken/II/19/l.html

Extent and content of the programme

The nominal study time of the Master is 2 years and 120 ECTS in second (advanced) level. The education will be in English. The study programme is organised in three modules, of which Module I and Module II will be offered at KTH School of Chemical Science and Engineering:

• Module I: Industrial Process Design
• Module II: Materials Science
• Module III: Sensors Systems

Eligibility and selection

The programme Materials and Sensors Systems for Environmental Technologies will recruit students according to the following criteria. Students must have a degree in higher education, corresponding to a bachelor’s degree or equivalent (180 ECTS) with a basic formation in Chemical Engineering and/or Materials and Polymer Science. Students must be proficient in the language of the selected entrance university plus one more language in the consortium.

Applicants must provide proof of their proficiency in English (equivalent to Engelska B), which is most commonly established through an internationally recognized test. KTH accepts a TOEFL test score of a minimum of 550, 213 in the computer-based test, 79 in the internet based test (TOEFL code: 9520), or an IELTS score of at least 6.0, no band lower than 5.0, both general and academic accepted.

The admission criteria and procedure will be defined by the Consortium according to the rules specified by the EACEA for the Erasmus Mundus programmes.
Implementation of the education

Structure of the education

The academic year at KTH is divided into 4 study periods. Each study period is approximately seven weeks containing at least 33 study days. Each study period is followed by an examination period with at least five examination days. In addition to the ordinary examination periods (four) three re-examination periods are given; after the Christmas Holidays, after the assessment period in May and in August directly before the start of the first study period of the academic year. Complete information can be found on http://www.kth.se/info/kth-handboken/II/4/2.html

This Master is a two years programme that is structured according to the ECTS. The programme consists of 120 ECTS, divided in 60 ECTS each academic year. One academic year is in turn subdivided in 2 semesters (1 semester = 30 ECTS). The study programme is organised in three modules.

1. Module I: Industrial Process Design
2. Module II: Materials Science
3. Module III: Sensors Systems

- In order to provide initial broad formation in these three fields, during the first and second semesters, students should attend 54 ECTS of fundamental and profiling courses, chosen within the three modules.
- In the third semester, 24 ECTS of specialization courses can be chosen from the three modules, leading to wide specialization possibilities.
- In the fourth semester, students can also chose between performing a final Master Thesis or a final industrial internship (30 ECTS). Final Master Thesis will deal with a research topic in close relation to the research activities of the hosting University. At the end of the thesis, the student submits a thesis report.
- Industrial internship will allow the student to live a real professional experience, assisted by a supervisor at the enterprise and by another supervisor at the hosting university. At the end of the internship, the student must submit a final project work.
- The study programme also includes 12 ECTS of language courses (6 ECTS each academic year), including courses on the culture and language of the hosting European countries.

Individual study plans can be offered to each student, according to their particular interests. In order to be awarded by the Master degree, students should have passed at least 24 ECTS from each of the three modules.

Different teaching methods are used in this Master programme to help the students to reach and develop the above competencies: lectures sessions, seminars, practical classes, laboratory sessions, etc. Some of the courses of the Master program will be offered through the web-platform of their Universities, in order to perform continuous evaluation through the web. This will allow as well students to have an easy and quick access to all the information related to the subjects.

Moreover, a part of the learning activities are carried out in connexion with the professional world (industrial internships).

Courses

The programme is course-based. Lists of courses are included in appendix 1.

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Grading system

Courses in the first and the second cycle are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances.

The Master is a European Erasmus Mundus Programme where the ECTS grading system will be applied in the different countries of the Consortium.
Courses are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances.

**Conditions for participation in the programme**

The application should be done according to the rules of the Erasmus Mundus Consortium (see Annex 3). The student is registered at the Student Office of the School of Chemical Science and Engineering. At least 45 ECTS credits have to be completed during the first academic year in order to participate in the second academic year.

**Recognition of previous academic studies**

Under certain circumstances, and in agreement with the programme director, credits for previous studies can be received according to the local policy of KTH, see http://www.kth.se/info/kth-handboken/II/13/3.html

**Studies abroad**

- Students can choose one of the three Universities of the Consortium for their first semester. Students can take all the courses of the first and second semesters (S1, S2) at this entrance University. Optionally, students can change to one of the other two Universities of the Consortium for the second semester.
- For the second year, three different mobility paths are proposed. Students can spend the third and fourth semesters (S3, S4) in their second university, or they can attend each semester in one of the two Universities of their choice.

**Degree project**

Students admitted to the programme are required to perform an individual study in the form of a thesis project corresponding to 30 ECTS credits. To begin the thesis project, a student must normally have completed at least 60 ECTS credits of the total course work. The purpose of the thesis project is that the student demonstrates the ability to perform independent project work, using the skills obtained from the courses in the programme. It is the student's responsibility to find a suitable thesis project, with assistance from KTH.

The topic of the thesis must be agreed jointly by the professors of the Universities members of the consortium.

The thesis will be supervised and evaluated by the contractors according to local procedures and regulations of the respective institutions.

The Master Thesis is graded on a scale from A to F. A-E are passing grades, A is the highest grade.

More information on the KTH policy on the degree project can be found at: http://www.kth.se/info/kth-handboken/II/15/5.html

**Degree**

Students should have individually passed every subject in their study plan to be awarded by the Master Diploma. At least 85% presence in each module is required for examination. The most common form of examination is written tests. However, oral tests, reports, presentations, etc (performed individually or in a group) are also other forms of examination. All the exams (written and oral) will be carried out in English or in the national language of the hosting Institution. An active participation in all class activities will also be positively considered for final mark. All the exams and evaluation processes will be carried out at the corresponding hosting institution, where the courses are delivered.

At the end of the final Master thesis or industrial internship, students should prepare a written report. This final report will be submitted for its approval to an Evaluation Committee, in which two professors from each University will participate (optionally by video conference). This will ensure the required consistency in the award of the Master degree. Students should finally prepare an oral presentation of this final work that will be presented to and evaluated by the Evaluation Committee.

KTH’s local degree ordinance can be found in the KTH-handbook.
The application for the degree is done with special forms and is handed to the student office at the School of Chemical Science and Engineering

**Degree name**
Degree of Master of Science (Two Years) Major: Chemistry and Chemical Engineering Teknologe Masterexamen
Huvudområde: Kemi och kemiteknik See http://www.kth.se/info/kth-handboken/II/19/1x.html

Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions
Appendix 1: Course list

Master's Programme, Materials and Sensors System for Environmental Technologies, 120 credits (TMSSM), Programme syllabus for studies starting in autumn 2008

General courses

Year 1

Mandatory courses (100.5 credits)

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS150N</td>
<td>Swedish 1, Elementary Level</td>
<td>7.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>KD2020</td>
<td>Organic and Biochemical Analytical Separations</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KD2300</td>
<td>Biomedical Materials</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2010</td>
<td>Industrial Energy Processes</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2020</td>
<td>Chemical Engineering</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2070</td>
<td>Transport Phenomena, Advanced Course</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2130</td>
<td>Renewable Fuel Production Processes</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KE2170</td>
<td>Fuel Cell</td>
<td>6.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2180</td>
<td>Biopolymers</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2340</td>
<td>Chemical Sciences</td>
<td>15.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2360</td>
<td>Characterization of Polymers and Advanced Products</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2450</td>
<td>Fibre Technology - Natural and Synthetic Fibres</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>LI1041</td>
<td>Information Searching</td>
<td>1.5</td>
<td>First cycle</td>
</tr>
<tr>
<td>LI106N</td>
<td>Information Searching</td>
<td>1.5</td>
<td>First cycle</td>
</tr>
</tbody>
</table>

Supplementary information

Module 1:

Study of production processes and products, which will allow students to develop their capacity to anticipate and diagnose environmental problems related to industrial processes.

Courses:

DS150N, KE2010, KF2340, KE2130, KE2070, KE2020, KE2170, LI1041 and LI106N.

Module 2:
Focus on traditional and new materials, as well as in their properties, characterization, finished products, and waste management. This will allow them to design performing materials, more economical and environmentally-friendly than current ones.

Courses:

DS150N, KD2300, KF2340, KF2180, KF2360, KD2020, KF2450, LI1041 and LI106N

**Year 2**

**Mandatory courses (54.0 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK2036</td>
<td>Theory and Methodology of Science with Applications (Natural and</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td></td>
<td>Technological Science)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DS1300</td>
<td>Technical English, Lower Intermediate Level</td>
<td>6.0</td>
<td>First cycle</td>
</tr>
<tr>
<td>KE2080</td>
<td>Chemical Engineering in Fine and Specialty Chemicals</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2060</td>
<td>Pulp and Paper Processes</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2130</td>
<td>Polymer Chemistry</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2190</td>
<td>Polymeric Materials: Structure and Properties</td>
<td>7.5</td>
<td>Second cycle</td>
</tr>
<tr>
<td>KF2270</td>
<td>Structure and Properties of Organic Materials</td>
<td>9.0</td>
<td>Second cycle</td>
</tr>
</tbody>
</table>

**Supplementary information**

**Module 1:**

Study of production processes and products, which will allow students to develop their capacity to anticipate and diagnose environmental problems related to industrial processes.

Courses:

KE2080, KF2060, DS1300*, AK2036 and Master Thesis/Industrial Internship

**Module 2:**

Focus on traditional and new materials, as well as in their properties, characterization, finished products, and waste management. This will allow them to design performing materials, more economical and environmentally-friendly than current ones.

Courses:

KF2130, KF2270, KF2190, DS1300* and Master Thesis/Intustrial Internship

* You must take a placement test before applying for this course (you will be placed in “lower intermediate”, “upper intermediate” 9 ECTS, or “advanced level” 9 ECTS)
Appendix 2: Specialisations

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This programme has no specialisations.