



Programme syllabus

Master's Programme, Molecular Science and Engineering, 120 credits
Masterprogram, molekylär vetenskap och teknik
120.0 credits

Valid for students admitted to the education from autumn 15 (HT - Autumn term; VT - Spring term).

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

Programme objectives

Knowledge and understanding

To receive a Master of Science degree in *Molecular Science and Engineering* the student should:

- demonstrate general knowledge in and understanding of chemistry and in-depth knowledge in selected chemistry area.
- have insight into current research and development.
- demonstrate knowledge of the scientific basis for physical and chemical processes, different kinds of energy and their conversion, the properties and use of different materials, and to assess the applicability of the used models in different contexts.
- demonstrate knowledge of the importance of chemical, thermodynamic and kinetic aspects of chemical reaction routes.
- demonstrate knowledge in how the molecules are built-up, chemical and molecular measuring and characterization techniques, molecular reactions, molecular interactions and their influence on the properties, methods for synthesis and production of molecules, materials and surfaces as well as molecular aspects of sustainable development.
- be able to apply knowledge of mathematics, numerical analysis and other sciences in the field of chemistry.

Skills and abilities

To receive a Master of Science degree in *Molecular Science and Engineering* the student should:

- demonstrate the ability to develop chemical products and apply systematic thinking in terms of choice of raw materials, energy, security, environment, human conditions and needs as well as goals of sustainable society.
- demonstrate the ability to identify, formulate and manage current and real problems drawn from industry, society and research, taking into account the potential and limitations.
- demonstrate the ability to make assessment of the reasonableness of the obtained solutions, and compare and evaluate alternative solutions.
- demonstrate laboratory skills and knowledge of safe chemical managing, and the ability to implement and evaluate experiments on a laboratory scale and on a larger scale plan.
- demonstrate the skills to use computer tools for information retrieval.
- demonstrate the ability to orally and in writing present and discuss ideas and outcomes and communicate with persons with or without the technical scientific background.
- demonstrate ability to effectively work as an individual and as a team member to plan and implement projects within a given framework.

Ability to make judgements and adopt a standpoint

To receive a Master of Science degree in *Molecular Science and Engineering* the student should:

- demonstrate the ability to critically review the literature and technologies in areas related to chemistry.
- demonstrate the ability to take a stand on issues of ethical nature in their professional field.
- demonstrate an understanding for the fact that chemistry problems can be complex, incompletely defined and contain contradictory conditions, and also consider social, economic, commercial, environmental and working-environmental aspects.
- demonstrate the ability to rapidly acquire knowledge in new areas and to apply new knowledge for innovation and development of chemical products.

Extent and content of the programme

Molecular Science and Engineering is a two-year (120 credits) second cycle master's programme. The language of instruction is English.

Eligibility and selection

General admission requirements

A completed *Bachelor's degree* - corresponding to a Swedish Bachelor's degree (180 credits), or equivalent academic qualifications from an internationally recognized university.

Language requirements – applicants must prove their proficiency in English, which is most commonly established through an internationally recognized test.

Documentation – for detailed information about list of required documents, see “Admission requirements and selection” at www.kth.se

Specific admission requirements

In order to be admitted to the Molecular Science and Engineering programme, a Bachelor's degree in Chemistry or closely related subject, of 180 credits, including following is required:

- Courses in chemistry or closely related subject corresponding to at least 75 credits.
- Courses in mathematics corresponding to at least 20 credits.
- Basic knowledge in numerical analysis/computer science corresponding to at least 9 credits.

Selection process

The selection process is based on the following selection criteria: University, previous studies (for instance GPA, grades in specific subjects and English), motivation for the studies (for instance letter of motivation, references, thesis proposal and relevant work experience). The evaluation scale is 1-75.

For further information please see; study at KTH, “Admission requirements” at www.kth.se

Implementation of the education

Structure of the education

The academic year is 40 weeks and is divided into two semesters, autumn and spring. Each semester consists of two study periods. For information on the extent of the school year, the exam and re-examination see "student at KTH" schedules at www.kth.se

The programme consists of courses for 90 credits followed by a degree project on advanced level (30 credits). One mandatory course (7,5 credits) is included the first year. The rest of the courses are conditionally elective or recommended. The student is required to choose at least 3 courses listed as conditionally elective. The remaining courses should be selected from the courses listed as conditionally elective or recommended with the exception of 15 credits that can be chosen freely outside the list. This gives the student a great opportunity to create his/her own curriculum. Guidelines and recommendations for course combinations will be given.

Courses

The programme is course-based. Lists of courses are included in [appendix 1](#).

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.

Conditions for participation in the programme

Students accepted to the programme will start the programme in the end of August when the registration also takes place and where the student must be present in person. Thereafter the student must register to the term and to the courses via the personal menu. The students are required to make a course selection for the coming term via www.universityadmissions.se not later than November 15 and May 15 each academic year.

At least 45 credits have to be completed during the first academic year (including the re-examination period in August) in order for the student to be promoted to the second year of the programme. Students who have not passed 45 credits in the first year, must contact the educational coordinator for an individual study plan. This study plan will include residual courses and appropriate courses for the upcoming year. The student who has not done this will not be registered on any courses in the upcoming 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.

For more information see "regulations, policy in credit transfer" at www.kth.se

Studies abroad

For information about studies abroad, contact the international coordinator at the School of Chemical Science and Engineering.

Degree project

Students admitted to the programme are required to perform an individual study in the form of a degree project, advanced level, corresponding to 30 credits. This means 20 weeks of fulltime studies. To start the degree project at least 60 credits must be completed where at least 30 credits in the second cycle within the main field of study. The examiner of the degree project may add additional prerequisites.

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.

Information regarding the grading scale and criteria of the degree project work are found in the course syllabus.

More information on the KTH policy on the degree project can be found at www.kth.se

Degree

In order to graduate with the Degree of Master of Science (Two Years) a pass grade must be achieved in all courses, which are included in the student's study plan. The study plan shall comprise 120 higher education credits including a degree project comprising 30 higher education credits.

At least 90 credits are at second cycle, of which at least 60 higher education credits (including a 30- credits degree project) with in-depth studies in the main field of study.

Students who fulfil all the requirements will be awarded a Master of Science (120 credits). Students must apply for the degree. To apply use the web service “Application for degrees” that is found in the personal menu. For further information see www.kth.se

Degree name

Degree of Master of Science (120 credits)

Teknologie masterexamen

For further information see Local regulation for qualifications at first and second cycle at www.kth.se

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Master's Programme, Molecular Science and Engineering, 120 credits (TMVMTM), Programme syllabus for studies starting in autumn 2015

General courses

Year 1

Mandatory courses (7.5 Credits)

Course code	Course name	Credits	Edu. level
AK2036	Theory and Methodology of Science with Applications (Natural and Technological Science)	7.5 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
KD2310	Advanced Organic Chemistry	7.5 hp	Second cycle
KD2320	Spectroscopic Tools for Chemistry	9.0 hp	Second cycle
KD2330	Analytical Separations	7.5 hp	Second cycle
KD2350	Surfaces, Colloids and Soft Matter	7.5 hp	Second cycle
KD2360	Quantum Chemistry	9.0 hp	Second cycle

Recommended courses

Course code	Course name	Credits	Edu. level
BB2020	Molecular Enzymology	7.5 hp	Second cycle
BB2460	Biocatalysis	7.5 hp	Second cycle
KD2155	Solid State Chemistry: Structures and Methods	7.5 hp	Second cycle
KD2340	Molecular Thermodynamics	7.5 hp	Second cycle
KD2370	Photo, Radiation and Radical Chemistry	7.5 hp	Second cycle
KE2350	Risk Analysis and Management for Chemical Engineers	6.0 hp	Second cycle
ME2814	Ideation- Creating Your Own Company	7.5 hp	Second cycle

Supplementary information

Study year 1 consists of one mandatory course, at least three of the conditionally elective courses and recommended courses.

Recommended courses may be cancelled if number of admitted students are less than minimum of places, or will be given every second year.

Students in the Degree Progr. in Biotechnology, who wants to obtain the Degree of Master of Science in Engineering, Degree Programme in Biotechnology, must take these courses;

BB2460 Biocatalysis, 7,5 credits

BB2020 Molecular Enzymology 7.5 credits

Year 2

Recommended courses

Course code	Course name	Credits	Edu. level
BB2280	Molecular Modeling	7.5 hp	Second cycle
KD2170	Nano-structured Materials	7.5 hp	Second cycle
KD2300	Biomedical Materials	7.5 hp	Second cycle
KD2380	Corrosion and Surface Protection	7.5 hp	Second cycle
KD2385	Selective Organic Synthesis, Theory	6.5 hp	Second cycle
KD2390	Selective Organic Synthesis	9.0 hp	Second cycle
KD2420	Environmental Aspects of Atmospheric, Aquatic and Terrestrial Chemistry	7.5 hp	Second cycle
KE2110	Applied Electrochemistry	7.5 hp	Second cycle
KE2300	Electrochemical Energy Devices	7.5 hp	Second cycle
KE2350	Risk Analysis and Management for Chemical Engineers	6.0 hp	Second cycle
KF2130	Polymer Chemistry	7.5 hp	Second cycle
KF2140	Polymer Physics	7.5 hp	Second cycle

Supplementary information

This is a preliminary list of courses for study year 2 for those who started the program 2015. There might be changes. Recommended courses may be cancelled if number of admitted students are less than minimum of places, or will be given every second year.

Study year 2 consists of recommended courses and ends with a mandatory degree project, second level, 30 higher education credits.

(See listed degree projects, below)

Degree Project in Chemistry, Second Cycle - KD200X

Degree Project in Chemical Engineering, Second Cycle - KE200X

Degree Project in Fibre and Polymer Technology, Second Cycle - KF200X



Appendix 2: Specialisations

Master's Programme, Molecular Science and Engineering, 120 credits (TMVTM), Programme syllabus for studies starting in autumn 2015

This programme has no specialisations.