



Programme syllabus

Master's Programme, Engineering Materials Science, 120 credits
Masterprogram, teknisk materialvetenskap
120.0 credits

Valid for students admitted to the education from autumn 17 (HT - Autumn term; VT - Spring term).

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

Programme objectives

In addition to the objectives specified in the Swedish Higher Education Ordinance, there are also specific objectives for this programme. Graduates from the programme shall:

Knowledge and understanding

- Have extensive knowledge of both materials and processes in order to be able to develop and manufacture new materials and products.
- Have such knowledge as is required to be able to work in materials-related industries within research and development as well as in production and manufacturing.
- Have good insight into current research and development as well as industrial development trends.

Skills and abilities

- Be proficient in utilising modern modelling and simulation methods as well as their applications
- Possess the skills in presentation, communication and teamwork needed to establish good conditions for effective work, both individually and in collaboration in groups with different compositions of individuals
- demonstrate the skill required to participate in research and development work or to work independently in other advanced technical contexts
- demonstrate the ability to critically, independently and creatively plan and, using adequate methods and tools, create technical solutions, processes and systems that cater to human and societal needs and thus, from an ethical and professional standpoint, contribute to the development of knowledge in society

Ability to make judgements and adopt a standpoint

- Demonstrate professional and ethical accountability in scientific, technical, ecological and societal enterprises.
- Have an understanding of the fact that engineering problems, viewed from a systems perspective, are often complex, can be incompletely defined and sometimes involve conflicting conditions
- Demonstrate an understanding of the role of technology in society and people's responsibility for how it is used, including social and economic aspects as well as environmental and work environment aspects, and also in the development of new materials and processes
- Have the ability to identify their need of further knowledge and to continuously develop their skills.

The KTH local Degree Ordinance can be found in the KTH regulatory framework, www.kth.se.

Extent and content of the programme

The programme comprises 120 higher education credits, which corresponds to two years of full-time studies. The programme is in the second cycle and the language of instruction is English.

For the academic year 2017/2018, the programme has the following tracks that lead to a Degree of Master.

Track 1: Industrial Materials

Track 2: Materials and Process Design

Track 3. Sustainable Materials

The courses included in each track are found in appendix 1.

Choice of track is made in conjunction with the start of the programme. The choice is influenced and directed by the student's prior knowledge and profile from previous university education, and is decided in consultation with the programme director. There is no restriction on the number of places.

Language of instruction

Instruction is only provided in English.

Eligibility and selection

Eligibility requires a university education of at least 180 credits, a Bachelor of Science in Engineering or a technical Degree of Bachelor within the subject area of Materials Engineering.

Another similar technical or scientific first-cycle education and degree of at least 180 credits within, for example, Engineering Chemistry, Mechanical Engineering and Engineering Physics may also qualify the applicant, provided that relevant courses in mathematics, chemistry, physics, thermodynamics, engineering materials and solid mechanics are included

English skills equivalent to English, course B/6 are required.

The selection process is based on the following criteria: university, credits awarded (e.g. grades, grades in specific subjects and English), motivation for the studies (for instance, letter of motivation, references, courses and relevant professional experience). The assessment of qualifications scale is 1-75.

Otherwise refer to the KTH admission regulations in the KTH regulatory framework, www.kth.se

Implementation of the education

Structure of the education

Structure of the education

The academic year comprises 40 weeks and is divided into four periods. If necessary, instruction may be provided outside the parameters of the academic year.

The division of the academic year is presented on the KTH student web www.kth.se

The programme is organised around courses in the applied subjects relating to engineering science and technology that are of importance to the programme's technical and scientific profile. The teaching and use of professional skills and abilities of great importance to an engineer, for example, communication, ethics, entrepreneurship, sustainable development, corporate and societal aspects, are integrated into the programme's courses.

To create a unified whole, the programme emphasises cooperation between different subjects, both in a specific year and between years. This is achieved through courses being coordinated scheduling wise, having a progression of knowledge and skills, and through the different tracks having different entry requirements, as described below;

- 1) **Industrial Materials.** This track is only intended for students with a Materials Engineering or Metallurgical background and good knowledge of metallurgical theory and principles for the production of metals, basic theory for phase transformation and thermodynamics for phase diagrams, and equilibria and transformations in metallic and ceramic materials. For students on the Materials Design and Engineering Programme, this track also leads to a Degree of Master of Science in Materials Design and Engineering, otherwise to a Degree of Master in Engineering Materials Science.
- 2) **Materials and Process Design.** This track is intended for students with another technical or scientific university education within, for example, Engineering Chemistry, Mechanical Engineering and Engineering Physics. It has a specialisation like Industrial Materials, but with an arrangement involving introductory courses in the first semester, which means that the track can be followed by students without prior in-depth materials or metallurgical knowledge.
- 3) **Materials Processing.** This track is intended for students with a Metallurgical or Mechanical Engineering background and with an interest in machining processes, in particular plastic forming and modelling and simulation. This specialisation also provides a deeper understanding of the relationship between plastic machining and mechanical properties.
- 4) **Sustainable Materials.** This track is intended for students with a Materials Engineering or Metallurgical background with an interest in innovation and entrepreneurship. It has a focus on substitution/replacement and process technology recycling of metallic materials in a sustainable cycle-based approach to raw materials (circular economy). This track can grant students eligibility for participation in KIC EIT Raw Materials.

Courses

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

The programme is structured in the form of courses. Course lists are found in Appendix 1: Course list

The programme consists of compulsory, conditionally elective, recommended and optional courses. The compulsory courses are defined for each year and track/profile in course lists. The goals, entrance qualifications, content and course requirements for each course can be found in the official course syllabuses.

The type of instruction and examination format vary between the courses and these are indicated in each official course syllabus.

The optional courses can be chosen from KTH's range of offered courses. Credits from courses at other universities/higher education institutions can also be transferred if the qualification requirements are met.

The following limitations apply to optional courses:

- There is a limit imposed on the number of credits that may be chosen per semester
- An optional course may not correspond to a significant extent to an existing programme course or an already credited course
- Higher education preparatory courses may not be counted as optional courses
- Optional courses may be chosen freely but should be relevant to the professional role of engineer.

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

Semester registration

At the beginning of the semester, the student must submit a compulsory semester registration via their personal login a www.kth.se

Semester registration is required to take new courses and for credits awarded to be reported, and for any payments of student aid to be made by CSN.

Application for courses within the programme

Prior to each semester, the student must apply for all courses the student intends to take. Course application is done at www.antagning.se or www.universityadmissions.se

- 1 - 15 May for autumn semester
- 1 - 15 November for spring semester

If the student does not apply via www.antagning.se or www.universityadmissions.se, the application is only considered subject to availability.

The student can obtain information on how to apply from the school's office of student affairs.

Course registration

At course start, the student must register themselves on all courses. Course registration must be done individually, either via the student's personal login at www.kth.se or according to instructions from the school offering the course.

A student who has registered on a course, but has subsequently decided not to proceed with the course, must inform the school offering the course as soon as possible, according to the school's instructions.

Course registration requires that the student has been admitted to the course.

Conditions for studies in year 2

At least 45 credits from year 1, according to the course list of the programme syllabus, shall be earned by the end of the re-examination period in August.

Individual study plan

A student who does not fulfil the above requirements must, in consultation with the study advisor for the programme, establish an individual study plan for the continuing studies.

An individual study plan may mean that the student cannot be guaranteed full-time studies. See the KTH regulatory framework: www.kth.se

Recognition of previous academic studies

Students have the opportunity to apply to be given credit for results from a course or courses at another higher education institution/university within or outside the country. The entire KTH policy for credit transfer is included in KTH's regulatory framework, www.kth.se

As the grading systems differ widely between countries, grades from exchange studies are not translated to the KTH grading scale.

An application is made by submitting a form to the school's office of student affairs.

Studies abroad

Students have the opportunity to study abroad through agreements KTH has with universities within and outside the EU, www.kth.se. It is also possible to do a degree project abroad. For some exchanges, an application for scholarships can be made, e.g., Erasmus, etc.

The application deadline for studies abroad is around 15 December for the following academic year.

Degree project

Degree project, second cycle

The programme includes a degree project for a Degree of Master that comprises 30 credits and which is usually carried out in the spring semester of year 2.

Commencement of the degree project requires that the majority of the studies in the Master's Programme are completed, i.e.,

- that 60 credits have been obtained, of which 30 credits relate to specialised studies in the second cycle within the Master's Programme.

KTH's comprehensive rules and guidelines for a degree project, 30 credits, for a Degree of Master, 120 credits, can be found in the KTH regulatory framework. www.kth.se

Degree

Application for a certificate

The student must apply for a certificate. Applications are made by logging on to the KTH website where "Applications for degrees" is found under the heading Programme.

Conditions for a Degree of Master, 120 credits

A Degree of Master of Science is obtained after completing the degree programme. The programme is designed so that the student, when they graduate, has fulfilled the national qualification requirements with a passing grade in all courses included in the student's study plan of 120 credits, of which

- at least 90 credits are attained in the second cycle, which includes at least 60 credits (including a 30 credit degree project) of specialised studies within the programme's main field of study.

Title of general qualification at second cycle

Degree of Master of Science (120 credits)

Teknologie masterexamen

Refer to the KTH guidelines (KTH regulatory framework), local directions for higher education qualifications at first and second cycle, the local Degree Ordinance www.kth.se

[Appendix 1 - Course list](#)

[Appendix 2 - Programme syllabus descriptions](#)



Appendix 1: Course list

Master's Programme, Engineering Materials Science, 120 credits (TTMVM), Programme syllabus for studies starting in autumn 2017

Track, Industrial Materials (IMTA)

Year 1

Mandatory courses (31.5 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
MH2039	Process Engineering	6.0 hp	Second cycle
MH2040	Applied Thermodynamics and Kinetics, Part 1	6.0 hp	Second cycle
MH2041	Applied Thermodynamics and Kinetics, Part 2	6.0 hp	Second cycle
MH2042	Simulation and Modeling Toolbox	6.0 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
ME2063	Team Leadership and Human Resource Management At least 30 hp conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2000	Experimental Methods At least 30 hp conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2046	Quantum Metallurgy At least 30 hp conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2048	Advanced Course in Materials Design At least 30 hp conditionally elective courses must be chosen during year 1-2.	9.0 hp	Second cycle
	Advanced Course in Process Science		

MH2049	At least 30 hp conditionally elective courses must be chosen during year 1-2. Powder Metallurgy	9.0 hp	Second cycle
MH2100	At least 30 hp conditionally elective courses must be chosen during year 1-2. Casting Processing	6.0 hp	Second cycle
MH2252	At least 30 hp conditionally elective courses must be chosen during year 1-2. Combustion in Industrial Processes	6.0 hp	Second cycle
MH2601	At least 30 hp conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle

Supplementary information

At least 30 hp conditionally elective courses must be chosen during year 1-2.

Year 2

Conditionally elective courses

Course code	Course name	Credits	Edu. level
KD2380	Corrosion and Surface Protection At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	7.5 hp	Second cycle
ME2016	Project Management: Leadership and Control At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MF2046	Product Innovation At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2045	Energy and Materials Sustainability At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2280	Simulation and Modelling in Materials Processing At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2281	Metal Forming At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2450	International Seminar in Material Processes At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2501	Economical Process Analysis and Strategy At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle

[Industrial Metallurgical Processes](#)

[MH2504](#) At least 30 credits of the conditionally elective courses must be chosen during year 1-2. 6.0 hp Second cycle

Supplementary information

At least 30 hp conditionally elective courses must be chosen during year 1-2.

Mandatory: Degree Project in Engineering Materials Science second level 30 credits

Track, Materials design (MDNA)

Year 1

Mandatory courses (18.0 Credits)

Course code	Course name	Credits	Edu. level
MH2029	Extractive Metallurgy	6.0 hp	Second cycle
MH2032	Mechanical Properties of Materials	6.0 hp	Second cycle
MH2038	Micro and Nano Structures in Materials	6.0 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
MH2000	Experimental Methods At least 30 hp conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2040	Applied Thermodynamics and Kinetics, Part 1 One of the courses MH2040/MH2041 is compulsory and the other is conditionally elective	6.0 hp	Second cycle
MH2041	Applied Thermodynamics and Kinetics, Part 2 One of the courses MH2040/MH2041 is compulsory and the other is conditionally elective	6.0 hp	Second cycle
MH2042	Simulation and Modeling Toolbox At least 30 hp conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2046	Quantum Metallurgy At least 30 hp conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2048	Advanced Course in Materials Design At least 30 hp conditionally elective courses must be chosen during year 1-2.	9.0 hp	Second cycle
	Advanced Course in Process Science		

MH2049	At least 30 hp must be chosen during year 1-2.	9.0 hp	Second cycle
MH2100	Powder Metallurgy At least 30 hp must be chosen during year 1-2.	6.0 hp	Second cycle
MH2252	Casting Processing At least 30 hp must be chosen during year 1-2.	6.0 hp	Second cycle
MH2300	Functional Materials At least 30 hp must be chosen during year 1-2.	6.0 hp	Second cycle
MH2601	Combustion in Industrial Processes At least 30 hp must be chosen during year 1-2.	6.0 hp	Second cycle

Supplementary information

At least 30 hp conditionally elective courses must be chosen during year 1-2.

One of the courses MH2040 and MH2041 is mandatory and the other is conditionally elective.

Year 2

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
MF2046	Product Innovation At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2045	Energy and Materials Sustainability At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2281	Metal Forming At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2450	International Seminar in Material Processes At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2501	Economical Process Analysis and Strategy At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
	Industrial Metallurgical Processes		

[MH2504](#) At least 30 credits of the conditionally elective courses must be 6.0 hp Second cycle chosen during year 1-2.

Supplementary information

Mandatory: Degree Project in Engineering Materials Science second level 30 credits.

At least 30 credits of the conditionally elective courses must be chosen during year 1-2.

Track, Sustainable Materials (SUMA)

Year 1

Mandatory courses (13.5 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
MF2032	Eco Design	6.0 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
ME2719	Entrepreneurship and Innovation	7.5 hp	Second cycle
MF2022	Eco Design Project	6.0 hp	Second cycle
MH2029	Extractive Metallurgy	6.0 hp	Second cycle
MH2032	Mechanical Properties of Materials	6.0 hp	Second cycle
MH2038	Micro and Nano Structures in Materials	6.0 hp	Second cycle
MH2039	Process Engineering	6.0 hp	Second cycle
MH2040	Applied Thermodynamics and Kinetics, Part 1 One of the courses MH2040 and MH2041 is mandatory and the other is conditionally elective	6.0 hp	Second cycle
MH2041	Applied Thermodynamics and Kinetics, Part 2 One of the courses MH2040 and MH2041 is mandatory and the other is conditionally elective	6.0 hp	Second cycle
MH2048	Advanced Course in Materials Design One of the courses MH2048 and MH2049 is mandatory and the other is conditionally elective	9.0 hp	Second cycle
MH2049	Advanced Course in Process Science One of the courses MH2048 and MH2049 is mandatory and the other is conditionally elective	9.0 hp	Second cycle
MH2100	Powder Metallurgy	6.0 hp	Second cycle
MH2300	Functional Materials	6.0 hp	Second cycle

Supplementary information

One of the courses MH2040 and MH2041 is mandatory and the other is conditionally elective.

One of the courses MH2048 and MH2049 is mandatory and the other is conditionally elective.

At least 30 hp conditionally elective courses must be chosen during year 1-2.

Year 2

Mandatory courses (36.0 Credits)

Course code	Course name	Credits	Edu. level
MH202X	Degree Project in Materials and Process Design, Second Cycle	30.0 hp	Second cycle
MH2045	Energy and Materials Sustainability	6.0 hp	Second cycle

Conditionally elective courses

Course code	Course name	Credits	Edu. level
AL2181	Environmental System Analysis and Decision-making At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	7.5 hp	Second cycle
ME2016	Project Management: Leadership and Control At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MF2046	Product Innovation At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2450	International Seminar in Material Processes At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2501	Economic Process Analysis and Strategy At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle
MH2504	Industrial Metallurgical Processes At least 30 credits of the conditionally elective courses must be chosen during year 1-2.	6.0 hp	Second cycle

Supplementary information

At least 30 credits conditionally elective courses must be chosen during year 1-2.

Conditionally elective is also:

MH2051 Circular economy for materials processing, 7,5hp (period 1)



Appendix 2: Specialisations

Master's Programme, Engineering Materials Science, 120 credits
(TTMVM), Programme syllabus for studies starting in autumn 2017

Track, Industrial Materials (IMTA)

Track, Materials design (MDNA)

Track, Sustainable Materials (SUMA)