

Programme Regulations 2019
of the Master's degree programme in
Quantum Engineering
Departments of
Information Technology and Electrical Engineering⁽¹⁾
and
Physics

16 October 2018

*This English translation is for information purposes only.
The original German version is the legally binding version.*

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¹ Department in charge

**Programme Regulations 2019 of the
Master's degree programme in Quantum Engineering
Department of Information Technology and Electrical Engineering
Department of Physics**

16 October 2018 (Version: 16 October 2018)

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The ETH Zurich Executive Board,

pursuant to Art. 4, Para. 1, Subpara. a of the ETH Zurich Organisational Ordinance (*Organisationsverordnung ETH Zürich*) of 16 December 2003,⁽²⁾

decrees:

Chapter 1: General regulations

Part 1: General

Art. 1 Subject and scope, Appendix

¹ These Programme Regulations set out the requirements according to which the Master's degree in Quantum Engineering at the ETH Zurich Departments of Information Technology and Electrical Engineering (D-ITET) and Physics (D-PHYS) may be acquired.

² D-ITET and D-PHYS are joint sponsors of the specialised⁽³⁾ Master's degree programme in Quantum Engineering (subsequently 'the degree programme'). D-ITET is in charge of the programme.

³ The Appendix is a part of these Programme Regulations.

⁴ Any changes to these Programme Regulations or the appendix are undertaken only on the request of or in consultation with D-ITET and D-PHYS. Moreover:

- a. Changes to the Programme Regulations are subject to the approval of the Executive Board
- b. Changes to the Appendix are subject to the approval of the Rector

² RSETHZ 201.021

³ A specialised Master's degree programme in the sense of Art. 3, Para. 3 of the Bologna Directives of 28 May 2015 (SR 414.205.1, only available in German).

Art. 2 Steering committee

¹ In addition to the normal D-ITET and D-PHYS bodies, a steering committee oversees academic matters relating to the degree programme. This committee also determines

- a. the professors and other lecturers who may be selected as tutors (see Art. 11) or as supervisors of semester projects and/or Master's theses (see Art. 28 and 30);
- b. the members of the admissions committee.

² The steering committee comprises

- a. the D-ITET Director of Studies (or the D-ITET study programme coordinator as delegate)
- b. two to four representatives each from D-ITET and D-PHYS (each department select their representatives according to departmental procedures)

Art. 3 Academic title

¹ Graduates of the degree programme are awarded the academic title

Master of Science ETH in Quantum Engineering
(abbreviation: MSc ETH QE)

² This title may also be used in the abbreviated form 'MSc ETH'.

Art. 4 Legal basis

These Programme Regulations are based upon the stipulations set out in the following legal documents:

- a. Ordinance on Course Units and Performance Assessments at ETH Zurich of 22 May 2012⁴ (ETH Zurich Ordinance on Performance Assessments)
- b. Ordinance on Admission to Studying at ETH Zurich of 30 November 2010⁵ (*Zulassungsverordnung ETH Zürich*)

Part 2: Credit system

Art. 5 Policy

¹ The degree programme follows a credit system which is aligned with the European Credit Transfer System (ECTS).

² ETH Zurich deploys the ECTS in accordance with the Rector's Credit System Guidelines (*Richtlinien zum Kreditsystem*).⁶

⁴ RSETHZ **322.021en** (*in English*), SR **414.135.1** (*in German*)

⁵ (*only available in German*) SR **414.131.52**, RSETHZ **310.5**

⁶ See www.weisungen.ethz.ch (*in German only*)

Art. 6 Credits, basis for calculation

- ¹ Credits describe the average time expenditure required to achieve a learning goal.
- ² One credit corresponds to a workload of 30 hours. This workload comprises all of the study-related activities required to obtain said credit.
- ³ The curriculum is designed such that full-time students may obtain an average of 30 credits per semester.

Art. 7 Allocation of credits

- ¹ D-ITET and D-PHYS allocate a certain number of credits to each course unit they offer.
- ² If an ETH Zurich course unit is found on the curriculum of more than one ETH Zurich degree programme, the department offering the course unit assigns it a standard number of credits in consultation with those integrating it into a programme. The Rector of ETH Zurich settles any cases of disagreement.
- ³ If a course unit is offered by another university that university is responsible for allocating it a certain number of credits.

Art. 8 Issuing of credits

- ¹ Credits are issued for satisfactory performance. Performance is considered satisfactory if it has been awarded a grade of at least a 4, or a 'pass'.
- ² No credits are issued for unsatisfactory performance.
- ³ The full number of credits are always issued if the prerequisites of Para. 1 have been satisfied. Partial issue of credits is not permitted.
- ⁴ The number of credits issued is that number published in the Course Catalogue valid at the time the respective performance assessment was undertaken.

Art. 9 Recording, checking, administration

D-ITET records, checks and administers the credits acquired.

Chapter 2: Content, structure and scope of the Master's degree programme

Part 1: Content, structure and scope

Art. 10 Programme content, structure

¹ Quantum Engineering addresses the development of technologies which deploy the laws of quantum mechanics. Its concerns include improving measurement accuracy and developing processing power which outperforms that of classical supercomputers. The Master's degree programme in Quantum Engineering is an interdepartmental teaching, research and infrastructure programme. Its aims are to train students at the interface of science and technology, and in so doing to define quantum sciences as a tool for engineers.

² The Master's degree programme comprises compulsory and elective courses in quantum engineering, a semester project, a six-month Master's thesis project and practical training in the area of quantum engineering (in industry or in the laboratory). The Master's degree prepares the student for doctoral work or for entry to the labour market

³ Details of the progression of the programme and recommendations thereto are published on the degree programme website.

Art. 11 Tutoring system, individual study plan

¹ The studies of every student in this degree programme are shaped and coordinated under the guidance of a professor or another lecturer ('tutor'). Possible tutors are listed on the degree programme website.

² After admission to the programme students must submit a list of three tutors, in order of preference. When they enter the programme they are allocated a tutor.

³ In consultation with the student, the tutor assembles the target subjects (courses and practical training) in the form of a study plan, with attention to the predetermined allocation of courses to categories in the Course Catalogue (see Art. 17). D-ITET determines deadlines and further modalities for compiling and adapting the individual study plan.

⁴ The Director of Studies settles any disputes between student and tutor regarding course selection.

⁵ The individual study plan should guarantee a solid, varied educational foundation and at the same time take into account the student's talents and expectations. The tutor is available for guidance throughout the Master's degree programme.

⁶ The study plan is binding. Courses may only be counted towards the Master's degree if they are listed in the individual study plan.

⁷ Any student who wishes to change his/her tutor should submit a well-grounded request to the Director of Studies. The Director of Studies may, on cogent grounds, deny the request. A change of tutor is also subject to the following:

- a. Changes are only possible at the beginning of a semester.
- b. A change does not entitle the student in question to an extension of the maximum permitted duration of studies.
- c. Disagreements between the Director of Studies and the student are settled by the Rector.

Art. 12 Scope, duration, limits on duration of studies

¹ As stipulated in Art. 31, 120 credits are required to obtain a Master's degree.

² The normal duration of the degree programme is two years.

³ The maximum permitted duration of studies is four years. The Rector may extend this if cogent grounds are provided in a request submitted by the specific deadline.

⁴ If admission to the degree programme is granted subject to the acquisition of additional credits the maximum permitted duration of studies may be extended by half a year for required extra credits in the range of 21 – 30 and by one year for required extra credits in the range of 31 – 60. For fewer than 21 required extra credits no extension is granted.

Art. 13 Course Catalogue

¹ Every semester, after consulting with the steering committee, D-ITET lists the course units of the degree programme in the Course Catalogue. This list is binding.

² The details of the entries in the Course Catalogue are set out in Art. 4 of the ETH Zurich Ordinance on Performance Assessments⁽⁷⁾ and in the corresponding implementation stipulations⁽⁸⁾ of the Rector.

Art. 14 Language of instruction

Course units and the corresponding performance assessments are normally conducted in English. The language of instruction of ETH course units is also subject to the pertaining Rector's directives⁽⁹⁾.

⁷ RSETHZ 322.021en (*in English*), SR 414.135.1 (*in German*)

⁸ See www.directives.ethz.ch

⁹ See www.directives.ethz.ch

Art. 15 Admission to course units

Special admission prerequisites may apply to a course unit. If these are not specified in these Programme Regulations, they are specified by that ETH Zurich department or the university which offers the respective course unit.

Art. 16 Student exchange (ETH Master's degree students)

¹ During the Master's degree programme credits may be acquired at other universities (mobility credits). Of these mobility credits a maximum of 30 may be recognised towards the Master's degree. The stipulations of Para. 3 and 4 below still apply.

² Credits from course units of other universities do not qualify as mobility credits if said course units belong to the degree programme curriculum.

³ Students who did not complete the preceding (Bachelor's) degree at ETH Zurich may not take part in ETH Zurich exchange programmes. Individual exchange stays are possible, but the recognition of mobility credits towards the Master's degree is not possible.

⁴ If admission to the degree programme is subject to the acquisition of additional credits (admission with additional requirements) an exchange stay is only possible after all additional requirements have been fulfilled. Mobility credits may not be counted towards fulfilment of additional requirements.

⁵ For an exchange stay the student draws up a written study plan in advance with the help of the Tutor. This plan includes the credits to be acquired at the host university. It must be approved by the Director of Studies in consultation with the D-ITET Student Exchange Coordinator.

⁶ The Director of Studies decides whether mobility credits will be recognised. Art. 16 of the ETH Zurich Ordinance on Performance Assessments⁽¹⁰⁾ and the pertaining implementation stipulations⁽¹¹⁾ of the Rector set out how proof of academic achievement is handled.

⁷ Questions regarding student exchange may be referred to the D-ITET Student Exchange Coordinator.

¹⁰ RSETHZ **322.021en** (*in English*), SR **414.135.1** (*in German*)

¹¹ See www.directives.ethz.ch

Part 2: Grouping by category

Art. 17 Grouping by category

¹ To obtain a Master's degree, study achievements are required in the following categories. The minimum number of credits required in each category is set out in Art. 31.

- a. Core courses
- b. Electives
- c. Semester project
- d. Practical training
- e. Science in Perspective
- f. Master's thesis

² In consultation with the Steering Committee, D-ITET assigns course units to the categories in Para. 1 and publishes them in the Course Catalogue.

Art. 18 Overview of categories

¹ Core courses

Core courses cover foundational knowledge in core areas of quantum technology. They are selected by the tutor and the student in consultation and set out in an individual study plan. Details of performance assessments are set out in Art. 27.

² Electives

Electives enable the student to deepen degree-specific knowledge and/or extend knowledge in interdisciplinary courses. They are selected by the tutor and the student in consultation and set out in an individual study plan. Further details, e.g. regarding performance assessments, are set out in Art. 27.

³ Semester project

The semester project, where students must apply the disciplinary and social skills they have acquired, gives them the opportunity to gain experience by solving a technical problem independently and addressing scientific work in a research project. Further details, e.g. regarding performance assessments, are set out in Art. 28.

⁴ Practical training

Students must complete practical training in research or in industry, which is arranged in consultation with the tutor. The goal of practical training is to familiarise students with work environments. Here they have the opportunity to get involved in current projects of the respective institution. Further details are set out in Art. 29.

⁵ **Science in Perspective**

Students are required to complete course units from the “Science in Perspective” programme. Details are set out in the pertaining directive⁽¹²⁾; stipulations regarding performance assessments are listed in Art. 27 below.

⁶ **Master’s thesis**

The Master’s thesis concludes the degree programme. With the Master’s thesis students demonstrate their ability to produce independent, structured scientific work. Further details are set out in Art. 30.

Chapter 3: Admission to the Master’s degree programme

Art. 19 Prerequisites for admission

¹ Admission to the degree programme presupposes a university Bachelor’s degree comprising at least 180 ECTS credits, an equivalent university degree, or a Bachelor’s degree from a Swiss university of applied sciences in a discipline which qualifies the holder for the degree programme. The qualifying disciplines are listed in the appendix.

² Details of the academic, language and performance prerequisites for admission (profile of requirements) are provided in the Appendix.

Art. 20 Application, admission procedure and entry to the Master’s degree programme

¹ All candidates should apply to the ETH Zurich Admissions Office for admission to the degree programme.

² The admissions committee of the degree programme investigates candidates’ academic backgrounds and suitability for the Master’s degree programme and submits a recommendation for admission/rejection to the Director of Studies.

³ The Rector decides whether to admit/reject the candidate on the basis of the recommendation of the Director of Studies.

⁴ The Rector may, depending on the candidate’s qualifications and previous knowledge, make admission conditional upon the acquisition of additional knowledge and competences during the Master’s degree programme (admission with additional requirements).

⁵ Details regarding application, the admission procedure and entry to the Master’s degree programme are determined by the Rector. They are set out in the Appendix.

¹² See www.directives.ethz.ch

Chapter 4: Performance assessments

Part 1: General regulations

Art. 21 Performance evaluation

Performance in examinations is graded. Performance in other forms of performance assessment is either graded or evaluated on a pass/fail basis.

Art. 22 Admission to performance assessments

Admission to performance assessments may be subject to conditions. If these are not specified in these Programme Regulations, they are specified by that ETH Zurich department or the university which offers the respective course unit.

Art. 23 Registering for / deregistering from performance assessments

¹ The following provisions apply to registration for / deregistration from performance assessments at ETH Zurich:

- a. If the performance assessments in question are end-of-semester examinations or session examinations, registration and deregistration are governed by the stipulations of the ETH Zurich Ordinance on Performance Assessments⁽¹³⁾ and the associated implementation stipulations of the Rector⁽¹⁴⁾.
- b. If the performance assessments fall into another category, registration and deregistration are generally handled by the respective lecturer in person.

² If the performance assessments concerned are those of another university, registration and deregistration are subject to the rules of the respective university.

Art. 24 Absence, interruption, breaking off, late submission or non-submission

The following stipulations apply to absence from, interruption or breaking off of, and late submission or non-submission of performance assessments:

- a. ETH Zurich performance assessments are governed by the stipulations of the ETH Zurich Ordinance on Performance Assessments⁽¹⁵⁾ and the associated implementation stipulations of the Rector⁽¹⁶⁾.
- b. Performance assessments of another university are subject to the rules of the respective university.

¹³ SR 414.135.1, RSETHZ 322.021

¹⁴ See www.weisungen.ethz.ch

¹⁵ SR 414.135.1, RSETHZ 322.021

¹⁶ See www.weisungen.ethz.ch

Art. 25 Issuing of results, disputes

¹ Students may view all of their performance results online via the corresponding ETH Zurich application. They are informed by email as to which performance assessment results are now viewable.

² The procedure in cases of disagreement regarding newly documented results is outlined each time results are issued.

Art. 26 Dishonest conduct

The sanctions for dishonest conduct in the context of performance assessments are outlined in the Disciplinary Code of ETH Zurich (*Disziplinarordnung ETH Zürich*) of 2 November 2004¹⁷.

Part 2: Performance assessments in the Master's degree programme

Art. 27 Core courses, Electives, Science in Perspective

¹ Every course unit in the categories 'core courses', 'electives' and 'science in perspective' is subject to a performance assessment.

² The respective mode of each performance assessment is listed in the Course Catalogue if the course unit is offered by ETH Zurich.

³ If a course unit is offered by another university that university determines the performance assessment mode of said course unit.

⁴ A performance assessment is passed if it is awarded a grade of at least a 4 or a 'pass'.

⁵ A failed performance assessment may be repeated once unless the ETH Zurich department or the university offering the respective course unit stipulates otherwise.

⁶ A performance assessment, once passed, may not be repeated.

⁷ The categories 'core courses' and 'electives' are also subject to the following special stipulations:

- a. The core courses and electives to be completed are listed in the individual study plan, which is binding.
- b. If students cannot earn credits in a core course because they have failed it twice, they may adjust the study plan once. The change must be approved by the tutor. The provisions of Art. 31, Para. 2 also apply.

¹⁷ SR 414.138.1, RSETHZ 361.1

- c. If students cannot earn credits in an elective because they have failed the respective performance assessment twice, they must adjust the study plan. The change must be approved by the tutor.

Art. 28 Semester project

¹ The semester project is supervised by a professor (supervisor). The names of possible supervisors are listed on the degree programme website.

² The supervisor determines the starting date of the semester project and its evaluation criteria and sets these out in writing, and grades the student's performance.

³ It is recommended that the semester project and Master's thesis (see Art. 30) be supervised by two different professors.

⁴ The semester project may take a maximum of 14 weeks if it is undertaken during the semester alongside lectures. This means that half of the total time allotted for full-time studies may be used. If all of the total time allotted for full-time studies is used, the project may take a maximum of 7 weeks. The Director of Studies may approve an extension if cogent grounds are given.

⁵ The semester project is passed if it is awarded a grade of at least a 4.

⁶ A failed semester project may be repeated once. If it is repeated, a new theme must be addressed. The repetition may be conducted under a new supervisor.

⁷ A semester project, once passed, may not be repeated.

Art. 29 Practical training

¹ Practical training in industry or in a research laboratory inside or outside the ETH domain is a compulsory element of the Master's degree programme. It is usually conducted during the programme; exceptions as to timing are decided by the Director of Studies.

² Practical training is selected in consultation with the tutor.

³ If practical training takes place outside ETH Zurich, students are responsible for ensuring that the institution in which they complete it issues them with a confirmation of practical training.

⁴ Performance in practical training is graded on a pass/fail basis. Grading proceeds according to the stipulations of the respective research laboratory or via the confirmation of practical training mentioned in Para. 3. The Director of Studies decides whether practical training outside of ETH Zurich will be recognised.

⁵ Failed practical training may be repeated once.

⁶ Further details regarding practical training are provided in the pertaining D-ITET guidelines.

Art. 30 Master's thesis

¹ Students are only permitted to commence the Master's thesis if

- a. the Bachelor's degree programme has been completed
- b. any additional requirements for admission to the degree programme have been fulfilled
- c. the required minimum number of credits in the 'core courses' category has been acquired (see Art. 31, Para. 1 (a); and
- d. the semester project and the practical training (see Art. 31 Para 1 (b) and (c) have been successfully completed, and the corresponding credits have been acquired

² The Director of Studies rules on any exceptions to Para. 1 (c) and (d). Exceptions require a well-grounded request from the Master's thesis supervisor and the consent of the tutor. Exceptions to Para. 1 (a) and (b) are not permitted.

³ The Master's thesis is supervised by a professor (supervisor). Potential professors for this role are listed on the degree programme website.

⁴ The supervisor sets the date for beginning the Master's thesis, determines its evaluation criteria in writing, and grades it.

⁵ It is recommended that the Master's thesis and the semester project (see Art. 28) be supervised by two different professors.

⁶ The Master's thesis project lasts six months (full-time). The Director of Studies may, on request, grant an extension if cogent grounds are given.

⁷ The Master's thesis project concludes with a written report and an oral presentation.

⁸ The Master's thesis is passed if the grade it receives is at least a 4.

⁹ A failed Master's thesis project may be repeated once. If it is repeated, a new theme must be addressed. The repetition may be conducted under a new supervisor.

¹⁰ A Master's thesis, once passed, may not be repeated.

Chapter 5: Issuing of the Master's degree

Part 1: Credits by category, and degree request

Art. 31 Credits by category

¹ The 120 credits required for the Master's degree must be earned in the following categories in at least the numbers given. Further details are set out in Para. 2 and 3.

- | | | |
|----|---------------------------------------|-------------------|
| a. | Core courses and electives | 64 credits |
| | 1. Core courses (at least 24 credits) | |
| | 2. Electives (-- credits) | |
| b. | Semester project | 12 credits |
| c. | Practical training | 12 credits |
| d. | Science in Perspective | 2 credits |
| e. | Master's thesis | 30 credits |

² Of the 64 credits required in the category 'core courses and electives' (Para. 1 (a))

- a. at least 24 credits must come from the category 'core courses'. At least four core courses must be completed, irrespective of whether the minimum of 24 credits could be earned by taking fewer than four.
- b. any credits still to be earned to make up the required sum of 64 must come from the 'Electives' category.

³ D-ITET oversees compliance with the stipulations set out in Para. 2.

Art. 32 Degree request

¹ When they have fulfilled the requirements set out in Art. 31 students may request the issue of the Master's degree. The degree request must be submitted within four years of commencing the Master's degree programme. The Rector may extend this deadline if cogent grounds are provided by the respective request deadline.

² The request should contain all those study achievements with pass grades in the categories and sub-categories listed in Art. 31 which are to be listed in the final academic record. The sum of credits in each category and sub-category must reach the minimums designated in Art. 31.

³ The following points also apply to recognition of study achievements for the Master's degree:

- a. In the categories 'cores courses' and 'electives', only course units listed in the individual study plan can be recognised. Further details are provided in Art. 11.

- b. A maximum of 130 credits may be recognised towards the Master's degree in the final academic record. All other study achievements are listed on a separate sheet of the academic record.
- c. A maximum of 30 mobility credits may be recognised towards the Master's degree. The stipulations of Art. 16 apply.

⁴ The credits earned by completing a course unit may not be recognised more than once, or divided up.

⁵ Recognition of study achievements or credits from preceding studies is not possible. Exceptions are listed in Para. 6.

⁶ Credits earned at ETH Zurich before taking up this Master's degree programme may be recognised as long as the knowledge and skills acquired thereby are integral to the degree programme and the credits in question have not already been recognised towards a degree. The Director of Studies decides whether credits will be recognised. There is no automatic entitlement to recognition.

Part 2: Academic record, degree certificate and Diploma Supplement

Art. 33 Documents

Graduates of the degree programme receive three documents: an academic record, a degree certificate and a Diploma Supplement.

Art. 34 Academic record

¹ The academic record verifies the successful completion of the Master's degree.

² The academic record lists:

- a. The study achievements listed in the degree request as per Art. 32, Para. 2, including grades and other measures of performance
- b. The final grade, computed as the weighted average of all the grades listed in the degree request, with the corresponding credits as weighting.

³ A separate sheet of the academic record lists:

- a. Any additional admission requirements
- b. All further study achievements as set out in the pertaining implementation stipulations¹⁸ of the Rector

⁴ D-ITET records, checks and administers the grades and other measures of performance, and issues the order to print the academic record.

¹⁸ See www.weisungen.ethz.ch

Art. 35 Degree certificate, Diploma Supplement

¹ Details regarding the degree certificate are set out in Art. 28 of the ETH Zurich Ordinance on Performance Assessments⁽¹⁹⁾.

² The Diploma Supplement comprises a standardised explanation of the degree.

Chapter 6: Final clauses

Art. 36 Definitive failure, exclusion from the degree programme

¹ The degree programme is regarded as definitively failed if one of the following applies:

- a. The conditions for obtaining the Master's degree (acquisition of the required number of credits for the Master's degree according to the stipulations of Art. 31, or any other conditions) can no longer be satisfied due to failure of performance assessments or failure to respect programme deadlines.⁽²⁰⁾
- b. In cases of admission with additional requirements said additional requirements have not been fulfilled due to failure of performance assessments or failure to respect the deadlines set for them.

² Definitive failure results in exclusion from the degree programme.

Art. 37 Transcript of records after exclusion or abandonment of studies

Students who are excluded from the degree programme or withdraw from it before obtaining the Master's degree receive a transcript of records which lists all the study achievements generated and evaluated before exclusion or withdrawal.

Art. 38 Special cases

The Director of Studies rules on cases which are not or are not sufficiently addressed by these Programme Regulations, their Appendix, or other relevant ordinances and directives.

Art. 39 Entry into effect

¹ These Programme Regulations enter into effect at the beginning of Autumn Semester 2019.

¹⁹ RSETHZ 322.021en (*in English*), SR 414.135.1 (*in German*)

²⁰ Academic deadlines are deadlines for conducting performance assessments, additional individual deadlines, and the maximum permitted duration of studies.

² They apply to students who enter the degree programme from Autumn Semester 2019 onwards. This includes cases of re-entry to the degree programme from Autumn Semester 2019 onwards.

On behalf of the Executive Board

President: Lino Guzzella

General Secretary: Katharina Poiger Ruloff