ETHzürich
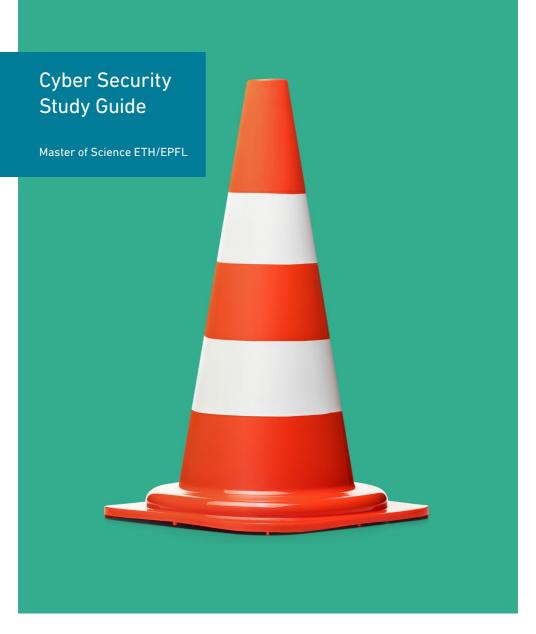
Cyber Security
Study Guide

Master of Science ETH/EPFL

D INFK

Master's Programme in Cyber Security ETH Zurich – EPFL Study Guide

Programme Regulations 2019

RSETHZ 324.1.1600.30

1   Introduction

This document contains important information for a successful completion of the joint Master's programme ETH Zurich – EPFL in Computer Science Major in Cyber Security at ETH, offered by the Department of Computer Science (D-INFK). It comprises a short description of the Master's programme structure and other essential information on how to plan the studies.

Prospective and current students are asked to read this document carefully, as it will help them to choose courses and plan their personal study programme. It is the student's responsibility to meet the requirements of the programme. Should any questions arise, please contact one of the persons below for further advice.

1.1   Study Administration and Student Advisory Services

For questions not covered by this study guide, the Department of Computer Science (D-INFK) offers various services. For names and addresses of the following officials, see the inside front cover.

– The D-INFK Director of Studies is responsible for the degree programmes, examination regulations and the validation of examination results. All requests addressed to the Director of Studies must be submitted to the Studies Administration Office in written form.

– The D-INFK Studies Administration Office can help with most study-related issues, in particular with administrative concerns. In any case, it can refer students to the right person.

– For questions concerning military service (only Swiss military service), the Studies Administration Office may be consulted as well.

– For questions on study planning, please contact the D-INFK Student Coordinator.

– Students interested in studying abroad, please contact the D-INFK Student Exchange Advisor of the Department of Computer Science and the Student Exchange Office (see section 1.2.6).

– In difficult situations during your studies (e.g. coping with pressure and stress, low motivation, fear of exams, making decisions, learning how to study), students can contact the Counselling & Coaching team.

– The Psychological Counselling Service offers a variety of services for confidential assistance with personal and academic problems; for example, how to deal with demanding situations such as examinations. It is advantageous to seek help at an early stage. The Psychological Counselling Service is free of charge for all students enrolled at ETH Zurich.

The **Verein der Informatik Studierenden (VIS)** is the computer science student union at ETH Zurich (www.vis.ethz.ch). One of its valuable services is to collect and provide previous examination papers for the purpose of exam preparation. VIS also organises several events, such as barbecues and a ski camp in winter. Furthermore, VIS helps networking, organises excursions to companies and provides contacts for internships.

VIS is part of VSETH, the overall student's association. As such, when a student becomes a registered VSETH member (check the VSETH box on the registration form), they automatically become a VIS member as well. VIS requires the active assistance of students and encourages them to become a member of the organising committee. The VIS office is found in CAB E 31 and is always open for a coffee and a chat. More information can be found here: www.vis.ethz.ch

MoEB (Committee for Master's students without an ETH Bachelor's degree).
MoEB is a section of VIS. It was founded to support Master's students without an ETH Bachelor's degree by representing their interests within the department and by offering activities to integrate them into the student community. More information can be found at: wwww.vis.ethz.ch/moeb

1.2   General Information

1.2.1   Course Catalogue

All courses are listed in ETH's Course catalogue: www.vvz.ethz.ch. Students will find further information about the objective, content, teaching language, time schedule and localities of the courses, as well as details about the examination and the number of credits awarded after successful completion of the courses.

1.2.2   Credits

All study programmes at ETH are based on the European Credit Transfer System (ECTS). For a Master's degree ETH Zurich – EPFL in Computer Science Major in Cyber Security, the acquisition of 120 ECTS credits is required. The number of credits assigned to a course is determined by the number (#) of weekly hours spent in lectures (V), in exercises (U), in lectures combined with exercises (G), in laboratories (P) and additional self-study (A).

1.2.3   Assessments

Any method to evaluate the achievements of students on a course can serve as an assessment. Most courses, however, rely on examinations. Examinations may take place at the end of the semester (end-of-semester examinations) or at the end of the semester break (examination session).

End-of-semester examinations are organised by the department. Students are informed of the dates by the lecturers themselves or by the Studies Administration Office. The examination sessions are organised by ETH's Examinations Office and students will be informed via *myStudies* (see also chapter 3.3) and email.

Repetition of a failed examination is possible only after re-enrolment and full participation in the relevant course. An examination may be taken only twice.

The type of examination (end-of-semester/session examination), the examination mode (oral/written form) and the duration are announced in the course

catalogue (www.vvz.ethz.ch). For further information, please contact the Studies Administration Office of D-INFK.

1.2.4   Preparing for Examinations

Solving the exercises accompanying a given course is not always mandatory. Nevertheless, we strongly encourage students to make the effort, as it is the best way to prepare for the examination. VIS (CAB E31) offers a collection of old examination papers. In general, the style of examinations does not change much from one year to another, particularly if the course is taught by the same professor. Therefore, it is worth taking a close look at old papers.

1.2.5   Grading System

The grading scale at ETH ranges from 1.0 to 6.0 in quarter grade steps (0.25). The pass grade is 4.0 and the maximum grade is 6.0. The numerical grades correspond to the following predicates:

Grade	Meaning
6	Excellent (the best possible grade)
5	Good
4	Sufficient (the lowest passing grade)
3	Insufficient (fail)
2	Poor
1	Very poor (the lowest possible grade)

For some courses, a pass/fail rating is used instead of grades.

Credits are awarded only if the course requirements have been fulfilled and the associated examinations have been passed successfully. If a course has been completed successfully, the full number of credits is awarded independently of the grade obtained.

1.2.6   Student Exchange Programmes

International experience, cross-cultural competence and language skills are becoming increasingly important in today's business world. The Student Exchange Office organises study placements for ETH students who hold a Bachelor's degree from ETH Zurich at partner universities in Switzerland and abroad within the student exchange programmes and various bilateral agreements.

Students interested in studying abroad should contact the D-INFK Student Exchange Advisor and ETH's Student Exchange Office. However, courses taken during a mobility stay do not count towards the Master's degree. The mandatory semester at EPFL is a part of the programme and does not count as a mobility stay.

2   Master's Programme

Cyber security is a cornerstone of the information society. The consecutive ETH Master's programme in Cyber Security is a two-year programme that offers a thorough education in cyber security topics, such as information security, system security, network security and cryptography. The programme is offered in collaboration with EPFL. Students enrolled in the programme complete a semester at EPFL.

The specialist Master's programme in Cyber Security offers a broad set of courses from all areas of cyber security. To complement these subjects, students choose an area in computer science as a minor, such as Data Management Systems, Machine Intelligence, Visual and Interactive Computing or Theoretical Computer Science. A semester project and the Master's thesis provide students with an opportunity to apply their knowledge and skills. The Master's programme structure is described in detail in the following chapters.

2.1   Master's Programme Structure

The Master's programme in Cyber Security is divided into several course categories as shown in Figure 1. The minimum numbers of credits required for completion of the degree are listed in the fields of the course categories. Several course categories are nested to provide more flexibility, as the least number of credits required within subordinate course categories do not sum up to the least number of credits required for the superordinate course category. The remaining credits can be distributed freely over all subordinate course categories. See chapter 2.1.1ff for a detailed description of the course categories.

Master ETH Zurich – EPFL in Computer Science Major in Cyber Security	120
Core Courses and Electives in Cyber Security	**28**
Core Courses	16
Core Electives	
Seminar	2
Core Courses and Electives in a Minor	**18**
Core Courses	8
Core Electives	
Inter Focus Courses	**16**
Semester Project	**12**
Free Electives	
Science in Perspective	**2**
Master's Thesis	**30**

Figure 1: Course categories with the minimum number of credits required.

2.1.1   Core Courses and Electives in Cyber Security

The *Core Courses* provide essential knowledge in Cyber Security and ensure a high level of competence. *Elective Courses* cover specialist topics.

The Core Courses and Core Electives in Cyber Security are listed in the course catalogue (see chapter 1.2.1)

2.1.2   Seminar

In *seminars*, students are trained in how to read and understand scientific publications. Participants are expected to present a paper on a selected topic and contribute to the discussions following the presentations of other seminar attendees. Note that only one seminar can be accredited within the Master's programme.

2.1.3   Core Courses and Electives in a Minor

Students choose one area of computer science (other than Secure and Reliable Systems) as a minor. The objective of the *Core Courses* and the *Elective Courses* is to complement the cyber security education; for instance, in application areas of security.

The Core Courses and Electives of the chosen minor are listed in the course catalogue.

2.1.4   Inter Focus Courses

The *Inter Focus Courses* cover topics important to all computer scientists. They teach algorithmic reasoning – from real world problems to algorithmic modelling to implementation – and introduce students to advanced systems design issues.

2.1.5   Mandatory Semester at EPFL

Students enrolled at ETH Zurich must start the Master's programme in Zurich. During the course of the programme, one semester must be spent at EPFL, the Swiss Federal Institute of Technology in Lausanne, where students take courses worth 20–35 credit points. Inter Focus Courses and the Master's thesis must be taken at ETH Zurich. D-INFK defines one semester in advance the course categories of the courses at EPFL. Further details on how to plan and implement the semester at EPFL, including logistics, are announced in due time on the programme's website.

2.1.6   Semester Project

The *Semester Project* provides students with the opportunity to apply acquired knowledge and skills. They can gain hands-on experience by independently solving a technical–scientific problem.

2.1.7   Free Electives

All Master's level courses in the area of computer science, or a closely related field, offered by ETH Zurich, EPFL and the University of Zurich may be chosen as *free elective courses*. The acceptance of credit for courses at other Swiss universities requires a written request to the Director of Studies.

2.1.8   Science in Perspective

Two credits must be obtained at the Department of Humanities, Social and Political Sciences (D-GESS). The course catalogue can be found at: www.gess.ethz.ch or www.vvz.ethz.ch (Programme: GESS Science in Perspective). No more than six credits can be accredited in this category.

Language courses offered by the language centre accredited by GESS have an 851-xxxx-xx course-number. Students can acquire a maximum of three credits through a language course. Students, who have already obtained credits from a language course during their bachelor's degree at ETH cannot acquire more than three credits accumulated.

2.1.9   Internship

An internship provides an opportunity to gain experience in an industrial environment and creates a network of contacts.

In order to register for an internship, students must submit a written request to the Studies Administration Office containing the following details no later than two weeks before the beginning of the internship:
– detailed job description: task, technology, milestones
– start and end date of the internship (the minimum duration of an internship listed in the transcript must be 10 weeks)
– supervisor's name and academic degree

Since internships are conducted outside academic institutions, no credits are assigned.

If students need a work permit for their internship, the Studies Administration Office may issue a letter of support provided that at least the Inter Focus Courses and the Semester Project have been passed successfully.

2.1.10   Master's Thesis

The *Master's thesis* demonstrates that students are able to use the knowledge and skills acquired during their Master's studies to solve a complex cyber security problem.

2.1.11   Grade Point Average

The grade point average (GPA) listed in the final academic record is the weighted average of all grades listed in the final transcript, where the number of credits obtained in a course corresponds to the weight.

2.2   Study Duration

The Master's programme worth 120 credits should be completed in four se-
mesters. In general, students follow a course load of 30 credits per semester.
The overall study duration, including the Master's thesis, may not exceed eight
semesters.

2.3   Master's Degree

The Master's degree in Cyber Security at ETH entitles graduates to the fol-
lowing academic title:

**Master of Science ETH Zurich – EPFL in Computer Science Major in Cyber
Security** (MSc ETH Zurich – EPFL)

3 Planning the Master's Studies

The following chapter outlines the main administrative aspects in order to help students plan their studies at ETH.

3.1 Personal Study Plan

It is the student's responsibility to plan their Master's studies. D-INFK recommends that a personal study plan is established in order to structure the studies. Please consult ETH's course catalogue (www.vvz.ethz.ch) for detailed information on courses and course schedules of current and previous semesters. The courses offered and time schedules differ only slightly from year to year. For courses offered at EPFL, please consult the published course books at www.epfl.ch/schools/ic/cyber-security

Please note the following guidelines:
– The workload for one semester is about 30 ECTS credits.
– The minimum number of credits required within each course category must be fulfilled (see chapter 2.1 for more information on the course categories).

To help establish a personal study plan, a template can be found here: www.inf.ethz.ch/studies/forms-and-documents.html

3.2 Tutor System

At the beginning of the study programme every student is assigned to a tutor determined by D-INFK. The tutor is a faculty member and advises the student in how to plan their studies. Students can find their assigned tutor in *myStudies.*

3.3   Enrolment for Courses and Examinations

Students must enrol for the courses of the upcoming semester via www.mystudies.ethz.ch with their *nethz* login. To ensure that they receive all information sent by the lecturer to students registered on the course, students should enrol for the courses as soon as possible.

Enrolling for a course does not automatically result in registration for the corresponding examination. Students will be asked via email to register online through *myStudies* for an examination. After registration for an examination, the deadline for **deregistration** will be shown. Until this deadline, students may deregister from an examination without the consequences. After the deadline has passed, students can no longer deregister from the examination. Non-attendance of an examination for which a student has registered will be graded as failed. In the case of illness on the day of the examination, students must provide a doctor's certificate.

3.4   Admission and Registration for the Master's Thesis

The Master's thesis must be supervised by a professor in cyber security; theses under the supervision of other faculty members require permission from a cyber security professor. D-INFK strongly recommends that students acquire all course credits before the start of their Master's thesis. The thesis requires six months of full-time study/work, during which time students are strongly discouraged from attending any courses in parallel.

The **minimum prerequisites** for registration are:

– Completed Bachelor's programme
– All additional requirements completed (additional requirements, if any, are listed in the admission decree)
– Master's courses:
    • Completed 28 credit points in the category Major Cyber Security, from which at least 12 credit points must come from Core Courses
      and
    • Completed 16 credit points in the category Inter Focus Courses
      and
    • Completed 12 credit points in the category Semester Project
      and
    • At most 8 credit points missing in total in the categories Minor Courses, Free Electives and Science in Perspective

Before starting a Master's thesis, it is important to agree with the supervisor on the task and the assessment scheme. Both have to be documented in detail. If problems should occur during the period of writing the Master's thesis, the student and supervisor can then refer to this written agreement. The Master's thesis is electronically registered in *myStudies*.

In order to complete the Master's thesis successfully, a grade of 4.0 or higher must be obtained. In the case of failure, the Master's thesis can be repeated once. Note that for the second attempt, students must work on a different project than the first attempt.

Further details on the internal regulations of the Master's thesis can be down-loaded at: www.inf.ethz.ch/studies/forms-and-documents.html

3.5   Master's Degree Request

When the Master's degree requirements have been fulfilled, students must lodge their diploma degree request. The degree request is available in *myStudies*. The printed request must be signed and submitted to the Studies Administration Office. Students are asked to submit it personally, in order that any potential problems with the request can be solved immediately. Performances can be assigned to two different sections:

Section 1: Performances in the final transcript
All successfully completed (passed) courses to be listed in the final transcript should be assigned to this section. Only courses in this section count towards the final GPA.

Section 2: Performances in the addendum
Courses assigned to this section are listed in the addendum of the final transcript and do not count towards the final GPA. This section includes:
– Successfully completed courses not assigned to any category
  (Performances without a category)
– Additional requirements
– Failed performance assessments

After submission of the request, the following documents will be issued: the final academic record, possibly with addendum, the diploma certificate and the diploma supplement. Note that deregistration from the Master's programme is performed automatically.

Important addresses and contacts

Studies in Cyber Security www.inf.ethz.ch/master-cybsec.html

Course catalogue www.vvz.ethz.ch

Rectorate ETH Zurich, HG Building
Rämistrasse 101
8092 Zurich, Switzerland
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       Mo–Fri, 09:00–11:00, 14:00–16:00

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