ETH zürich

Data Science
Study Guide

Master of Science ETH

D INFK

Master's Programme in Data Science Study Guide

Programme Regulations 2016

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1   Introduction

This document contains important information for successful completion of the Master's programme in Data Science at ETH, offered by the Department of Computer Science (D-INFK, leading house), the Department of Mathematics (D-MATH) and the Department of Information Technology and Electrical Engineering (D-ITET). It comprises a short description of the Master's programme structure and other essential information on how to plan the studies.

Students should read this document carefully. It will help them choose their courses and plan their personal study programme. It is the student's responsibility to fulfil the requirements of the programme. Students should contact the persons mentioned 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 last page.

– 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 Administration Office in written form.

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

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

– For questions on planning their studies, students may contact the D-INFK Student Coordinator.

– To discuss the learning agreement, students should contact their tutor for advice (see section 3.2).

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

– The Psychological Counselling Service offers a variety of services for confidential assistance with personal and academic problems; for example, how to deal with competitive situations such as examinations. It is of great advantage to seek help early. 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 with networking, organises excursions to companies and provides contacts for internships.

VIS is part of VSETH, the overall student 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. See the website for more information: www.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. It contains information about the objectives, content, teaching language, time schedule and localities of the courses, as well as details about the examinations 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 in Data Science, the acquisition of 120 ECTS credits is required.

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) determine the number of credits assigned to a course.

1.2.3   Assessments

Any method to evaluate the achievements of students in 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 (session examinations).

The department organises end-of-semester examinations. Students are informed of the dates by the lecturers themselves or by the Studies Administration Office. The session examinations are organised by the ETH Examinations Office and information is made available via *myStudies* (see also chapter 3.4) 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 examination does not change much from one year to another, particularly if the same professor is teaching the course. 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 when 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. The learning agreement for the Master's in Data Science can include up to 30 credits earned at an exchange university. Please note that credits obtained at an exchange university may not be accredited in the course categories *Data Analysis*, *Data Management* or *Data Science Lab.*

Students interested in studying abroad should contact the D-INFK Student Exchange Advisor and ETH's Student Exchange Office. The courses to be taken at the exchange university must be approved by the D-INFK Student Exchange Advisor in consultation with the Director of Studies of the Department of Computer Science before the exchange. The necessary forms are available at the D-INFK Student Exchange Advisor.

2   Master's Programme

Computers have fundamentally changed the way the world produces, manages, processes and analyses data. Moreover, the amount of data produced keeps growing every day, and what we do with it and how we extract value from it have become crucial questions for our society. The Master's programme in Data Science at ETH provides high quality education geared towards nurturing the next generation of data scientists.

Research in the field of data science requires solid skills in managing and storing massive amounts of data, as well as the ability to develop efficient mathematical algorithms for data analysis. A description of the structure of the Master's programme and how it provides students with the necessary knowledge and skills follows.

2.1   Master's Programme Structure

The Master's programme in Data Science is divided into several course categories as shown in Figure 1. The minimum numbers of credits required for completing 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 add 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 below for a detailed description of the course categories.

Master's in Data Science	120
Core Courses and Interdisciplinary Electives	72
Core Courses	60
Data Analysis	16
Information and Learning	8
Statistics	8
Data Management and Processing	16
Core Electives	10
Interdisciplinary Electives	8
Data Science Lab	14
Seminar	2
Science in Perspective	2
Master's Thesis	30

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

2.1.1 Core Courses

The objective of the *Core Courses* is to ensure a high level of competence in data science. They are split into three sub-categories, where the first category comprises two sub-categories:

– Data Analysis:
   • Information and Learning (at least one course)
   • Statistics (at least one course)
– Data Management (at least two courses)
– Core Electives

The *Core Electives* are listed in the course catalogue (www.vvz.ethz.ch). The selection of Core Courses requires approval by the tutor and must be fixed as part of the learning agreement.

2.1.2 Data Science Lab

The *Data Science Lab* provides students with the opportunity to apply acquired knowledge and skills in an interdisciplinary data science project. Importantly, it allows them to gain hands-on experience with real data. The project is conducted in groups of approximately three students and is completed by a report and presentation of the results to the other student groups. Some prerequisites must be met in order to register with the Lab; these are listed in the ETH course catalogue.

2.1.3 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 the other seminar attendees.

2.1.4   Interdisciplinary Electives

Interdisciplinary Electives enable students to gain insight into an application area of data science. These courses provide background knowledge and skills important for the respective area in order to enable graduates of the Master's programme in Data Science to bridge the gap between different academic cultures.

Students must choose one specific area within the Interdisciplinary Electives and attend courses worth at least eight credits and a minimum of two courses within the chosen area (see course compilations on www.inf.ethz.ch/ ds-electives. Students may freely choose courses within the selected course compilation; however, they are responsible for fulfilling the respective course prerequisites. Importantly, the course selection must be approved by the tutor and fixed in the learning agreement. If students wish to follow courses other than those listed in the course compilations, they must obtain approval from the D-INFK Director of Studies. Requests should be submitted to the D-INFK Studies Administration Office in advance.

2.1.5   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). Language courses offered by the language centre accredited by GESS have an 851-xxxx-xx course number. Students who already have obtained their Bachelor's degree at ETH can acquire a maximum of three credits through a language course (including those credits obtained for the Bachelor's degree).

2.1.6   Master's Thesis

The Master's thesis demonstrates the student's ability to use the knowledge and skills acquired during their Master's studies to solve a complex data science problem.

2.1.7   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 semesters. 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 Data Science at ETH entitles graduates to the following academic title:

Master of Science ETH in Data Science (MSc ETH Data Science)

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   Learning Agreement

It is the student's responsibility to plan their Master's studies, including all courses they intend to take. Students are asked to consult ETH's course catalogue (www.vvz.ethz.ch) for detailed information on courses and course schedules. Please refer to the corresponding semesters of the previous years, since normally the courses offered and time schedules deviate only slightly from year to year.

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).

When a student has completed their planning, they must put together their learning agreement. An example on how to set this up can be found here: www.inf.ethz.ch/studies/forms-and-documents.html

For advice on planning their Master's studies, students may contact their tutor (see next section) or the Student Coordinator (see last page for contact details).

3.2   Approval of your Learning Agreement

A tutor may be any professor involved in the Master's programme in Data Science; please see www.inf.ethz.ch/ds-faculty

Students should send an email to the professor stating that they are a newly enrolled Master's student at ETH and ask whether they would be willing to be their tutor. If so, they must then fix an appointment to discuss their learn-

ing agreement. The compilation of the learning agreement is the student's responsibility, but tutors are happy to give advice.

If students want to obtain accreditation for courses not listed in the course catalogue, they must send a request to the Director of Studies via the Studies Administration Office. The tutor is not authorised to grant exceptions from the normal Master's programme.

3.3   Internal Registration

The learning agreement must be submitted via www.mystudies.ethz.ch within four weeks of the start of the first semester of the Master's studies. The tutor will then review and approve the learning agreement. Instructions on how to submit the learning agreement in *myStudies* can be found on the department's website: www.inf.ethz.ch/studies/forms-and-documents.html

3.4   Enrolling for Courses and Examinations

Students are asked to 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, deregistration from an examination without any consequences is possible. 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 contact the examination office and submit a doctor's certificate of illness.

3.5   Admission and Registration for the Master's Thesis

The topic for the Master's thesis must be chosen within Data Science. It is recommended that students acquire all course credits before the start of the Master's thesis. The thesis requires six months of full-time study/work, and students are strongly discouraged from attending any courses in parallel.

The **minimum prerequisites** for the Master's thesis registration are:

– Completed Bachelor's programme
– All additional requirements completed (additional requirements, if any, are listed in the admission decree)
– Minimum degree requirements fulfilled for the course categories *Data Analysis* and *Data Management* and overall 50 credits obtained in the course category *Core Courses*
– *Data Science Lab* (14 credits) completed

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 occur during the Master's thesis, student and supervisor can consult this written agreement. Note that the tutor does not necessarily have to supervise the student's Master's thesis. The student registers the Master's thesis electronically in *myStudies*.

A Master's thesis can be completed in industry provided that a professor involved in the Master's programme in Data Science supervises the thesis.

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. Please note that for the second attempt, the student must work on a different project than the first attempt.

Further details on the internal regulations can be downloaded at:
www.inf.ethz.ch/studies/forms-and-documents.html

3.6   Master's Degree Request

When the Master's degree requirements have been fulfilled, the student must file the diploma degree request. The degree request is available in *myStudies*. The printed request must be signed and handed to the Studies Administration Office. Students are asked to submit it personally so 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. Please note that the assignment of courses to course categories must correspond to the individual learning agreement. 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. Deregistration from the Master's programme is performed automatically.

Important addresses and contacts

Studies in Data Science	www.inf.ethz.ch/data-science
Course Catalogue	www.vvz.ethz.ch
Rectorate	ETH Zurich, HG Building
	Rämistrasse 101
	8092 Zurich, Switzerland
	kanzlei@rektorat.ethz.ch
	www.ethz.ch/students-admin
	Office HG F 19
	Mo–Fri, 11:00–13:00
	Phone +41 (0)44 632 30 00
	Mo–Fri, 09:00–11:00, 14:00–16:00
Department of Computer Science	ETH Zurich, CAB Building
	Universitätstrasse 6
	8092 Zurich, Switzerland
Director of Studies	Prof. Zhendong Su
	master@inf.ethz.ch
Study Coordinator	Dr. Ghislain Fourny
	STF H 311
	gfourny@inf.ethz.ch
Studies Administration Office	Bernadette Gianesi
	CAB H 37.1 / +41 (0)44 633 42 23
	master@inf.ethz.ch
Student Exchange	Brigitte Marti
	CAB H 36.1 / +41 (0)44 633 71 26
	mobility@inf.ethz.ch
VIS	Association of computer science students
	CAB E 31 / +41 (0)44 632 72 12
	vis@vis.ethz.ch
	www.vis.ethz.ch
Coaching	Pascal Kogelmann
	HG F 67.3, Rämistrasse 101
	pascal.kogelmann@sts.ethz.ch
	www.sts.ethz.ch
Psychological Counselling Service	By appointment
	+41 (0)44 634 22 80
	pbs@ad.uzh.ch
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