Guidance to the Master and PhD Programmes in Computer Science

at the Faculty of Science, University of Basel

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This document is the English translation of an excerpt of the „Wegleitung für die Bachelor- und Masterstudiengänge in Informatik sowie das Doktorat in Informatik" (chapters 1, 3, and 4) which has been approved by the Faculty of Science of the University of Basel on June 22nd, 2010. In case of doubt, please refer to the original German version which is the legally binding document.

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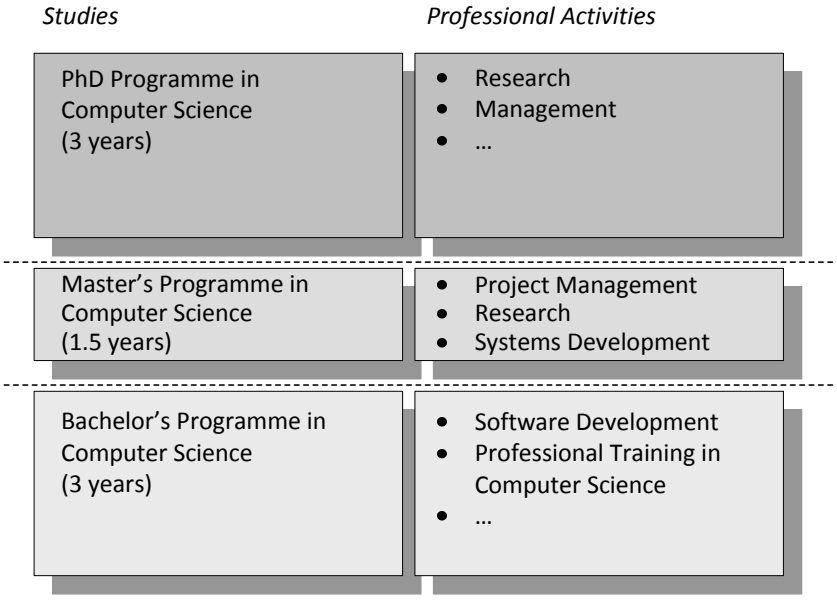
1 Overview

The University of Basel offers a course in Computer Science which is divided into a 3-year Bachelor's programme and a 1.5-year Master's programme. This guidance explains and supplements the official study regulations *Ordnung für das Bachelorstudium Informatik an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel* and the *Ordnung für das Masterstudium Informatik an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel*, hereinafter reffered to as *Bachelorstudienordnung* und *Masterstudienordnung* (**BSO** and **MSO**).

The guidance will point out the relevant paragraphs of the study regulations in square brackets, e.g., [BSO § 10.1].

1.1 Profile

The Computer Science programme of the University of Basel aims at an application-oriented education with a sound knowledge of the Natural Sciences. It opens its graduates a wide range of career opportunities in business and industry, but it also provides the theoretical knowledge for doing research. The graduates of the Computer Science programme are able to analyse the problems systematically and to independently develop solutions with the aid of information and communication technologies. They not only know about the current state of the Computer Science, but are also prepared to deal autonomously with the continual changes within the field of Computer Sciences. Working and programming in a team as well as discussing and presenting the solutions prepare for the future professional life.



1.2 Offered Degrees

The Computer Science programme is divided into a 3-year Bachelor's programme, followed by an optional 1.5-year Master's programme. The Bachelor's programme on the one hand allows entering the professional world, on the other hand it is the basis for further scientific work, i.e., a Master's programme and subsequent PhD studies.

The content of the Computer Science programme is aligned to the Natural Sciences. The courses are synchronised with the offers of the Faculty of Science at the University of Basel and aim for the highest possible mobility: Students with a Bachelor in Mathematics or Physics for example can, by the tactical selection of Computer Science courses during their studies, begin directly with the Master's Programme in Computer Science. And within the Bachelor's programme a specialisation in the Natural Sciences is possible: The Computer Science students can choose a major according to their preferences. The following majors are offered:

- Computational Intelligence
- Distributed Systems
- Life Science-Informatics
- Business Information Systems

The successful completion of the Bachelor's programme is awarded with the degree *Bachelor of Science in Computer Science*.

Following the Bachelor's Programme in Computer Science the University of Basel offers a consecutive Master's programme. The degree awarded is: *Master of Science in Computer Science*. The Master's programme offers a higher professional qualification and serves as a starting point for an academic activity. The Master's programme is in English.

After having obtained the Master's degree, it is possible to begin with the PhD programme in one of the main research areas of the Department of Mathematics and Computer Science.

1.3 Start of the Programmes

The Bachelor's programme begins in the autumn semester [BSO § 4]. The Master's programme can be started either in the autumn or in the spring semester [MSO § 4].

1.4 Credit Points and Duration of the Programmes

The programmes in Computer Science at the University of Basel are structured according to the declaration of Bologna and their Bachelor and Master degrees provide an acknowledgment on an international level. Credit points can be obtained after the successful participation in courses. The Bachelor's degree is awarded after having obtained 180 credit points, the Master's degree requires additional 90 credit points.

The credit points are calculated according to the *European Credit Transfer System* (ECTS). The basic idea of this credit point system is to make the learning effort during the studies more transparent and internationally comparable. The credit point system provides a measure for the average workload during one year of full-time studies. The European credit point system assumes that full-time students work 45 hours during 40 weeks for their studies (=1800 hours).

This annual study time corresponds to 60 credit points, i.e. 1 CP is awarded for 30 hours of studying (presence in the courses plus individual work). By determining credit points for the individual courses, the average amount of work becomes apparent. Thus the studies become more transparent, better plannable and are easier to evaluate in case of a transfer to another university.

Basically, there are no guidelines as to within which period of time the necessary credit points have to be obtained. The 180 CP for the Bachelor's degree can be obtained after 3 years of full-time studies. But the credit points can also be obtained during a longer, self-determined time period. This allows for example an employment parallel to the studies or an extension of the studies for family reasons.

1.5 Examinations and Mobility

In order to obtain credit points, the regulations for the Bachelor's and Master's programmes provide different forms of examinations ([BSO § 8] and [MSO § 9] – a list with the different forms of examinations can be found in the *Ordnung für die Bachelor- und Masterstudiengänge sowie die Doktoratsstudien an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel* under [RO § 7.3] and a detailed description under [RO §§ 9–13]).

The exams within the Computer Science programmes are usually tied to the courses (*lehrveranstaltungsbegleitende Leistungsüberprüfungen*), i.e., with the successful examination the appropriate amount of credit points has been obtained and the content of a course is considered completed. The examination in courses from other programmes is subject to their respective regulations. Particularly in Mathematics and Physics the main form of examination is the "exam", based on oral or written tests, which sometimes comprise the content of several courses and examine them as a whole. The same applies to the Master's programme in Computer Science with its Master's examination that covers several subject areas simultaneously.

All Computer Science courses are assessed either with a mark or with pass/fail. Thus it can be demonstrated at any time, which level of knowledge and proficiency was reached by the students. This makes the application for admission at another university for further studies or for crediting of successfully completed academic performances easier. Although the automatic recognition of degrees at European level will hardly be realized in the near future, the unified credit points and the similar degree levels facilitate the mobility of the students.

3 Master of Science in Computer Science

The master's programme can be started either in the autumn or in the spring semester and can be completed after one and a half years of full-time study or an appropriately extended part-time study. After the successful completion of the Master's programme, the degree *Master of Science in Computer Science* will be awarded. The language of instruction is English.

In the Master's programme the students acquire a specialized knowledge in Computer Science by gaining a close insight into a distinct research area within the framework of their Master's thesis. This knowledge enables them – under guidance – to work on their own small research project and to interpret the results obtained. They are able to describe their own scientific work and to reproduce the conclusions and hypotheses in a traceable/comprehensible way. The students understand scientific texts in English and are able to question their findings/research results and hypotheses. They can also write texts in English. After completing the Master's programme, the students have gained experience in teamwork and developed skills in communication, cooperation and conflict resolution.

Figure 1 shows the Computer Science Programmes at the University of Basel in an overview and illustrates that the four Majors of the Bachelor's programme represent a preparation for the Master's programmes (of which some are still in preparation). All Computer Science Majors, however, lead without conditions directly to the Master's Programme in Computer Science. This also applies to all students with a Bachelor's degree in Computational Science (exception: Major in Computational Chemistry, see below).

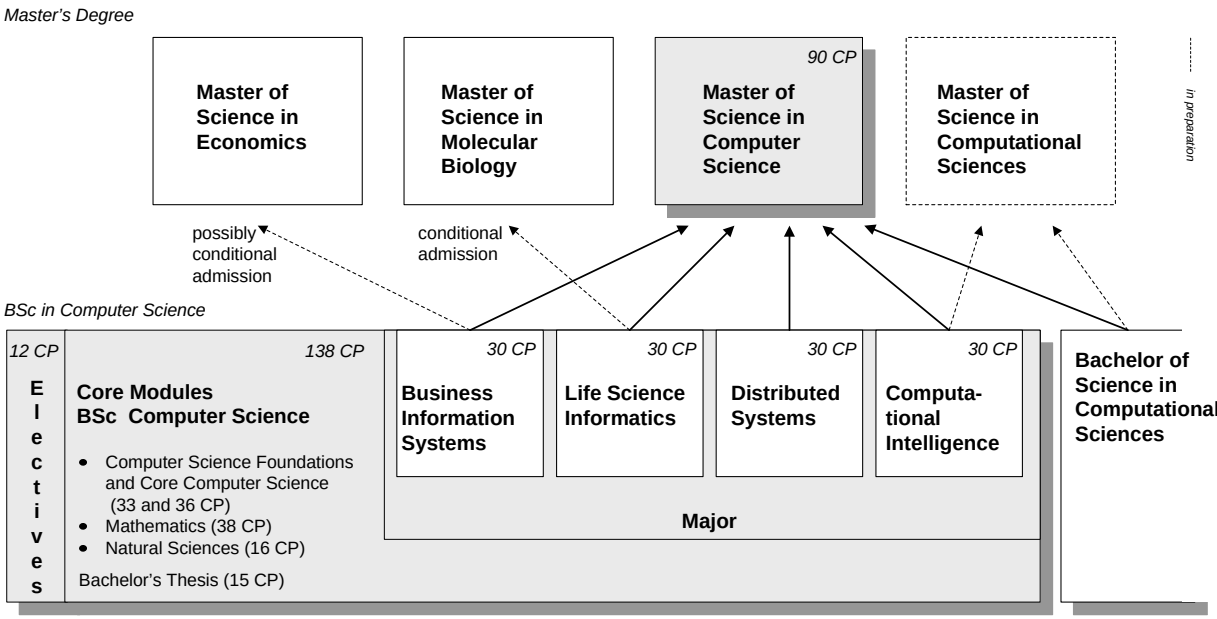


Figure 1: Overview of the Bachelor and Master Programmes in Computer Science at the University of Basel

3.1 Admission to the Master's Programme

Directly admitted to the Master's Programme in Computer Science are:

- Students who have a Bachelor's degree in Computer Science from a university in Switzerland.
- Students with a Bachelor's degree in Physics or Mathematics from the University of Basel, if they have acquired at least 25 credit points from Computer Science courses, of which at least 12 credit points must come from the module *Core Computer Science* (but not more than from one Computer Science seminar).
- Students with a Bachelor's degree in Computational Science from the University of Basel with a major in *Computational Physics*, *Computational Mathematics* or *Computational Biology* (see figure 1). Students with a major in *Computational Chemistry* must have successfully completed the course "Mathematische Methoden IV"
- Students with a Bachelor of Arts in Computer Science from the Faculty of Humanities of the University of Basel, if they have fulfilled the conditions according to the *Wegleitung für das Studienfach Informatik im Bachelor- und im Masterstudium an der Philosophisch-Historischen Fakultät der Universität Basel.*

The admission to the Master's Programme in Computer Science for all other Master candidates is given on request of the Faculty's Examination Board by the rectorate [RO §§ 4.4 und 4.7].

3.2 Modules of the Master's Programme

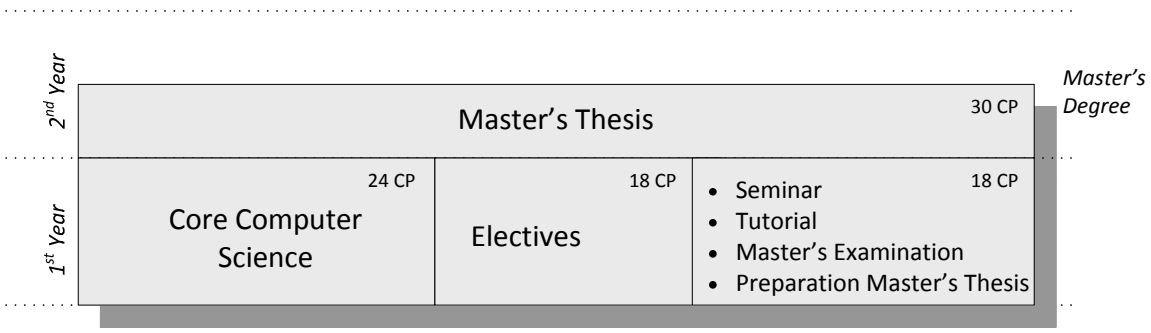


Figure 2: Structure of the Master's Programme in Computer Science

The Master's programme is passed if the following credit points were obtained:

- Module Core Computer Science (24 KP)
- Electives (18 KP)
- Seminar (6 KP)
- Tutorial (4 KP)
- Master's examination (4 KP)
- Preparation (4 CP) and implementation (30CP) of the Master's thesis

3.3 Core Computer Science

The module Core Computer Science consists of four courses on Master level from the research fields of the professors for Computer Science at the University of Basel.

The following list provides examples of lectures in the module Core Computer Science:

- CS311 High Performance Computing (6 CP)
- CS321 Autonomic Computer Systems (6 CP)
- CS351 Machine Learning (6 CP)
- CS341 Distributed Information Systems (6 CP)

3.4 Electives of the Master's Programme

The credit points of the electives have to come from Computer Science, Computational Sciences, or Mathematics courses. It is also possible to obtain 6 CP for a non-academic internship based on a topic from one of the Computer Science, Computational Sciences, or Mathematics courses. The internship lasts between three and six months and may take place in a private or public institution which is selected by the student in consultation with a professor. Before the internship the students define, together with the professor and the representative of the non-academic institution, the nature and duration of the practical work in a Learning Contract.

3.5 Tutorial Activities

During the Master's programme the students must be active as a tutor. In this role they are supporting a team of Bachelor students during the project work of their Bachelor's thesis, during the course *CS107 Labor Werkzeuge der Informatik* or comparable courses. As advisors of bachelor projects the tutors attend the team meetings and contribute with their own experience and knowledge. For the tutorial activities 4 points are credited on the basis of a Learning Contract; the activities are not paid.

In exceptional cases the credit points for tutorial activities can be obtained before the start of the Master's programme. The prerequisite is the acquisition of all credit points in the modules *Computer Science Basics, Mathematics* and *Life Sciences* of the Bachelor's programme.

3.6 Master's Examination and Master's Thesis

After the acquisition of all credit points from the module Core Computer Science, the electives, the seminar, the tutorial activity, the Master's examination and the preparation of the Master's thesis, the Master's thesis project can be started. The details on the preparation of the Master's thesis project and the actual Master's thesis project are each defined in a Learning Contract. Further information on the preparation of the Master's thesis and the Master's examination can be found in the *Ordnung für das Masterstudium Informatik an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel* [MSO §§ 10 und 11].

The topic of the Master's thesis is defined by the responsible professors in consultation with the students, who can start with the preparation of their Master's thesis (4 CP) already in the first semester of the Master's programme. The actual Master's thesis project (30 CP), including the elaboration of a written text, must be completed within 6 months. The final presentation takes place promptly after the submission of the written report.

The written summary of the Master's thesis must be submitted electronically and the results have to be reported publicly in a 30-minute presentation. Details on the marking of the Master's thesis can be found in the *Ordnung für das Masterstudium Informatik an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel* [MSO § 12].

4 PhD in Computer Science

The prerequisites for the admission to the PhD programme as well as the examination procedure are defined in the *Promotionsordnung der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel* of 16th December 2003 (hereinafter referred to as *Promotionsordnung,* **PO**).

The admission requires a Master's degree at university level with an independent Master's thesis. The admission may be subject to conditions which can be met either parallel to or before the beginning of the PhD programme, depending on the type of the Master's degree. A diploma from a University of Applied Sciences (*Fachhochschule*) awarded after three years of studies requires a Master's degree to start the PhD programme. For the diploma awarded after four years there will be conditions depending on previous academic activities.

After the successful completion of the PhD programme as well as the elaboration of a dissertation and its defense, the PhD degree is awarded.

4.1 PhD Supervision

The PhD studies are supervised by a full faculty member as well as a co-supervisor. This "thesis committee" coordinates with the candidate the course of the doctorate and determines the content of the PhD programme. There are three coordination appointments during the PhD programme. About a year after the beginning of the doctorate the PhD programme (see below) as well as the topic of the PhD thesis is determined. At that time the PhD student has to present his topic in a "proposal defense" to the members of the department. About one and a half years later the progress of the PhD thesis is assessed. The third coordination appointment about half a year before the scheduled defense of the PhD thesis deals with the completion of the PhD thesis and the selection of the co-supervisor (see "*Promotionsordnung*", and "PhD examination" below).

4.2 PhD Thesis

In order to obtain a doctoral degree a PhD thesis (dissertation) on a Computer Science topic has to be elaborated. The thesis has to make an independent contribution to the current research. Experience shows that this takes - with full commitment - at least 6 semesters. The PhD thesis can be written in German or English.

4.3 PhD Programme

Besides the writing of the PhD thesis the students have to pass a PhD programme, for which they have to be enrolled at the University of Basel. This programme includes courses of at least 12 credit points, whereof 4 CP can be obtained from courses outside the natural sciences. Courses that have not been credited for the Master's Programme in Computer Science are accepted for the PhD programme. Credit points obtained from other universities can be credited to the PhD programme. The requirements of the various courses for obtaining credit points also apply to the PhD programme.

If the PhD programme has been successfully passed, a certificate is issued by the Department of Mathematics and Computer Science, containing an overview of the obtained credit points as well as the results of the exams. The results of the PhD programme are not included in the PhD grade.

For the non-German speaking PhD students 4 credit points are exempted if they can prove that they have successfully passed a German course of at least 4 hours per week during a semester.

4.4 Registration for the PhD examination

The successful completion of the PhD programme is a prerequisite for the registration for the PhD examination. The candidate has to submit his PhD thesis to the Faculty of Science for approval, together with an evaluation report of an independent co-supervisor. The co-supervisor generally has to be a qualified university lecturer and may not have been involved in the elaboration of the PhD thesis. Preferably, an external co-supervisor shall be chosen.
The candidate has to submit the application for admission to the PhD examination to the dean's office of the Faculty of Science (details are defined in the *Promotionsordnung),* and a copy of the PhD thesis has to be deposited at the department's secretariat. All professors of the Department of Mathematics and Computer Science are allowed to inspect this copy as well as at the evaluation reports of the supervisor and co-supervisor and, where applicable, other external supervisors, until the day of the PhD examination.

4.5 PhD examination

The examination, which takes place in presence of the co-supervisor and the supervisor, has a duration of 60 minutes (see PO § 12). The examination is open to all members of the University of Basel and the external supervisors and consists of a colloquium and the questions of the co-supervisor and supervisor, which are referring to the topic of the thesis and its related fields.
The final grade is based on the average of the grade of the PhD thesis with a double weight and the grade of the examination (see PO § 13).

A Appendix: Important Addresses for Students

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