UNIVERSITÉ DE FRIBOURG SUISSE
FACULTÉ DES SCIENCES

UNIVERSITÄT FREIBURG SCHWEIZ
MATHEMATISCH-NATURWISSENSCHAFTLICHE FAKULTÄT

UNIVERSITAS
FRIBURGENSIS

Curriculum for the obtention of the Degree of

Master of Science
in Computer Science

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1 General Remarks

This curriculum describes all the regulations concerning the course of studies in computer science at the University of Fribourg. It is based on the regulations of the Faculty of Science as defined in the ***Règlement pour l'obtention des Bachelor of Science et des Master of Science de la Faculté des sciences*** [***Regulation of 2 February 2004 for the Obtainment of the Bachelor of Science and Master of Science***] (subsequently called *the Regulation* for short).

1.1 Academic Titles and Programme of Study

The Faculty of Science of the University of Fribourg awards the following official academic titles to students who have successfully completed their respective course of studies:
- **Bachelor of Science in Computer Science**, subsequently called **BSc**.
- **Master of Science in Computer Science**, subsequently called **MSc**.

The **programme of study of the BSc** in computer science represents a university course of studies, comprising a basic scientific education in computer science by its method- and problem-oriented nature. It enables one to enter a wide professional area. At the same time it provides the basis for life-long learning, an indispensable requirement for professional success. In addition, the BSc in Computer Science forms the basis for advanced studies leading to the MSc in Computer Science. Every person who is in possession of a federal general qualification for university entrance (maturité fédérale / *eidgenössisches Maturitätszeugnis*) or any equivalent document (cf. Art. 6 of the Regulation) will be admitted to the BSc degree programme.

The **programme of study of the MSc** in computer science represents a scientific course of studies, allowing one to specialize in a specific subject. The MSc in Computer Science gives access to various professional activities in research, education, industry, commerce, and administration. The MSc is furthermore the entry requirement for the scientific work and deepened scientific education leading to a doctorate. When accompanied by a subsidiary subject (biology, chemistry, geography, mathematics, or physics), the MSc allows one to enter a complimentary didactics programme leading to a qualification as a high-school teacher (Diplôme d'aptitude à l'enseignement secondaire II / *Fähigkeitszeugnis für das Höhere Lehramt II*).

Persons in possession of a BSc in Computer Science of the University of Fribourg or any other Swiss university are admitted to the MSc course of studies (Art. 7 of the Regulation), including the MA (Master of Arts) degree course in Information Systems. Persons in possession of a BSc degree in a different subject or equivalent degrees (e.g. after graduating from an engineering school) can also be admitted to the MSc study programme by a decision of the Faculty of Science to be made in each individual case. Provisional admission can be granted, which then depends on the fulfilment of additional requirements (cf. Section 3.5).

1.2 Course Structure

The degree courses leading to the BSc and MSc respectively are subdivided into **course units (UE)** comprising lectures, exercise classes, laboratories, seminars, student projects, etc. To each UE, a number of **ECTS[1] points** is assigned, which by assessment (e.g. successful exams) is converted into ECTS credits (see Section 1.3). The BSc degree course requires 180 ECTS credits

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[1] ECTS stands for *European Credit Transfer System*. One ECTS point corresponds to an amount of work of approximately 30 hours.

(corresponding to a length of study of 6 semesters), and the MSc degree an additional 90 ECTS credits (corresponding to a length of study of 3 semesters).

The BSc degree course is composed of a **major** of 120 ECTS, and a selectable **minor** of 60 ECTS or two **minors** of 30 ECTS each. The major consists of the compulsory UE in computer science and basic mathematics. The minor may not overlap with the major. Otherwise all subjects taught at the University of Fribourg can potentially be selected as minors. Corresponding curricula exist for all branches of the Faculty of Science (mathematics, physics, biology, biochemistry, etc.) and some other popular subjects (economics, law, psychology, etc.). If a student wishes to choose a different minor, he/she must consult the student advisor of computer science in order to work out a suitable curriculum.

The MSc degree programme consists of a one-year taught programme comprising lectures, exercise classes, and seminars, and a **MSc project** lasting 4-6 months leading to the **MSc thesis**. Examinations of the UE of the MSc are only possible after all the requirements for the BSc have been completed. (cf. 1.3).

The purpose of the different forms of UE is as follows:
- **Lectures** give an introduction to the scientific methods in computer science and advance thinking in a scientific way. They help acquiring the required knowledge and understanding the fundamental concepts, and introduce the formalisms used in data processing.
- **Exercise classes** complement the lectures and provide essential help for working with and understanding a lecture's content. They give students the opportunity to practise and apply the acquired principles, techniques, and models using a computer.
- **Student projects** are a first step towards concrete problem solving. Students learn using a log-book as well as designing, implementing, and evaluating a computer application.
- **Seminar presentations** are used for working on as well as presenting orally existing scientific results.
- The preparation of the **Master thesis,** under the supervision of an experienced researcher, is the actual starting point of scientific research.

1.3   Acquired skills

The aim of the studies leading to the award of an MSc in Computer Science is to deepen knowledge and perfect competence in the chosen field and at the same time develop skills in scientific English. Thus, at the end of the course, a student will have shown that he/she can apply their knowledge to accomplish a research project and will have learned how to work independently or how to integrate into an interdisciplinary research team. The award of the degree requires creative and self-critical talents as well as the ability to communicate ideas and work both in English and their native language.

1.4   Assessment of Course Units (UE) and Acquisition of ECTS Credits

Acquisition of ECTS credits occurs in three steps: assessment of the UE, grouping of UE into validation package, and awarding the respective credits.

Exercises are assessed following the criteria given at the beginning of the course (number of submitted exercise papers, number of correctly solved exercises, etc.). Admission to the exam corresponding to a lecture course can be subject to meeting the requirements of the corresponding exercise class. **Assessment** of lectures is made by an oral and/or written exam, whose type and duration are regulated in this curriculum. Exams take place during the official exam periods (sessions) in spring, summer, and autumn. Students register in GESTENS within the stipulated delays for each exam according to the on-line procedure. The marks range from 6

(highest mark) to 1 (lowest mark). An exam marked below 4 can be repeated once at the next exam session at the earliest.

Validation package comprise multiple, separately assessed UE. Art. 18 of the Regulation determines the number of these package whereas this curriculum determines their content.

ECTS points are credited according to art. 19 of the Regulation if
- the weighted average of the exam marks of a validation package is at least 4. The weighting is given by the number of ECTS points assigned to a UE.
- the assessment criteria of UE not examined (practical work, exercises, etc.) are met.

Under these prerequisites, validation package are validated and the corresponding ECTS points are converted into ECTS credits. By request, the Dean's office issues confirmations in which exam results and credits awarded are acknowledged (Art. 22 of the Regulation), provided the exam fee has been paid.

1.5   Teaching Languages

Each course of the BSc is taught in either German or French. Students can decide, in which of the two languages they want to express themselves. Occasionally, courses may be taught in English.

MSc courses are taught in English, German or French. For exams and written work (project reports, MSc thesis, etc.) students can choose between English, German or French.

1.6   Ethics and Science

Ethical principles are an integral part of a scientific education. Accepted international conventions must be respected during research and upon the writing up of any scientific work whether it be a project, a lecture, a thesis or a report. In particular, every external source of information (articles, lectures, web pages, etc.) must be correctly cited.

1.7   Regulations and additional Information

Detailed information about studying computer science can be found in the following documents, which can be obtained from the Office of the Department of Computer Science, chemin du Musée 3, CH-1700 Fribourg:
- Regulation concerning the admission to the University of Fribourg [Réglement d'admission de l'Université de Fribourg / *Zulassungsreglement der Universität Freiburg; (www.unifr.ch/rectorat/reglements)*]
- Regulation of 2 February 2004 for the Obtainment of the Bachelor of Science and Master of Science at the Faculty of Science of the University of Fribourg
- Curriculum for the basic and subsidiary subjects of the Faculty of Science of the University of Fribourg
- Study guide of the University of Fribourg
- University calendar of the University of Fribourg

Finally, each student obtains a personal and secure space that can be reached using an individual university e-mail password. This space can be reached by the link "Connexion" on web page www.unifr.ch/science/gestens and allows inscription to courses and exams, access to exam results, the initiation of the process of attestation, etc.

3   Master of Science (MSc)

[Version 2004, validation packages: MSc1-IN.0005, MSc2-IN.0006]

The programme of study of the MSc in Computer Science spans one and a half years, corresponding to 90 ECTS credits. The course (UE) of the MSc correspond to 60 ECTS in total. They consist of lectures, exercise classes, and two seminars. They impart knowledge in theoretical computer science and special subjects of computer science on an advanced level,. UE can be followed in Fribourg as well as partly in the context of the BeNeFri agreement (between the Universities of Berne, Neuchâtel, and Fribourg) and at other Swiss universities. The MSc degree course is completed by a master research project of 30 ECTS in total which includes writing a master thesis.

UE of the MSc can only be assessed and recognized after successful completion of the BSc.

3.1   Course Units of the MSc

1st Semester (Autumn)

Code	Course Unit	hours	ECTS
	Compulsory		
IN.7001	Theory I: Computability and Complexity	3	5
IN.7002	Theory II : Formal Languages	3	5
	Elective		
IN.7xxx	Advanced Lecture Course	3	5
IN.7xxx	Advanced Lecture Course	3	5
IN.7xxx	Advanced Lecture Course	3	5
IN.7000	Seminar I		5
			30

2nd Semester (Spring)

Code	Course Unit	hours	ECTS
	Compulsory		
IN.8001	Theory III: Information Theory	3	5
IN.8002	Theory IV: Formal Semantics	3	5
	Elective		
IN.8xxx	Advanced Lecture Course	3	5
IN.8xxx	Advanced Lecture Course	3	5
IN.8xxx	Advanced Lecture Course	3	5
IN.8000	Seminar II		5
			30

3rd Semester

Code	Course Unit	hours	ECTS
	Compulsory		
IN.9000	Master Project / Thesis		30
			30

3.2   Content of the UE of the MSc

Lectures

The MSc degree programme comprises 10 courses, each lasting one semester, divided into four compulsory and six elective units. The compulsory courses cover theoretical knowledge, which is essential at the master level. The elective courses aim at specialization; they can be selected among the courses offered each year and cover the various research areas of the department.

Seminars

To introduce students to research, each student must participate at a **seminar** each semester. Seminars are realized in groups and focus on a particular subject related to the research interests of one of the various research groups.

3.3   MSc Exams and Assessment

All of the 1st year UE of the MSc form the **validation package MSc1**, enabling one to obtain 60 ECTS credits. Seminars are assessed according to criteria determined at the beginning of each semester. The other courses (lectures with exercise classes) are examined as follows:

1.   Written exams of 2 hours or oral exams of 20 minutes at the end of the semester (for all course units).

3.4   Master Project / Thesis and Assessment

The master project and thesis (IN.9000) form the **validation package MSc2**. As a matter of principle, work on the master thesis can only be started after the validation package MSc1 has been validated.

The master project and thesis of 30 ECTS points and duration of 20 weeks introduces the students to scientific research. Normally, students will work on it during the third semester, and it represents the summit of the course of studies. It is research work of a considerable volume under the supervision of an experienced researcher. During the master project and thesis, students can test their interest and ability to do research. They produce a thesis in the form of a scientific report and give an oral presentation of 30 minutes.

The master thesis is assessed with a mark ranging from 6 (best mark) to 1 (worst mark). A pass is accorded if the mark is at least 4. A failed master project / thesis can be repeated once on a different subject.

The successful completion of validation packages MSc1 and MSc2 awards the right to title **Master of Science in Computer Science, University of Fribourg (MSc)**.

3.4   Regulations of Admission to the Master Programme

3.4.1 Admission Procedure

Admission to the Master degree programme in computer science is linked to two requirements: fulfilment of the admission requirements of the University – defined in the Regulations for the Admission to the University of Fribourg [*Reglement über die Zulassung an der Universität Freiburg*] – and possession of a Bachelor degree in computer science or information systems from the University of Fribourg or an academic degree considered equivalent by the Faculty of Science.

The faculty possesses a list of academic titles that it recognizes as equivalent. Persons in possession of such a title will be admitted automatically. Persons in possession of an academic qualification not in the list can send the Faculty of science an application letter, on which the *Commission for student requests* – appointed by the faculty board – will make a decision.

Depending on the academic qualification, the Commission for student requests can make its acceptance dependent on the fulfilment of additional requirements, provided they are of a minor scope and can be completed in parallel to the master degree programme. Otherwise, applicants can be admitted to a "pre-master programme" and can start with the master degree programme only after fulfilling the requirements initially laid down for the pre-master.

3.4.2 Standard Transfers

Particular admission transfers to the master are regularly used, especially by candidates in possession of a Bachelor HES in computer science or a related subject. Detailed descriptions of these standard transfers represent an appendix to this curriculum and can be obtained from the Dean's Office of the Faculty of Science or the Office of the Department of Computer Science.