UNIVERSITAS FRIBURGENSIS

FACULTY OF SCIENCE
BIOLOGY
CHEMISTRY
GEOSCIENCES
INFORMATICS
MATHEMATICS
MEDICINE
PHYSICS

UNIVERSITY OF FRIBOURG (SWITZERLAND)

FACULTY OF SCIENCE

Curriculum for the obtention of the Degree of

Master of Science in Mathematics

Accepted by the Faculty of Science on March 22, 2004
Revised version from October 2005

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1 General Remarks

This curriculum describes all the regulations concerning the course of studies in mathematics 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 certificats universitaires (« Bachelor of Science ») et des diplômes (« 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 Programmeme 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 Mathematics**, subsequently called **BSc**.
- **Master of Science in Mathematics**, subsequently called **MSc**.

The **programme of study of the BSc** in mathematics represents a university course of studies, comprising a basic scientific education in mathematics. It provides the basis for advanced studies leading to the MSc in Mathematics and it enables one also to enter a wide professional area. 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 mathematics represents a scientific course of studies, giving 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* / *Lehrdiplom für die Sekundarstufe II*).

Persons in possession of a BSc in Mathematics of the University of Fribourg or any other Swiss university are admitted to the MSc course of studies (Art. 7 of the Regulation). 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 3.1).

1.2 Course Structure

The degree courses leading to the BSc and MSc respectively are subdivided into **courses (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 (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).

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

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 mathematics and basic computer science. All subjects taught at the University of Fribourg can potentially be selected as minors. In the case of two minors, one of them may even be chosen in mathematics so as to reinforce the major.

The MSc degree programme consists of a one-year taught programme comprising lectures, exercise classes, and seminars, and 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.
- **Seminars** are used for working on as well as presenting orally and in a written summary existing scientific results.
- The preparation of the **Master's thesis,** under the supervision of an experienced researcher, is the actual starting point of scientific research.

1.3 Assessment of Course (UE) and Acquisition of ECTS Credits

Acquisition of ECTS credits occurs in three steps: assessment of the UE, grouping of UE into validation packages, 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.

A **validation package** comprises multiple, separately assessed UE. Art. 18 of the Regulation determines the number of these packages 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 packages 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.

1.4 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 German, French, or English.

1.5 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.

1.6 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 Mathematics, chemin du Musée 23, 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
- 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
- Actual information may also be obtained from the web site of the Department of Mathematics, *ww.unifr.ch/math*.

3 Master of Science (MSc) in Mathematics

[Version 2005, validation package: MSc1-MA.0011, MSc2-MA.0012]

The MSc degree programme consists of course work corresponding to 90 ECTS credit points and normally requires 3 semesters. It is concluded with a master's thesis.

Course units for the MSc programme can be assessed and validated only after the BSc certificate has been obtained.

3.1 Admission to the MSc programme

Admission to the MSc programme in Mathematics requires a Bachelor of Science degree in Mathematics obtained at the University of Fribourg, or a title deemed equivalent by the Faculty of Science. The Faculty provides a list of equivalent degrees. Candidates that have such a degree are admitted without further requirements. Other cases will be decided upon by the Faculty of Science that may impose further conditions.

It is possible to participate in courses belonging to the master's programme before the BSc has been obtained. However, assessment and validation of these courses can take place only after the BSc certificate has been obtained.

3.2 Course units of the MSc programme

The MSc programme comprises six lecture courses, two seminars, a master's thesis and its presentation in a lecture. The following table lists the programme for each semester.

1st semester

Code	Course unit	hours	ECTS
	Mathematics *)		
	4 lecture courses	16	24
MA.480x	Seminar	2	3
			27

*) see section 3.3

2nd semester

Code	Course unit	hours	ECTS
	Mathematics *)		
	2 lecture courses	8	12
MA.480x	Seminar	2	3
and	with		
MA.4809	Seminar paper		3
MA.4810	Preparation for master's thesis		12
			30

*) see section 3.3

3rd semester

Code	Course unit	hours	ECTS
MA.5801	Master's thesis		30
MA.5802	Presentation of master's thesis		3
			33

It is possible to choose certain course units that are not part of the university's normal course programme, notably courses given in the *3ème Cycle Romand de Mathématiques*, the *3ème Cycle Romand de Statistique et Probabilités appliquées* and lecture courses offered at the Universities of Bern and Neuchâtel as part of the BeNeFri convention.

Of the six lecture courses chosen, at least one each must belong to the fields of Analysis, Algebra-Geometry and Applied Mathematics (Numerical Analysis, Stochastics, Bio-Mathematics). It is recommended to consider the course announcements in time and to consult with the student adviser.

3.3 Continuation of minor field and practical work

Students that had computer science, physics or one of the three existing options in economics as a minor in their BSc curriculum have the possibility to extend their knowledge in the same discipline during their MSc programme. In this case, 12 ECTS points in Mathematics are replaced by 12 ECTS points in the corresponding discipline. Suitable courses are chosen in agreement with the student advisers of the major and minor disciplines. Only one of these minors can be continued. The 12 ECTS points obtained for the minor are counted towards Applied Mathematics in the sense of the preceding section.

ECTS points can also be obtained from a practical project in cooperation with the *Ecole d'ingénieurs et d'architectes de Fribourg*.

3.4 Examinations in the MSc programme

The course units of the first two semesters of the MSc programme comprise the validation package **MSc1**.

These courses are assessed independently of each other. Each lecture course offered by the Department of Mathematics is assessed through a 20 minutes oral exam. Dates of these exams are determined by the Department of Mathematics. Other courses are assessed by the school or faculty offering the course.

3.5 Master's thesis

The master's thesis is written under the supervision of a professor or lecturer of the Department of Mathematics. The subject of the thesis is normally related to the courses and seminars of the first year of the MSc programme. Students should contact a supervisor early in their programme in order to choose a topic for their thesis. The master's thesis is to be completed within 6 months and is then presented in the form of a lecture that should be accessible to fellow students.

The master's thesis is graded on a scale of 6.0 (best grade) to 1.0 (worst grade). If the grade obtained is below 4.0, a second thesis can be written on a different topic.

The validation package **MSc2** consists of 33 ECTS points. These points are given if the master's thesis has obtained a grade of 4.0 or better and if its presentation in the required lecture has been accepted.

The degree "Master of Science in Mathematics" is conferred after successful completion of the validation packages MSc1 and MSc2.