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Curriculum for the award of the Degree of

Master of Science in Mathematics

Accepted by the Faculty of Science and Medicine on 09.05.2005
Revised version from 06.04.2020

Contents

1 General Remarks

This curriculum describes 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 and Medicine as defined in the ***Règlement du 6 April 2020 pour l'obtention des Bachelor of Science et des Master of Science de la Faculté des sciences et de médecine [Regulations of 2 February 2004 for the Obtainment of the Bachelor of Science and Master of Science]*** (subsequently called *the Regulations* for short).

The Regulation of 6 April 2020 for the award of the Bachelor of Science and Master of Science degrees establishes a limit on the duration of Bachelor's and Master's studies, as well as of the minor study programmes (see articles 10, 11a, 12a, 13 and 31).

(https://www3.unifr.ch/scimed/fr/rules/regulations)

1.1 Academic Titles and Programme of Study

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

The **programme of the MSc** in mathematics represents a scientific course of studies giving access to various professional activities in research, education, industry, commerce, and administration. In addition, the MSc is the entry requirement for the scientific work and deepened scientific education leading to a doctorate. When accompanied by an adequate subsidiary subject (biology, chemistry, geography, mathematics, or physics), the MSc allows one to enter a complementary didactics programme leading to a qualification as a high-school teacher (*Diplôme d'enseignement pour les écoles de maturité, DEEM / Lehrdiplom für die Maturitätsschulen, LDM*).

Candidates in possession of a BSc in Mathematics of the University of Fribourg or any other Swiss university or ETH are admitted without further requirement to the MSc course of studies (art. 7 of the Regulation). Candidates in possession of a BSc degree **from abroad**, in a different subject or of equivalent degrees can also be admitted to the MSc study programme by a decision of the Faculty of Science and Medicine to be made in each individual case. Provisional admission may be granted subject to the fulfilment of additional requirements (cf. Section 3.1).

1.2 Course Structure

The degree courses leading to the MSc are subdivided into **course units[1] (UE)** comprising lectures, seminars, etc. To each UE, a number of **ECTS[2] points** is assigned, which after assessment (e.g. successful exams) is converted into ECTS credits (see Section 1.4). The MSc degree course requires 90 ECTS credits (corresponding to a duration of study of 3 semesters).

The programme consists of a one-year taught programme comprising lectures 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. 1.4).

The purpose of the different forms of UE is as follows:

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1 UE is an abbreviation of the German term *Unterrichtseinheit*.
2 ECTS stands for European Credit Transfer System. One ECTS point corresponds to approx. 30 hours of work.

- **Lectures** give an introduction to the scientific methods in mathematics and advanced scientific thinking. They provide the fundamentals of various mathematical fields and their applications.
- **Seminars** give the opportunity for working more deeply on a mathematical subject and presenting it orally as well as in written form.
- The **master's thesis** is an autonomous scientific work under the supervision of an experienced researcher.

1.3 Acquired Skills

The aim of the studies leading to an MSc in Mathematics is to deepen knowledge and perfect competence in the chosen field. Thus, at the end of the programme, students will have shown that they 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.

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

The UE of the MSc programme are grouped into two validation packages, MSc1 and MSc2. The acquisition of ECTS credits occurs in two steps: the assessment of the UE and the awarding of the credits for completed validation packages.

Admission to the exam corresponding to a course can be subject to meeting the requirements of the corresponding exercise class. The **assessment** of lectures is made by an oral exam, whose type and duration are regulated in an appendix to this curriculum. Exams normally take place during the official exam periods (sessions) scheduled by the Faculty. Students register in the students' portal MyUniFR (https://my.unifr.ch) within the time stipulated for each exam according to the on-line procedure. When the semester during which the student has taken a UE on which he/she wants to be examined does not appear in the list of examinable UE, he/she should notify the Department of Mathematics to have it added. The grades range from 6 (highest) to 1 (lowest). An exam with a grade below 4 can be repeated once at the earliest during the next exam session.

The first **validation package** comprises multiple, separately assessed UE (Art 22 and 24 of the Regulation)

ECTS points are credited if: (Art 23 of the Regulation)
- the weighted average of the exam grades of a validation package is at least 4. The weighting is given by the number of ECTS points assigned to an UE.
- the assessment criteria of the not examined UE (seminars, etc.) are met.
- no mark equal 1.0

If these conditions are met, the validation package is successfully completed and the ECTS points of its UE are converted into ECTS credits for the validation package.

The second validation package consists of the master's thesis and a presentation of the latter. The validation occurs according to 3.5 below. Upon request, the Dean's office issues transcripts of records acknowledging exam results and awarded credits (Art. 26 and 27 of the Regulation) provided the exam fee has been paid.

1.5 Teaching Languages

Courses are taught in French, German or English. The students may choose the language of their seminar talks, written works and exams (French, German or English).

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 lecture, a thesis or a report. In particular, every external source of information (articles, lectures, web pages, etc.) must be adequately and correctly cited.

1.7 Regulations and Additional Information

Detailed information about studying Mathematics can be found in the documents referenced on the web page https://www3.unifr.ch/scimed/fr/plans, which can also be obtained from the Office of the Department of Mathematics, chemin du Musée 23, CH-1700 Fribourg.

3   Master of Science (MSc) in Mathematics

[Version 2020, validation package: PV-SMA.0000031, PV-SMA.0000032]

The MSc degree programme consists of course work corresponding to 90 ECTS credits and usually 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

The acceptance to a Master programme in Mathematics may be granted provided the following two conditions have been met by the applicant:

- Satisfying the University admission requirements as defined in the *Règlement concernant l'admission à l'Université de Fribourg* (https://www3.unifr.ch/apps/legal/fr/document/274904),
- The student possesses a Bachelor of Science in Mathematics from the University of Fribourg or an academic degree judged equivalent by the Faculty of Science and Medicine.

For candidates with degrees that are not judged equivalent by the Faculty of Science and Medicine, the Commission for Students' Requests will decide on eligibility (*Commission des requêtes des étudiant-e-s*, Dean's Office, Faculty of Science and Medicine, ch. du Musée 8, CH-1700 Fribourg, Switzerland).

Based on the candidate's academic qualification, the Commission for Students' Requests can accept the application on the condition that additional requirements are fulfilled, provided they are of a minor scope and can be completed simultaneously with the Master studies. Otherwise, access is denied or applicants can be admitted to a "pre-master programme" and can begin the Master programme only after having fulfilled the requirements initially set for the pre-master. Final acceptance to the Master programme for a qualifying student depends on the successful completion of the additional requirements.

Students enrolled in the Bachelor programme of Mathematics at the University of Fribourg can participate in courses and one seminar belonging to the Master programme before completing the BSc. However, assessment and validation of these courses can take place only after the BSc certificate has been obtained. Participation in a seminar for the master's programme requires prior successful completion of all seminars for the bachelor.

3.2 Course Units of the MSc Programme

The MSc programme comprises seven lecture courses[3], two seminars, a master's thesis and its presentation in a lecture. The following table lists a possible schedule for each semester.

1st semester

Code	Course unit	tot. h.	ECTS
	Mathematics *)		
SMA.04xxx	4 lecture courses	4 x 56	24
SMA.048xx	Seminar	28	3
			27

> *) see section 3.3

2nd semester

Code	Course unit	tot. h.	ECTS
	Mathematics *)		
SMA.04xxx	3 lecture courses	3 x 56	18
SMA.048xx	Seminar	28	3
and	with		
SMA.04814	Essay	–	3
SMA.04813	Preparation for master's thesis	–	6
			30

> *) see section 3.3

3rd semester

Code	Course unit	tot. h.	ECTS
SMA.05801	Master's thesis	–	30
SMA.05802	Presentation of master's thesis	–	3
			33

It is possible to choose some course units that are not part of the university's normal course programme, notably courses given in the *3ᵉ Cycle Romand de Statistique et Probabilités appliquées*, the *Swiss Doctoral Program in Mathematics,* as well as lecture courses offered at the Universities of Bern and Neuchâtel as part of the BeNeFri convention or the collaboration with the University of Bern. This requires the prior consent of the student advisor.

Of the seven lecture courses chosen, at least one each must belong to the fields of **Analysis, Algebra-Geometry-Topology** and **Applied Mathematics** (Numerical Analysis, Stochastics, Bio-mathematics). It is recommended to study the course announcements in time and to discuss the programme with the student adviser.

3.3 Continuation of the 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 may extend their knowledge in the same discipline during their MSc programme. In this case, up to 12 ECTS credits in Mathematics may be replaced by ECTS credits 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 pursued. The 1 to 12 ECTS credits obtained for the minor are counted towards Applied Mathematics in the sense of the preceding section.

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[3] A lecture consists of a 4-hours a week semester class, a two-hours a week yearly class or two 2-hours a week semester classes.

Six ECTS points may also be obtained, with prior consent of the student adviser, from a practical project in cooperation with the *Ecole d'ingénieurs et d'architectes de Fribourg* or the industry.

3.4 Examinations in the MSc Programme

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

Assessments of the courses are described in an appendix to the curriculum of mathematics. External courses are assessed by the school or faculty offering them.

3.5 Master's Thesis

The master's thesis is written under the supervision of a professor or tenured lecturer of the Department of Mathematics. The subject of the thesis is usually 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 then presented in the form of a lecture that should be accessible to fellow students. It may also be written under the co-direction of non-tenured lecturer of the Department for Mathematics (MA, SNFS-professor), or under the co-direction of a professor from another university.

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

The second validation package consists of 33 ECTS points. These points are transformed into ECTS credits 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, University of Fribourg (MSc)** is conferred after successful completion of the 2 validation packages.