UAB Universitat Autònoma de Barcelona	Foundations of Mathematics II Code: 107927 Credits: 6	2026/2027

Degree programme	Type	Course
Mathematics	FB	1

Contact lecturer

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Teaching staff

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Group languages

You can consult this information at the end of the document.

Prerequisites

Practice and skill in manipulating algebraic expressions are required. No specific prior mathematical knowledge is required to follow the course, but a minimum achievement of the skills and results of the subject "Fundamentals of Mathematics I" is recommended. However, the desire to understand reasoning in depth and to have a critical sense of the mathematical statements of others and, above all, of one's own is essential.

Objectives

At the beginning of the course, we will place special emphasis on the logical structure of mathematics, the axiomatic method and set theory with special attention to the notion of cardinality.

In the second part of the course we will visit integers, their quotients and polynomials with the perspective and tools of the first part, we will see beautiful demonstrations of well-known facts such as that there are infinite prime numbers or that there is a greatest common divisor of two numbers and we will also see that in polynomials we find analogous results.

We hope that the theorems and demonstrations of the course will contribute to the student acquiring adequate training in the use and construction of correct mathematical reasoning and becoming critical of mathematical statements and, above all, combative when faced with problems.

Learning outcomes

- CM06 (Discriminate between statements of results and their proofs to identify situations in which a counterexample is needed.) Discriminate between statements of results and their proofs to identify situations in which a counterexample is needed.
- CM07 (Construct proofs that respect the rules of propositional logic and mathematical induction.)

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- KM11 (Identify the basic principles of classical logic, as well as their relationship to the use of sets.) Identify the basic principles of classical logic, as well as their relationship to the use of sets.
- KM12 (Describe some basic axiomatic systems in set theory, modular arithmetic, and polynomial arithmetic.) Describe some basic axiomatic systems in set theory, modular arithmetic, and polynomial arithmetic.
- KM13 (Describe the basic algorithms for factoring and solving Diophantine equations.) Describe the basic algorithms for factoring and solving Diophantine equations.
- KM14 (Describe the processes for solving Diophantine equations and calculating polynomial roots.) Describe the processes for solving Diophantine equations and calculating polynomial roots.
- SM11 (Use the axiomatic method in the construction of the hierarchy of numbers, and in particular, in the justification of the introduction of complex numbers.) Use the axiomatic method in the construction of the hierarchy of numbers, and in particular, in the justification of the introduction of complex numbers.

Contents

1. Mathematical logic and set theory
2. Abelian groups
3. Arithmetic
4. Polynomials

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Study of theory and solving exercises	88	3.52	CM06, CM07, KM11, KM12, KM13, KM14, SM11
Seminars	6	0.24	CM06, CM07, KM13, KM14, SM11
Problem sessions	14	0.56	CM06, CM07, KM13, KM14, SM11
Theory classes	30	1.2	CM06, CM07, KM11, KM12, KM13, KM14, SM11

The methodology and training activities are adapted to the training objectives: introducing the mathematical language, learning to use it correctly, seeing proofs (and finding them, and writing them correctly!) and proof methods. To achieve these objectives, it is important that the student understands the theory but also, and even more, it is important that he/she tries to do the exercises.

In the problem classes, the exercises from the lists that the student will have previously worked on on his own will be discussed and solved on the board.

In the seminar sessions, the teacher will provide materials with exercises to practice discovering and writing proofs. Students must ask as many questions as necessary and finally the teacher will explain the resolution of the most representative exercises.

It must be clear that the correct assimilation of the syllabus of this subject requires dedication and continuous and sustained work on the part of the student. It is highly recommended to consult the bibliography as part of this independent work.

Note: 15 minutes of a class will be reserved, within the calendar established by the center/degree, for students to complete the surveys to evaluate the performance of the teaching staff and to evaluate the subject/module.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Submission of solved problems	15%	0	0	CM06, CM07, KM11, KM12, KM13, KM14, SM11
Final exam	40%	3	0.12	CM06, CM07, KM11, KM12, KM13, KM14, SM11
Midterm exam	20%	3	0.12	CM06, CM07, KM11, KM12, KM13
Retake exam	60%	3	0.12	CM06, CM07, KM11, KM12, KM13, KM14, SM11
Seminars	25%	3	0.12	CM06, CM07, KM11, KM12, KM13, KM14, SM11

The course assessment is continuous. The grade is obtained with the following activities:

1) Submission of solved exercises. The weight of these submissions in the final grade is 15%.

2) Activities assessable in seminars. The weight of these activities in the final grade is 25%.

3) Partial exam. 20% of the grade.

4) Final exam of the subject. 40% of the grade.

In order to pass the subject without a retake exam, the final exam grade must be at least 3.5 out of 10.

Those students who have not passed the subject (and only these) may take a retake exam, the grade of which will replace that of sections 3) and 4). This exam requires a minimum grade of 3.5 points out of 10. Activities 1) and 2) are not retaken.

If the final exam or the retake exam does not exceed 3.5 points, the course grade will not exceed 4.5, that is, it will be calculated as the minimum between the weighted average of the grades of the assessment activities and 4.5.

The "non-assessable" grade will be awarded to those who have only participated in assessable activities with a total weight of less than 50%.

Single assessment:

Students who have opted for the single assessment will have a written exam on the entire course content on the same day that the final exam of the subject is taken (60% of the final grade). This exam requires a minimum grade of 3.5 points out of 10. On the same day there will be an oral presentation of some exercises from the course lists, previously set by the teaching staff (15%). Written solutions to the three seminars of the course must be submitted and there will be an oral presentation of one of them (25%). If the course is not passed, either by not achieving the minimum grade in the exam or by not reaching 5 points in weighted average, a retake exam (60%) may be taken. The other activities are not retaken. The final grade is the weighted average of the grades obtained with a maximum of 4.5 if 3.5 points have not been exceeded in the written exam or its retake.

Note: In this subject, the use of Artificial Intelligence (AI) technologies is not allowed in any of its phases

Bibliography

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A. Reventós, Temes diversos de Fonaments de les Matemàtiques. Apunts.

Software

Sage

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	1	Catalan	second semester	morning-mixed
(SEM) Seminars	1	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	2	Catalan	second semester	morning-mixed
(SEM) Seminars	2	Catalan	second semester	morning-mixed
(SEM) Seminars	3	Catalan	second semester	morning-mixed
(SEM) Seminars	4	Catalan	second semester	morning-mixed