

27004 - Numbers and Sets

Syllabus Information

Academic Year: 2022/23

Subject: 27004 - Numbers and Sets

Faculty / School: 100 - Facultad de Ciencias

Degree: 453 - Degree in Mathematics

ECTS: 6.0

Year: 1

Semester: First semester

Subject Type: Basic Education

Module:

1. General information

1.1. Aims of the course

Numbers and Sets is a basic course in the degree. The main goal of the course is to lead the student to the acquisition of the language and general methods of mathematical expression.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the learning outcomes of the module provides training and competence to contribute to some extent to their achievement: (4) Quality education, (5) Gender equality, (8) Decent work and economic growth, (9) Industry, innovation and infrastructure, (10) Reducing inequality, (17) Partnerships for the goals.

1.2. Context and importance of this course in the degree

This course lies within the module *Algebraic Structures*, although its transversal character makes the competences acquired therein necessary in the rest of the modules of the degree.

In this course the stress is placed on the transversal competence «CT5. To be able to obtain effective information from bibliographic and informatic resources», useful in all the subjects studied in the degree.

1.3. Recommendations to take this course

The attendance to the theoretical classes (presential or on line) and the personal work, together with the work on the proposed questions and problems, and the use of the office hours provided by the instructor.

2. Learning goals

2.1. Competences

The overcoming of the subject will allow the student to be more competent in the development of the objectives described in the section on the results of the learning exposed in that section (learning goals, see below). Moreover, the student will improve her/his performance in the following competences:

- CT1. To express clearly, both writing and speaking, reasonings, problems, reports, etc.
- CT3. When dealing with a problem, to distinguish the key points from the secondary ones. To state conjectures and give arguments to confirm or refute them. To identify errors in wrong arguments, etc.
- CE1. To understand and use the mathematical method and language. To know proofs of the basic theorems in the different areas of mathematics.
- CE3. To solve math problems by using basic calculus skills and other techniques.
- CT5. To be able of obtaining information by bibliographic, and informatic means.

2.2. Learning goals

To overcome the course, the student must show the following skills:

- He/she makes proper use of the language and the basic properties of set theory, and its applications.
- He/she makes proper use of natural numbers, the induction principle, and the basic combinatorial arguments.
- He/she knows how to compute the greatest common divisor and the Bézout identity in integers and polynomials.
- He/she has knowledge about the factorization of integer numbers and polynomials.
- He/she is familiar with modular arithmetic.
- He/she makes proper use of complex numbers and their geometric representation.

2.3. Importance of learning goals

The learning goals are important since they provide a ground formation for the degree. In this course the student acquires competences on the use of mathematical language and the fundamental concepts of mathematics, whose lack prevents the adequate approach to the mathematical problems. That acquisition is also obtained in the courses *Linear Algebra*, and *Mathematical Analysis I*.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must show his/her acquirement of the learning goals by the following evaluation activities:

- Two quizzes (during class hours) with theory and problems. This represents 10% of the final mark.
- Final exam, to be done in one of the official calls. It represents 90% of the final mark.
- Completion of the course «Basic Digital Competence: learn to inform yourself, create and communicate digitally (basic level)» and obtain the pass.

The student has the right to base his/her final graded on just a global exam.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process is based on the following activities:

- Lectures: exposition of the needed contents for acquisition of the learning goals.
- Problem sessions: approaching problems related to the course.
- Participative sessions dealing with questions and methods and solving problems.
- Office hours.
- Online course «Basic Digital Competence: learn how to get information, create and communicate digitally (basic level)».

4.2. Learning tasks

More information about the activities of the course, including notes and problems, is available at <http://moodle.unizar.es>.

For the online course «Basic Digital Competence: learn how to get information, create and communicate digitally (basic level)», is expected:

- A training session of 50 minutes, in order to explain to students the objectives and mechanics of operation of the virtual course.
- 8-10 hours of independent work of the student.

The teaching activities and assessment tasks will take place in a face-to-face mode, except in the case that, due to the health situation, the dispositions emitted by the competent authorities and by the University of Zaragoza compel to take them to a greater or lesser extent in a telematic form.

4.3. Syllabus

- Natural numbers and induction principle. Basic combinatorics. Recurrence.
- Integer numbers, rationals and reals. Axiomatic formulation. The supremum axiom.
- Language and basic properties of sets and maps. Equivalence relations and order relations.
- Cardinality. Countable and uncountable sets.
- Integer numbers. Greatest common divisor. Euclidean algorithm. Bézout identity and linear Diophantine equations. Modular arithmetic.

- Polynomials. Factorization. Quotients of polynomials.
- Complex numbers. Geometrical representation (the complex plane). Operations. Roots of the unity.

4.4. Course planning and calendar

We refer to the academic calendar of the University of Zaragoza and to the schedule established by Science Faculty and that will be available at the beginning of the course. The course takes four hours each week. The course «Basic Digital Competence: learn how to get information, create and communicate digitally (basic level)» will take place in October, during a week that will be chosen presently.

The final exam will take place at the official calls, the Science Faculty will announce the dates before the course begins.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=27004>