27004 - Numbers and Sets

Syllabus Information

Academic Year: 2019/20
Subject: 27004 - Numbers and Sets
Faculty / School: 100 -

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

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving sessions, tutorials and autonomous work and study.

4.2.Learning tasks

This course is organized as follows:

- **Lectures**.
- **Problem-solving sessions**. Participatory sessions addressing issues and problems.
- **Tutorials**.
- **Autonomous work and study**.

For the online course "Information Management" a training session of 50 minutes is expected, in order to explain to students the objectives and mechanics of operation of the virtual course in Moodle.

4.3.Syllabus

This course will address the following topics:

- **Topic 0**: **Origins of number theory**
  - Natural numbers
  - Induction principle
  - Basic arithmetics
  - Number theory in Antiquity
- **Topic 1**: **Sets**
  - Basic Notations
  - Axioms: Constructions and Operations with Sets.
  - Maps and Relations.
  - Axiom of Choice.
  - Notions on Cardinals.
- **Topic 2**: **Natural numbers and integers**
  - Peano Axioms. Natural Numbers and Set Theory.
  - Operations and order relation in the set of Natural Numbers.
  - Construction of The set of integers from the set of Natural Numbers.
  - Euclidean algorithm, Bezout's identity and diophantine linear equations. Congruences.
- **Topic 3**: **Fields of numbers**:
  - Rational Numbers (construction from Z, operations and order relation)
  - Real Numbers (Approximation to their construction in Set Theory Through Dedekind's cuts).
  - Complex Numbers (Operations, geometric representation).

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle.

4.5.Bibliography and recommended resources

- Boyer, C. Historia de las Matemáticas, Alianza Editorial, Madrid, 1986
- Dedekind, R. ¿Qué son y para qué sirven lod números. Alianza Editorial, Madrid 1998
- Ebbinghaus, H-D. et al. Numbers, Springer, New York, 1991
- Gerstein, L. J. Introduction to Mathematical Structures and Proofs, Springer, New York, 2012
- Halmos, P. R. Naive Set Theory, Van Nostrand, New York, 1960
- Kline, M. El pensamiento matemático de la antihüedad a nuestros díasvols. I and III. Alianza Editorial, Madrid, 1992
- Tattersall, J. I. Elementary Number Theory, in Nine Chapters, Cambridge Univ. Press, 1999
- Stewart, I. and Tall. D. The foundations of Mathematics, Oxford University Press, 1977

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