UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Istituzioni di Matematiche

1819-1-G8501R006

Course title

Foundations of mathematics

Topics and course structure

This course introduces the basic results in arithmetics and in some other number fields. Moreover, we introduce some elements on sets and on functions and in probability theory.

Elements of set theory: operations among sets.

Functions, injective, surjective and bijective functions. Infinite sets.

Binary relations. Equivalence relations and order relations: equivalence classes and partitions.

The set of natural numbers. Introduction to the natural numbers via the Peano axioms. Sum, product and order in the natural numbers. Induction principle. Representation of natural numbers in base 10 and in other bases.

The integers. Construction of the integers from the natural numbers. Divisibility: quotient and remainder. Congruences mod n, and some modular arithmetic. Prime numbers, fundamental theorem of arithmetic. Eratostene's sieve. Greatest common divisor and minimal common multiple via Euclide's algorithm.

Rational numbers. Construction of the rational numbers from the integers. Elementary properties of rationals: algebraic and topological properties.

Basic introduction to probability theory. Independent events and conditional probability. Elementary computation of probabilities.

A brief introduction to the construction of the real field from the rationals.

Objectives

At the end of the course the student is familiar with the classical mathematical deduction and with some arguments in logic. Moreover, the student is able to present the basic concept in arithmetic from a university level perspective.

Methodologies

Lectures, exercise classes in small groups, exercises on interacting online platform.

Online and offline teaching materials

Books and online exercises.

Programme and references for attending students

PROGRAMME

Elements of set theory: operations among sets.

Functions, injective, surjective and bijective functions. Infinite sets.

Binary relations. Equivalence relations and order relations: equivalence classes and partitions.

The set of natural numbers. Introduction to the natural numbers via the Peano axioms. Sum, product and order in the natural numbers. Induction principle. Representation of natural numbers in base 10 and in other bases.

The integers. Construction of the integers from the natural numbers. Divisibility: quotient and remainder. Congruences mod n, and some modular arithmetic. Prime numbers, fundamental theorem of arithmetic. Eratostene's sieve. Greatest common divisor and minimal common multiple via Euclide's algorithm.

Textbooks

- M.Cazzola, Matematica per scienze della formazine primaria
- S. Di Sieno - S. Levi, Aritmetica di base, McGraw-Hill, 2005
- G. Caiati - A. Castellano, In equilibrio su una linea di numeri, Mimesis, 2007

Didactical material

- A. Cerasoli, Io conto, Feltrinelli, 2010
- A. Cerasoli, Sono il numero 1, Feltrinelli, 2008
- P. Cereda et al, L'aritmetica del Pirata Newton, Mimesis, 2010
- P. Cereda – G.Dimitolo, La ciurma del Pirata Newton, Mimesis, 2008
- H. M. Enzensberger, Il mago dei numeri, Einaudi

Programme and references for non-attending students

As for attending students

Assessment methods

Office hours

Office hours by appointment (send an email to your professor):

students AL: Daniela Bertacchi daniela.bertacchi@unimib.it

students MZ: Pablo Spiga pablo.spiga@unimib.it

Programme validity

One year.

Course tutors and assistants

Martina Carola

Marco Daneluzzo

Maurizio Dini

Domenico Iannizzi

Paola Riva

Claudio Vailati