UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematics for Teaching - Algebra

2526-1-F0602Q096

Aims

The course “Matematica per l’insegnamento - Algebra” and his twin “Matematica per l’insegnamento - Geometria” are aimed at future teachers of mathematics and science. The aim of the course is to revisit in a rigorous way with proofs the mathematics of the elementary and secondary schools, with emphasis on the historical and didactical aspects.

Contents

1 - Elemetary logic

2 - Integral numbers

3 - Modular aritmetic

4 - Rational numbers, real numbers

5 - Polynomials

Detailed program

I. Elementary logic
1. Truth tables
2. Proofs
3. Sets

4. Functions
5. Equivalence relations
6. Natural numbers
7. Cardinality

II. Integers
1. Computations in Z
2. Divisibility
3. Prime numbers
4. p-adic valuation
5. Greatest Common Divisor and Least Common Multiple
6. The equation ax + by = c
7. Positional mumbering

III. Modular arithmetic
1. Groups
2. Rings
3. The congruence-class ring

IV. Rational and real numbers
1. Rational numbers
2. Base b expansion of rational numbers
3. Real numbers
4. Continued fractions (time permitting)

V. Polynomials
1. The ring of polynomials
2. Arithmetic of polynomials
3. Roots
4. Multiplicity
5. Polynomial interpolation

Prerequisites

Background: Basic mathematics of the elementary and secondary schools. Prerequisites: None.

Teaching form

Classroom lectures. Individual and group study. The course is scheduled in Italian but could be held in English in the presence of foreign students.

Textbook and teaching resource

Lecture notes for the course will be provided in pdf format.

Notes of the Prof. Colzani.

R.Courant, H.Robbins “What is mathematics? An elementary approach to ideas and methods”.

C.B.Boyer “A history of mathematics”.

G.Chrystal "Algebra: An elementary text-book".

Euclid “Elements”.

L.Euler “Elements of algebra”.

G.H.Hardy, E.M.Wright “An introduction to the theory of numbers”.

G.Polya "How to solve it".

G.Polya "Mathematics and plausible reasoning".

G.Polya "Mathematical discovery".

H.Steinhaus “Mathematical snapshots”.

J.Stillwell “Elements of Mathematics: From Euclid to Gödel”.

Wikipedia.

Semester

Second semester.

Assessment method

Oral examination. The maximal grade is thirty. The student will have to demonstrate adequate understanding of the content of the course, and be able to expose clearly the knowledge acquired during the course.

Office hours

By appointment.

Sustainable Development Goals

QUALITY EDUCATION