UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Teaching Mathematics

2425-1-F4001Q038

Aims

Skills Building theoretical tools and critical reflections relating to methods and theories of learning and teaching mathematics. **Competencies** Being able to independently acquire and experiment methodologies, technologies and materials developed and tested over the years in the research and practice of **mathematics education**. Being able to design educational paths in mathematical disciplines on subject topics tought in secondary school.

Contents

Introduction to the methods, the ideas, the historical development and the theoretical frameworks useful in teaching secondary school mathematics. **This course will be delivered only in Italian language**.

The course is split into two modules.

Detailed program

Module 1 Methods for mathematics teaching: how to determine and address the conceptual issues at the various learning levels; analyze the epistemological aspects of mathematics from a didactic point of view. Planning of activities and knowledge/skill assessment: links of the consolidated tradition of teaching mathematics by skills with the results of research in teaching and pedagogy. Methods and techniques for communicating mathematics.

Module 2 The role of problem solving in mathematics: planning and animating laboratories, analysis of examples of experiences. New technologies: analysis of multimedia tools for the communication and teaching of mathematics.

Prerequisites

In-depth knowledge of the methods and contents of basic mathematics, especially about the topics taught in secondary school.

Teaching form

Both modules adopt a hybrid teaching approach, that combines lecture-based teaching (DE) and interactive teaching (DI). DE involves detailed presentation and explanation of theoretical content. DI includes active student participation through exercises and problems, short presentations, group discussions, and group or individual work. It is not possible to precisely determine in advance the number of hours dedicated to DE and DI, as these methods are dynamically intertwined to adapt to the course's needs and promote a participatory and integrated learning environment, combining theory and practice.

Lessons are conducted for a total of 56 hours (8 CFU).

The course is held in Italian as it focuses on the Italian school system.

Textbook and teaching resource

References

Module 1

DIDATTICA DELLA MATEMATICA, di Roberto Natalini, Anna Baccaglini-Frank, Pietro Di Martino, Giuseppe Rosolini (Mondadori 2018).

Module 2

DIDATTICA DELLA MATEMATICA, di Roberto Natalini, Anna Baccaglini-Frank, Pietro Di Martino, Giuseppe Rosolini (Mondadori 2018)(chapters not revised in module 1).

LEARNING TO THINK MATHEMATICALLY: PROBLEM SOLVING, METACOGNITION, AND SENSE MAKING IN MATHEMATICS di Alan H. Schoenfeld in Handbook of research on mathematics teaching and learning (A Project of the National Council of Teachers of Mathematics, 1992) (Reprint https://journals.sagepub.com/doi/abs/10.1177/002205741619600202).

MATHEMATICAL DISCOVERY by George Polya (1962).

Contents revision

COMINCIAMO DA ZERO, di Vinicio Villani (Pitagora 2003).

COMINCIAMO DAL PUNTO, di Vinicio Villani (Pitagora 2006).

Semester

2S

Assessment method

There are no intermediate tests.

The finale exam consists in an **Integrated oral** on the two modules, with discussion and evaluation of **projects**. The ability to decline the contents and methods of mathematics into a didactic function, the autonomy in posing relevant and critical questions for the communication and evaluation of the transmission of knowledge will be assessed.

In particular, for the **Module 1** the project is a micro-lesson, which is presented during the oral discussion, accompanied by a report. The exams are individual, and the projects and reports must be traceable to a single person. Students are encouraged to work in groups, and collaborate to achieve the stated goals.

The explicit description of the nature of the projects will be illustrated during the course. **Guidelines** will be published on the *e-learning* space, and may vary according to the number and nature of course participants. The specific topics, dates and concrete methods of assessment will be **discussed** and **negotiated** with students.

For **Module 2**, the project must include reference to a problem that can form the basis for a proposal for laboratory-type activities on the lecture subject.
For this part, the coherence of the proposed problem with the topic of the lesson will be evaluated, whether or not the problem has touched one *main idea* of the discipline (as discussed at lecture), the possibility of reading the problem on multiple levels and of giving different resolutions , the possibility that the proposed problem can *act as a bridge* to relaunch further problems.

More information will be given in class and in the e-learning area of the course.

The final grade (max 30) expresses an overall evaluation of everything that contributes to the achievement of the objectives described above.

Office hours

On appointment.

Sustainable Development Goals

QUALITY EDUCATION