Academic subject: Elementary Mathematics from ad Advanced Point of View

Degree Class: LM-40 Mathematics		**Degree Course:** Mathematics	**Academic Year:** 2020/2021
		Kind of class: Optional	**Year:** / **Period: 1**
			ECTS: 7 divided into **ECTS lessons: 52** **ECTS exe/lab/tutor: 8**

Time management, hours, in–class study hours, out–of–class study hours

lesson: 52 exe/lab/tutor: 8 in–class study: 60 out–of–class study: 115

Language: Italian	**Compulsory Attendance:** no		
Subject Teacher: Eleonora Faggiano	**Tel:** **e–mail:** eleonora.faggiano@uniba.it	**Office:** Department of Mathematics Room 27, Floor II	**Office days and hours:** By appointment

Prerequisites: Knowledge of classical Euclidean geometry and, knowledge that usually are acquired during the geometry degree courses of a L-35 class. In particular, the concepts of group of transformations and of vectorial space.

Educational objectives:

The aim of the course is to provide advanced knowledge on elementary geometry. It presents, Geometry as a formal system focusing, in particular, on the Choquet's and the Prodi's axiomatics and comparing them. Moreover, the course suggests some reflections on crucial aspects of calculus from the didactic point of view.

Expected learning outcomes (according to Dublin Descriptors)

Knowledge and understanding: Acquiring advanced knowledge in Geometry. Understanding the notion of Geometry as a formal system. Acquiring elements of an historical view of Geometry and its teaching. Acquiring elements of an historical view of Calculus. Reflecting on: the notions of limit, continuity and differentiability of a function.

Applying knowledge and understanding:
Performing a critical vision of the contents. Reporting on specific subjects under study. Discussing point of views on educational applications of the course contents.

Making judgements:
Understanding the differences among the studied axiomatics and choosing the most appropriate in relation with the aims.

Communication:
Ability to present mathematical arguments and the conclusions from them with clarity and accuracy and in forms that are suitable for the audiences being addressed.

Lifelong learning skills:
Facility with abstraction including the logical development of formal theories and the relationships between them.
Ability to communicate about Geometry at different levels and for different audiences.

Course program

The role of Geometry in the teaching of Mathematics at school level.
Euclidean Geometry and Hilbert's axiomatics for Geometry. The Klein's Erlangen Program.
Choquet's axiomatics for Geometry: axioms of incidence, axioms of order; axioms of orthogonality and consequent properties; symmetries; the structure of real vector space for a line; isometry group and similarity group of a line; isometry group and translation group of a plane; similarity group of a plane; characterizations of angles and their relationship with isometries; congruence criteria for triangles; the structure of real vector space for a plane; homotheties; dilations; scalar product; structure of field for a plane; similarity criteria.
Geometry axioms in the Prodi's project "Matematica come scoperta" and their comparison with Choquet's axioms.
Sequences and functions. Notion of limit. Continuity and differentiability of a function.

Teaching methods:

Lectures, analysis and discussion of journal papers and other type of texts

Auxiliary teaching:
- Geometria elementare ed Algebra, photostat notes by I. Candela
- L'assiomatica della Geometria del Progetto Prodi, notes by A. Pesci
- Journal papers and other texts selected by the teacher

Assessment methods:
Evaluation of the group and individual activities performed durign the course and final oral examination.

Bibliography:

- Choquet, G., L'insegnamento della geometria, Ed. FELTRINELLI
- Linati, P., L'algoritmo delle occasioni perdute, Ed. Erickson, Trento
- Villani, V., Cominciamo dal punto, Pitagora Editrice, Bologna
- Agazzi E., Palladino, D., Le geometrie non euclidee e i fondamenti della geometria, ed. La Scuola 1998.
- Villani, V., Bernardi, C., Zoccante, S., Porcaro R., Non solo calcoli, Springer-Verlag Italia.