**Advanced geometry**

Prof. Mauro Spera

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The course aims at enhancing the students' basic knowledge of linear algebra and geometry and provide techniques for representing and studying algebraic surfaces in projective space. The student will acquire a wider geometrical perspective, useful for further theoretical advance and applications.

***COURSE CONTENT***

The course consists of the following parts:

1. ADVANCED LINEAR ALGEBRA

Vector space duality and its properties. Projective spaces derived from vector spaces, and dual projective spaces. Orthogonality in Euclidean vector spaces. Sesquilinear forms and Hermitian forms over complex vector spaces. Unitary spaces and their properties. Hermitian and unitary operators: their properties and the spectral theorem.

2. ADVANCED GEOMETRY:

Three-dimensional complex projective spaces and their properties. Study of real algebraic surfaces in these spaces: order, simple and singular points, surfaces of revolution and ruled surfaces. Application of the general theory to quadrics: projective and affine classification, plane sections, canonical affine equations, and metric properties.

***READING LIST***

M. Spera & E.Zizioli *Advanced geometry,* Notes of the course, (Italian) available online on Blackboard

 **Further references**

M. Abate, *Geometria,* McGraw Hill, Milan 1996.

M.C. Beltrametti - E. Carletti - D. Gallarati - G. Monti Bragadin, *Lezioni di geometria analitica e proiettiva,* Bollati Boringhieri, Turin, 1996.

G. Castelnuovo,Lezioni di geometria analitica, Dante Alighieri, Milan 1969.

E. Sernesi, *Geometria 1,* Bollati Boringhieri, Turin, 1991.

***TEACHING METHOD***

Traditional blackboard lectures.

***ASSESSMENT METHOD AND CRITERIA***

Assessment will take place through an oral exam aiming at verifying the student’s level of assimilation of the concepts and theorems through exposition and discussion of some of the points of the syllabus, with possible connections to pre-requisite knowledge. The final evaluation will assess the candidates’ explanatory efficacy, clearness and accuracy, together with assimilation of the concepts and their own personal critical elaboration.

***NOTES AND PREREQUISITES***

Prerequisites involve standard content of the first two years of a Bachelor Programme in Mathematics. Regular attendance is strongly encouraged.

***Office hours***

Prof. Spera will meet students in his office during lesson days and by appointment.

*Further information can be found on the lecturer's webpage at http://docenti.unicatt.it/web/searchByName.do?language=ENG or on the Faculty notice board.*