# Algebraic curves and Riemann surfaces

## Prof. Mauro Spera

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

The present course consists in an introduction to complex algebraic geometry, focussed on algebraic curves and on their interpretation as compact Riemann surfaces. Eventually, the student will master a wide range of techniques from Geometry, Algebra and Analysis, which, together, coalesce to establish one of the most elegant mathematical theories.

***COURSE CONTENT***

Review of complex analysis and topology.

Plane algebraic curves. Pluecker formulae.

Riemann surfaces. Examples. Riemann's existence theorem.

Differential geometric aspects of Riemann surfaces.

Elliptic functions and integrals. Riemann-Hurwitz formula.

Riemann-Roch formula.

Uniformization theorem.

Divisors, line bundles, Jacobians, theta functions.

***READING LIST***

M. Spera, *Lecture notes (available on Blackboard)*

**Further references**

S.K. DONALDSON, *Riemann surfaces*, Oxford University Press, 2011.

F.C. KIRWAN, *Complex algebraic curves*, Cambridge University Press, 1992

R. NARASIMHAN, *Compact Riemann Surfaces*, Birkhau"ser, Basel, 1992.

C.L. SIEGEL, *Topics in complex function theory - Voll I,II,III*, Wiley Classics Library 1988.

R. WALKER, *Algebraic Curves*, Springer, New York, 1950, 1978.

***TEACHING METHOD***

Traditional classroom lectures.

***ASSESSMENT METHOD AND CRITERIA***

At the end of the course there will be an oral test aiming at verifying the students’ learning outcomes.

Assessment will take place through an oral exam aiming at verifying the student’s level of assimilation of the concepts and theorems through the students’ 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 a Bachelor Programme in Mathematics. Basic knowledge of differential geometry is not compulsory but helpful. Regular attendance is strongly encouraged.

***Office hours***

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