

Course Title. *Introduction to moduli spaces of vector bundles on curves*

Teacher(s). Sonia Brivio and Filippo Francesco Favale

Overview. The course is devoted to give an introduction to the construction of moduli spaces of vector bundles on smooth algebraic curves. Prerequisites: notions of algebraic geometry and commutative algebra, basic language of categories.

When. Starting at the beginning of November 2020 till mid-December 2020.

TENTATIVE Weekly schedule: 4 hours every Monday.

Where. The course will be on line (or at the Department of Mathematics University of Milano-Bicocca, if possible).

Contacts. sonia.brivio@unimib.it; filippo.favale@unimib.it

Abstract. The subject of this course is the problem of classification of vector bundles on a smooth projective algebraic curve. We will begin with an overview of the moduli problem and we will introduce the notion of fine and coarse moduli spaces. We will study the family of vector bundles of fixed rank r and degree d on a smooth curve and we will define the notion of stability. We will discuss the construction of the moduli space classifying isomorphism classes of such vector bundles using Mumford's Geometric Invariant Theory. In the last part of the course we will present how these arguments may be modified in the singular case. Time permitting, we will outline more recent results and related problems.

References.

- P. E. Newstead, *Introduction to Moduli Problems and Orbit Spaces*; Published for Tata Institute of Fundamental Research, 1978
- D. Mumford, *Geometric invariant theory*, Ergebnisse der Mathematik und ihrer Grenzgebiete, Neue Folge, Band 34, Springer-Verlag, Berlin-New York, 1965
- C. S. Seshadri, *Fibrés vectoriels sur les courbes algébriques*, Asterisque, vol 96, Société Mathématique de France, Paris, 1982
- J. Le Potier, *Lectures on vector bundles*, Cambridge Studies in advanced Mathematics, n 54, 1997
- D. Huybrechts M. Lehn, *The geometry of moduli spaces of sheaves*. Second edition. Cambridge University Press, Cambridge, 2010.
- S. Mukai, *An introduction to invariants and moduli*, Cambridge studies in advanced mathematics, Cambridge, University Press, 2003
- P. E. Newstead, *Geometric invariant theory, Moduli spaces and vector bundles*, London Math. Soc. Lecture Notes, Ser., vol. 359, Cambridge University Press, pp. 99–127, 2009