

Topics in Differential Complex Geometry

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Abstract:

The aim of these lectures is to introduce classical objects and tools of Complex and Kähler Geometry. We will cover (but sometimes very partially) the following topics:

1. Basics of Complex Geometry

- Basics of several complex variables and complex manifolds. (*2,5 courses*)
- Notion of almost complex structures and decomposition of the tangent bundle (*1 course*)
- Vector bundles and holomorphic vector bundles (sections, constructions and examples). (*2 courses*)
- Dolbeaut cohomology (only the definition and few examples) (*0,5 course*)
- Basics of sheaves theory and Čech cohomology. (*3 courses*)

2. Curvature, existence of sections and projective embedding.

- Hermitian metrics on complex vector bundles. (*1 course*)
- Chern connection, curvature and the first Chern class of line bundles (from the Chern-Weil Theory point of view). (*2 courses*)
- Notion of ampleness of line bundles, link with existence of sections and discussion on the Kodaira Embedding Theorem. (*1 course*)

Prerequisites: differential geometry, complex analysis of one variable.

References:

D. Huybrechts, *Complex geometry*, Universitext, Springer, 2005.

J.-P. Demailly, *Complex Analytic and Differential Geometry*, available online: <https://www-fourier.ujf-grenoble.fr/~demailly/manuscripts/agbook.pdf>

P. Griffiths, J. Harris, *Principles of Algebraic Geometry*, Wiley Classics Library, 1994.

C. Voisin, *Hodge Theory and Complex Algebraic Geometry I*, Cambridge University Press, 2010.