Dr. S. Schreieder

SS 2016

V5A4 – Selected topics in Algebraic Geometry: Mixed Hodge Structures and Geometry

Wednesdays 12–14, seminar room 0.006

In this lecture course we explain Deligne's theory of mixed Hodge structures and discuss various applications to complex algebraic geometry. A rough outline is as follows:

- Recollections: pure Hodge structures, the Hodge decomposition theorem and the Hard Lefschetz theorem.

- Local systems and variations of Hodge structures.

- The category of mixed Hodge structures.

- Mixed Hodge structures of smooth (but possibly open) varieties.

- Applications: The global invariant cycle theorem and the semi-simplicity theorem.

- Mixed Hodge structures of projective (but possibly singular) varieties.

- Degenerations of Hodge structures in semi-stable families: Limit mixed Hodge structures and the Clemens–Schmid exact sequence.

Prerequisites. We assume familiarity with basic concepts of complex geometry in the amount of Sections 2 and 3 of [5].

References

[1] M. A. de Cataldo, *The Hodge theory of projective manifolds*, Imperial College Press, 2007.

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[3] P. Deligne, *Théroie de Hodge III*, Inst. Hautes Études Sci. Publ. Math. **44** (1974), 5–77.

[4] A. Durfee, *A naive guide to mixed Hodge theory*, Proc. Sympos. Pure Math. **40**, Amer. Math. Soc., Providence, RI, 1983.

[5] D. Huybrechts, *Complex Geometry*, Springer, Berlin, 2005.

[6] D. R. Morrison, *The Clemens-Schmid exact sequence and applications*, Chapter VI in: *Topics in Transcendental Algebraic Geometry*, Annals of Mathematics Studies **106**, Princeton, 1984.

[7] C.A.M. Peters, *Motivic Aspects of Hodge Theory*, Tata Institute of Fundamental Research Publications, Mumbai, 2010.

[8] C.A.M. Peters and J.H.M. Steenbrink, *Mixed Hodge Structures*, Springer, Berlin, 2008.

[9] C. Voisin, *Hodge Theory and complex algebraic geometry II*, Cambridge University Press, Cambridge, 2003.