

7.6 Reading 6: Advanced Algebraic Geometry (Scheme theory)

1	Title of the course: Advanced Algebraic Geometry (Scheme theory)
2	Course Code: HRI-MM-646-R
3	Total Contact hours: At least 75 hours of interaction with the instructor
4	Course Credit: 4
5	Course Prerequisites: Commutative Algebra (Algebra II), Category theory
6	Assessment (Evaluation Procedure): Oral Examination 80% + Presentation 20%
7	Course Outcome: • Understand and learn the advanced topics in Algebraic Geometry. • Learn applications of abstract techniques of scheme theory in geometric and number theoretic problems. • Pursue further courses/research in arithmetic and algebraic geometry.
8	Syllabus: • (Pre-)sheaf, Sheaves of modules over topological spaces • Spec of a ring, stalk, co-ordinate ring, dimension • Scheme, Gluing, reduced and integral scheme • Product, separated and proper scheme • Projective morphism, flat morphism, birational map • Coherent sheaves and vector bundles, divisors and line bundles • Sheaf cohomology, derived push-forward and pull-back, base change • Serre duality theorem, semicontinuity theorems • functor of points, Group scheme, Hilbert scheme
9	References: 1. I. Shafarevich, <i>Basic Algebraic Geometry II</i>, (Second Edition) Springer-Verlag (1988). 2. R. Hartshorne, <i>Algebraic Geometry</i>, Graduate texts in Mathematics (1977). 3. D. Mumford and T. Oda, <i>Algebraic Geometry II</i>, TRIM publications 73 (2015). 4. Q. Liu, <i>Algebraic Geometry and Arithmetic Curves</i>, OUP Oxford (2002). 5. D Eisenbud, J. Harris, <i>The Geometry of Schemes</i>, Graduate texts in Mathematics (2000), 6. U. Görtz, T. Wedhorn, <i>Algebraic Geometry I</i>, Vieweg+Teubner Verlag (2010).