ALGEBRAIC GEOMETRY 2023-2024

	DAY	TIME	WHERE	TYPE	TOPICS
LECTURE 1	3 oct	9:00	ROOM 134	THEORY	Presheaves, sheaves, morphisms, constant presheaves, sheaf condition via equalisers. Examples.
LECTURE 2	5 oct	11:00	ROOM 134	THEORY	Stalks, compatible germs. Surjectivity of maps of sheaves. Sheaf isomorphisms via stalks (proof). Existence of sheafification (proof). Skyscrapers. Exact sequences of sheaves.
LECTURE 3	10 oct	9:00	ROOM 134	THEORY	Supports of sheaves and sections. Defining sheaves on basic open sets. Direct image, inverse image, their adjunction. Sheaves supported on a closed subset.
LECTURE 4	12 oct	11:00	ROOM 134	THEORY	Locally ringed spaces, their morphisms. Immersions. Closed immersions = ideal sheaves. Zariski topology on Spec A and its quasicompactness. Closed points, closure of a subset of Spec A. “Functions” on Spec A.
LECTURE 5	17 oct	9:00	ROOM 134	THEORY	Localisation of a module. Structure sheaf of Spec(A). Definition of affine schemes. Schemes. Affine varieties.
LECTURE 6	19 oct	11:00	ROOM 134	THEORY	Quasicompact, connected, irreducible schemes. V(I) irreducible iff rad(I) is prime. Generic points on irreducible schemes. Morphisms of affine schemes. Spec is an equivalence Rings^op —> Aff.
LECTURE 7	24 oct	9:00	ROOM 134	THEORY	Examples of affine (and not affine) schemes and morphisms. Schemes over a base, closed subschemas. Hom(-,Y) is a sheaf. Morphisms to an affine scheme (adjunction). Affinisation.
LECTURE 8	26 oct	11:00	ROOM 134	THEORY	Proj of a graded A-algebra: Zariski topology and structure sheaf. Projective varieties. Projective A-schemes.
LECTURE 9	27 oct	9:00	ROOM 134	EXERCISES	Exercises on Spec and Proj.
LECTURE 10	31 oct	9:00	ROOM 134	EXERCISES	Exercises on projective varieties.
LECTURE 11	7 nov	9:00	ROOM 134	THEORY	Irreducible components. Locality Lemma. Reduced schemes. Integral schemes.
LECTURE 12	9 nov	11:00	ROOM 134	THEORY	Noetherian schemes. They have finitely many irreducible components. Dimension of schemes and varieties.
LECTURE 13	14 nov	9:00	ROOM 134	THEORY	0-dim schemes. Fibre products, properties. Fibres. Affine Communication Lemma. Stability under base change, compositions. Local on the target. Finite type morphisms. Projective morphisms to Spec A.
LECTURE 14	16 nov	11:00	ROOM 134	THEORY	Notions of “points”. Diagonal, (quasi)separated, proper, affine morphisms and their properties. Valuative criteria. Functions on proper integral varieties are constant.
LECTURE 15	21 nov	9:00	ROOM 134	EXERCISES	Diagonal is an immersion. Graph of a morphism. Sections (of separated morphisms) are (closed) immersions. (Bi)rational maps, ring of rational functions. Birational iff isomorphic dense open sets. Maps reduced to separated agreeing on a dense open are equal.
LECTURE 16	23 nov	11:00	ROOM 134	THEORY	Equivalence between dominant rational maps and inclusions of function fields. Birational morphisms. Rational parametrisations (circle, nodal cubic). Cremona map, blowup of A^2 at a point. Scheme-theoretic image.
LECTURE 17	24 nov	10:00	ROOM 134	THEORY	Quasi-finite, finite, integral morphisms. Tangent spaces, regular schemes, Jacobian Criterion (affine with proof). Reduced varieties have a regular closed point (no proof).
LECTURE 18	28 nov	9:00	ROOM 134	THEORY	Flat morphisms: properties and examples. Formally smooth, unramified and étale.
LECTURE 19	30 nov	11:00	ROOM 134	EXERCISES	Exercises on rational maps and blowing up.
LECTURE 20	5 dec	9:00	ROOM 134	THEORY	Dimension of fibres. Smooth (and comparison to regular), unramified and étale. Infinitesimal lifting (no proof). Examples
LECTURE 21	7 dec	11:00	ROOM 136	EXERCISES	Tangent space and maps from dual numbers. Affine and projective dimension theorems. No morphisms P^n —> C if n > 1.
LECTURE 22	12 dec	9:00	ROOM 134	THEORY	O_X-modules, (quasi)coherent sheaves on schemes, locally free sheaves, Picard group.
LECTURE 23	14 dec	11:00	ROOM 136	EXERCISES	Resolutions of singularities and blowups.
LECTURE 24	15 dec	10:00	ROOM 134	THEORY	Coherent sheaves on projective schemes, morphism to P^r. No morphisms P^n —> P^m if n > m.
LECTURE 25 (PHD)			ROOM 134		
LECTURE 26 (PHD)			ROOM 134		
LECTURE 27 (PHD)			ROOM 134		
LECTURE 28 (PHD)			ROOM 134		
LECTURE 29 (PHD)			ROOM 134		
LECTURE 30 (PHD)			ROOM 134		