

Prerequisites for Summer School on Noncommutative Algebraic Geometry at the University of Antwerp

Prerequisites are divided into “basic” and “advanced”. Familiarity with basic prerequisites is expected for everyone taking part in the course. Prerequisites involve category theory (CT), algebraic topology (AT) and algebraic geometry (AG). Students will be asked in advance to rate their familiarity with each of these three domains on a scale from 1 to 5, with 1 corresponding to the basic list, 3 corresponding to the advanced list, and 5 corresponding to research level, typically for PhD students working in this field.

The items in the following list will be considered as basic prerequisites:

- (CT) Category theory language, eg. sections 1.2 - 1.4 (12 pages) of
Categories for the working mathematician - S. Mac Lane
- (AG) Tensor products, eg Sections 'Tensor product of modules', 'Restriction and extension of scalars', 'Exactness properties of the tensor product', and 'Algebras' (7 pages) of
Introduction to Commutative Algebra - M. F. Atiyah and I. G. Mac-Donald
- (AT) Chain complexes, eg Sections 1.1-1.4 (18 pages) of
An Introduction to Homological Algebra - Charles A. Weibel
- (AT) Homotopy of spaces, eg Chapter 0: until 'Cell Complexes', and Chapter 1: Section 1.1: until 'Paths and Homotopy' (15 pages) of
Algebraic Topology - Allen Hatcher
- (AG) Algebraic varieties, eg Chapter I: Sections 1 and 2 (14 pages)
Algebraic Geometry - Robin Hartshorne

The items in the following list constitute optional, more advanced study material, which will be recalled during the courses when used. The interactive problem sessions will be organised taking differences in background knowledge into account.

- (CT) Yoneda's lemma, limits and colimits, adjunctions and equivalences: sections 3.1 - 3.4 and 4.1 - 4.4 of
Categories for the working mathematician - S. Mac Lane
- (AT) Simplicial complexes and simplicial sets: Sections 2 and 3 of
An elementary illustrated introduction to simplicial sets - Greg Friedman: <https://arxiv.org/pdf/0809.4221.pdf>

(AT) Homotopy theory: Section 1.1 until 'Induced Homomorphisms', and Section 2.1 until 'Homotopy Invariance' of

Algebraic Topology - Allen Hatcher

(AG) Schemes and sheaf cohomology: Chapter II: Sections 1,2 and 5, and Chapter III: Sections 1-5

Algebraic Geometry - Robin Hartshorne