Requirements. The main objective of both courses is to formulate and answer combinatorial questions about geometric or topological objects by means of algebra. The following gives a more specific description of the necessary background. In addition to main references, we give additional pointers to the literature that provide further perspectives on the topics to be treated. More advanced topics where background is beneficial but not required are marked with (*).

The common requirement for both courses is a basic but solid background in discrete geometry and combinatorics:

- simple and simplicial polytopes, face lattices
- simplicial complexes, triangulations
- f-vectors and Euler-Poincaré relations, Dehn-Sommerville relations*
- Möbius inversion on partially ordered sets, rational generating functions.

Fundamentals in (commutative) algebra on a graduate level:

- rings, (monomial) ideals, quotients;
- graded rings/modules, Hilbert polynomials*;

For the lectures “Valuations on polytopes – Geometry and Combinatorics" by Sanyal:

- convex geometry basics: support and separation, polarity, Minkowski addition;
- Ehrhart polynomials, h^*-vectors*
- volume, mixed volume*, Alexandrov-Fenchel inequalities*

For the lectures “Generalized Lower Bound Theorems and beyond" by Nevo

- links, stars, and simplicial (co)homology;
- Cohen-Macaulay complexes*