

CO 739 Combinatorial Hopf algebras and renormalization Winter 2020

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Outline

We will be looking at combinatorial Hopf algebras. We will study a number of classical and interesting Hopf algebras that appear in combinatorics. There will be some emphasis (but not an exclusive emphasis) on how Hopf algebras appear in renormalization in quantum field theory, and those examples which lead there.

You do not need to know any physics to take this course. You should know something about at least one of enumerative or algebraic combinatorics, abstract algebra, or renormalization in quantum field theory.

Suggested reading

You might find it helpful to brush up on whichever of the following things you are not familiar with.

- Integer partitions, rooted trees, words over finite and infinite alphabets.
- Basics of symmetric functions.
- Tensor products of vector spaces and algebras.

It is an added bonus if you know a little graph theory, if you remember how to do integrals you might see in undergrad calculus, or if you know some quantum field theory.

How many different departments do you think we can get represented among those taking this course? How many different research areas from within departments?