MATH-691

Triangulated Categories: What, Where, Why?

Sanders Beren

Cursus	Sem.	Type
Mathematics		Obl.

Language of teaching	English
Credits	2
Session	
Exam	Oral
Workload	60h
Hours	**28**
Courses	28
Number of positions	**20**

Frequency

Only this year

Remark

Next time: Spring 2018

Summary

This course provides an introduction to the theory and applications of triangulated categories, including the subject of tensor triangular geometry, motivated via three principal examples arising in algebraic geometry, representation theory, and homotopy theory.

Content

This course will be an introduction to the theory and applications of triangulated categories, including the subject of tensor triangular geometry. We will motivate the notion of a triangulated category via three principal examples arising in algebraic geometry, representation theory, and homotopy theory; namely, the derived category of a ring, the stable module category of a finite group, and the stable homotopy category of spectra. After motivating and introducing these three principal examples, we will develop some of the fundamental tools used in the theory of triangulated categories (such as Brown Representability and Bousfield Localization), before moving on to the subject of Tensor Triangular Geometry --- a generalization or, rather, broadening of Algebraic Geometry where commutative rings are replaced by tensor-triangulated categories. Throughout the course, there will be an emphasis on the historical development of the subject, while connections with modern developments in homotopy theory and derived algebraic geometry (e.g. "Brave New Algebra") will also be touched upon.

We will assume some knowledge of category theory (adjunctions, limits & colimits, Kan extensions) and homological algebra (complexes of R-modules, projective and injective resolutions, Ext and Tor, derived functors). Some knowledge of algebraic geometry (basic scheme theory) would be useful to further appreciate the examples and context of the subject, but we will stick to the affine case (i.e. commutative rings) to minimize prerequisites. Similarly, knowing a small amount about linear representations of finite groups or abstract homotopy theory would be helpful, but is not really necessary.