Topics in Noncommutative Algebra (L16)

Non-Examinable (Graduate Level)

Dr C.J.B. Brookes

The aim of the course is to introduce various classes of algebras that have applications in representation theory, number theory and geometric group theory, and I'll use them to discuss dimension, localisation and completion in the noncommutative context. I'll also discuss Hochschild (co-)homology and its relationship with the deformation theory of algebras.

My choice of examples will depend to some extent on the audience, but I expect to talk about group algebras, Iwasawa algebras (that are completed group algebras of compact p-adic Lie groups), Novikov rings (that are completed group algebras of interest to geometric group theorists) and differential operator algebras (and D-modules). Other possibilities are quantum coordinate rings (e.g. the quantum n-torus) and universal enveloping algebra of Lie algebras.

Prerequisites

The more general algebraic experience the better. I'll be assuming some acquaintance with commutative algebra.

The section on Hochschild (co-)homology will combine well with the course on group cohomology.

Literature

1. K. Ardakov and K.A. Brown, *Ring-theoretic properties of Iwasawa algebras: a survey*, Doc. Math. (extra volume Coates), 7-33 (2006). Also available at https://arxiv.org/pdf/math/0511345.

2. J.D. Dixon, M.P.F. du Sautoy, A. Mann and D. Segal, *Analytic Pro-p Groups.* Cambridge University Press, 1999.

3. K.R. Goodearl and R.B. Warfield Jr, *An Introduction to Noncommutative Noetherian Rings.* London Mathematical Society Student Texts **61**, 2004.

4. J.C. McConnell and J.C. Robson, *Noncommutative Noetherian rings.* Graduate Studies in Mathematics **30**, American Mathematical Society 2001.

5. J.C. Sikorav, *On Novikov homology.* Available at https://perso.ens-lyon.fr/jean-claude.sikorav/textes/Novikov.December2017.pdf.

6. S. Witherspoon, *Hochschild Cohomology for Algebras.* Graduate Studies in Mathematics **204**, American Mathematical Society 2019.