

Topics in Ring and Representation Theory (MATH11144) DRPS entry

As stated in the DRPS course description, this course changes from year to year, so this document gives the detailed syllabus for 2015/16. The DRPS entry can be found at

<http://www.drps.ed.ac.uk/15-16/dpt/cxmath11144.htm>

where the following entries should be modified:

1. **Exam:** (this is currently blank) This course has a December exam. The course information sheet on the course webpage contains more information about this, and the other assessment rules.
2. **Course Description:** (this currently says the course changes from year to year)
This is a first course in Lie algebras, and will lead up to the classification of finite dimensional semisimple Lie algebras, via root systems and Dynkin diagrams. These connect to a large number of other areas of mathematics.

During the course, the following topics will be covered.

- §1 Lie algebras, subalgebras, homomorphisms, structure constants.
- §2 Ideals, constructions with ideals, isomorphism theorems, direct sums.
- §3 Some examples in small dimension.
- §4 Solvable and nilpotent Lie algebras.
- §5 The Invariance Lemma.
- §6 Engel's Theorem and Lie's Theorem.
- §7 Basics of Representation Theory, Schur's Lemma.
- §8 Representations of \mathfrak{sl}_2 .
- §9 Cartan subalgebras and root spaces.
- §10 Root systems and their classification.
- §11 The classification of finite dimensional semisimple Lie algebras.