

# Kursrapport MM8043 Reductive Algebraic Groups HT24

Antal respondenter: 1  
Antal svar: 1  
Svarsfrekvens: 100,00 %

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## . Beskrivning av kursupplägget.

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The course offered an introduction to reductive algebraic groups without assuming familiarity with algebraic geometry. An emphasis was made on introducing different structures which are roughly classified by Cartan's ABCDEFG(HI) types and illustrating connections and contrasts between them. This included root systems, root data, semisimple Lie algebras and Coxeter groups. Several theorems were explained for general reductive groups and Lie algebras without proof while elementary proofs were given for some classical groups. An example is the theorem that all maximal tori are conjugate in an algebraic group. This was proved for  $GL(n)$  by proving and consequently using the fact that pairwise commuting, diagonalizable matrices are simultaneously diagonalizable. The course ended with a glimpse into the representation theory of reductive groups, highlighting the idea of weights and describing the classification of irreducible representations over an algebraically closed field -- the statement of the 'Theorem of the highest weight'.

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## . Kursens fördelar, beakta studenternas uppfattning i kursutvärderingar.

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The lack of prerequisites, in particular concerning algebraic geometry, makes the course more broadly accessible than courses on algebraic groups at other departments.

At the same time, the course gives students a better idea of current research directions than other Master's courses. For example, the course prepares students for studying the representation theory of reductive groups and the Langlands Program. The latter has been a monumental, unifying force in math over the past half-century. Wiles' proof of Fermat's Last Theorem was but one of the by-products. However it is often difficult for students to learn about it, due to the large amount of prerequisites.

The course and course notes offers students material that they would have a hard time finding in a textbook.

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## . Kursens nackdelar, beakta studenternas uppfattning i kursutvärderingar.

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There have been successive improvements over previous versions of the course concerning choices of topics covered, how much time to spend on each topic and what pace works best. These can be further improved next time the course is offered by incorporating experience from this year's course.

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## . Slutsatser samt förslag till förbättringar.

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Improving and completing the types notes would be helpful. The tablet notes and comparison with the last time the course was offered will be very helpful for this purpose.

It would be helpful if one could assume a little bit more background in abstract algebra and/or linear algebra, without assuming knowledge of algebraic geometry.

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