Introduction to Noncommutative Algebraic Geometry

Winter 2018, MATH 4907/6101 Topics in Algebra

School of Mathematics and Statistics, Carleton University

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Lectures: Tuesdays and Thursdays 10:05 – 11:25 Room: 230 Tory Building
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Description: Noncommutative Algebraic Geometry studies the interplay between noncommutative algebra and geometric methods and ideas. Noncommutative algebra plays a key role in quantum mechanics and representation theory. We will discuss hereditary orders, skew group rings and noncommutative curves and surfaces. Algebras of polynomial differential operators and algebras associated to elliptic curves will be studied.

Textbook: There is no official textbook for this course. We will use material from the following books:
"Noncommutative Algebra", by Farb and Dennis, Springer-Verlag, 1993.
"Noncommutative Noetherian Rings," McConnell and Robson, Wiley, 1988.
"Ideals, Varieties, and Algorithms" Cox, Little, and O'Shea, springer-Verlag, 2007.
"An invitation to Algebraic Geometry," Smith, Lauri Kahanpää, Pekka Kekäläinen, Traves, 2004.
We will also use notes:
Lectures on Orders, by Daniel Chan
`http://web.maths.unsw.edu.au/ danielch/Lect_Orders.pdf`
Non-commutative Algebraic Geometry, by S.P. Smith
`http://sites.math.washington.edu/ smith/Research/spain.pdf`
Stable Orders on Surfaces, by Artin and De Jong,
`http://www.math.lsa.umich.edu/courses/711/ordersms-num.pdf`

Prerequisites: MATH 3158 or permission of the School.
Recommended: Taking this course concurrently with MATH 4107 and/or MATH 4306.
Classes begin: Tuesday, January 9, 2018.
Classes end: Tuesday, April 10, 2018.

Term mark: There will be 6 assignments:
Each worth 10%.
You are expected to do all the assignments. No make up, early, or delayed assignments. Any missing assignments will be counted as zero.
The assignments must be your own work. In particular, you must cite everything you are taking from the literature or that you discussed with someone else. Total portion of the final mark in assignments: 60%.
Evaluation:
either: term mark is 60%; final exam is 40%,
or: term mark is 60%; final exam is 20%; project and presentation 20%.
The due date for the project is Thursday April 5, 2018. You must have a meeting with the instructor to discuss your project before Thursday March 1, 2018. The presentations will take place in early April; the day will be arranged later, possibly on Thursday April 5 at class time. Graduate students must take

project and presentation option; undergraduate students may choose to have the project and presentation option. This option involves writing a brief report (10-15 pages) plus a presentation (25-30 minutes). Essentially, any topic related with noncommutative algebra and/or algebraic geometry of interest to the student could be considered for the project after approval by the professor.

Withdrawal: The last day for withdrawal from the course without academic penalties is the last day of classes.

Academic Accommodation: You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy and Student Parental Leave: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Parental Leave Guide.

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Religious Observation Guide.

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