MATH 595: INTRODUCTION TO ALGEBRAIC DIFFERENTIAL OPERATORS AND D-MODULES, FALL 2020

Course Meets: Second half of the semester, day/time TBA

Instructor: Thomas Nevins (nevins@illinois.edu)

Prerequisites: Math 500.

Course Web Page: http://www.math.uiuc.edu/~nevins/courses/aut20/m595-Dmod.html

Rings of algebraic differential operators form basic examples in noncommutative algebra. Their modules, known as $\mathcal{D}$-modules, lie at the interfaces of algebraic geometry, representation theory, real and complex analysis, topology, and noncommutative ring theory.

This course will provide an introduction to rings of algebraic differential operators and $\mathcal{D}$-modules. It will focus, more than is common in most standard texts, on understanding concrete examples and calculations. Goals of the course will depend on the interests of students registered, but might include a treatment of holonomic $\mathcal{D}$-modules and the Riemann-Hilbert correspondence.

The main text for the course will be “$\mathcal{D}$-Modules, Perverse Sheaves, and Representation Theory” by Hotta, Takeuchi, and Tanisaki, available electronically at: https://vufind.carli.illinois.edu/vf-uiu/Record/uiu_5635867

There are many other good references freely available, including lecture notes by Bernstein (classic!), Kashiwara (classic!), Ginzburg, and Gaitsgory, and the book ”Primer on Algebraic D-Modules” by Coutinho. But the course will aim to be largely self-contained.

No background will be assumed beyond Math 500 and an eagerness to learn.