MATH 595 Fall 2015: Some Topics in PDEs

Instructor: Ikemefuna Agbanusi.

Lectures: T,R; 9:30 -10:50am in 441 Altgeld.

Course Content: While most (first) courses on PDEs focus on the use of explicit solutions and/or the “energy method”, we will develop the use of Fourier (and some related integral) transforms as a tool to study the existence, behavior and properties of solutions to PDEs. Most of the ideas and techniques have been developed from the mid ’50’s till today and consequently we cannot do justice to this enormous field. The topics/highlights we plan on covering are

- Sobolev Spaces. Ellipticity, Hypoellipticity and Local solvability
- Microlocalization, Propagation of singularities, Egorov’s theorem. Evolution Equations
- Some Inverse Problems e.g. in Oil Exploration
- “Quantum-Classical correspondence”

The list above is somewhat ambitious and may be modified based on students’ interests and/or time constraints.

Prerequisites: Graduate level Real/Complex analysis. I will not assume any prior knowledge of PDEs and Functional analysis although it may be slightly advantageous to have seen them before.

Textbook: There’s no required text for the course and the course will be based on the instructor’s lecture notes. However, there are very many excellent textbooks and articles on the topics we’ll cover and more references will be provided as the course goes on.

Grading: The final grade will be determined by the exercises assigned throughout the course.