Course announcement

MATH 8590 Topics in Partial Differential Equations

Instructor: Vladimir Sverak

1:25 - 2:15 PM, MWF, VinH 2

(A possible change in the time can be discussed, the only constraint is space availability)

Course description:

In this course we will cover the main issues in the theory of the incompressible Navier-Stokes equations from the PDE/Analysis point of view. The main focus will be on the state of the art results concerning existence, uniqueness and regularity. We will explain general schemes for proving local and global existence of non-linear evolution PDEs, why they work well for two-dimensional Navier-Stokes (and also the two-dimensional Euler’s equation), and the difficulties in dimension three. The theory of weak solution, their regularity and issues concerning uniqueness will also be covered. Latest developments will be discussed. In addition to the Navier-Stokes equation, the topics will also be illustrated on some simpler model problems, where the difficulties known from the Navier-Stokes theory already come up. A number of open problems of various degree of difficulty will be mentioned.

The prerequisite is some knowledge of the elementary PDE theory and simple Real Analysis, the more advanced concepts will be explained along the way.

There will be three homework assignments and the grade will be based on them.