MAP7436: SEM IN APPLIED MATH 1 MWF Period 5 (11:45am - 12:35 pm) Room: MWF, MAT114

Instructor: Cheng Yu, Little Hall 416, chengyu@ufl.edu

Office Hours: MW 9:40am-10:40am.

Textbook and Reference:

Partial Differential Equations by Evans,

Mathematical topics in Fluid Mechanics vol1 by P.-L. Lions,

Mathematical topics in Fluid Mechanics vol2 by P.-L. Lions,

Bardos, Claude; Titi, Edriss S. Onsager's conjecture for the incompressible Euler equations in bounded domains.

Constantin, P., W. E., Titi, E.S., Onsager's conjecture on the energy conservation for solutions of Euler's equation.

Chen, Gui-Qiang; Glimm, James, Kolmogorov's theory of turbulence and inviscid limit of the Navier-Stokes equations in \mathbb{R}^3 .

Kato, Tosio Remarks on zero viscosity limit for nonstationary Navier-Stokes flows with boundary. Feireisl, Eduard; Novotný, Antonín; Petzeltová, Hana. On the existence of globally defined weak solutions to the Navier-Stokes equations.

DiPerna, R. J.; Lions, P.-L. Ordinary differential equations, transport theory and Sobolev spaces.

Prerequisites: any graduate, advanced undergraduate students. I will make the course appealing and accessible to all students with background of advanced calculus.

Description:This course is designed for the graduate students from math and Engineering. In this course, we will discuss a variety of topics in Navier-Stokes equations and several applications in biology and in mechanics. We will also discuss the Millennium Prize conjecture: why the global smooth solution to the Navier-Stokes equations is hard? In particular, we will cover the following topics:

a. Derivation of Nabier-Stokes equations and Euler equations

- b. Existence and regularity theory for the Navier-Stokes equations
- c. Onsager's conjecture and the mathematical analysis for the Kolmogorov's theory
- d. Renormalized technique and its related problem.

Exams: The grade will be determined by a final project and presentations in class.

Extra Help: Please stop by my office during office hours or by appointment to discuss any aspect of the course. Welcome students to discuss any research problems on nonlinear PDEs.