ANALYSIS/PDE SEMINAR SERIES

TOPIC: On Models of Short Pulse Type in Optical Systems

SPEAKER: Yannan Shen, California State University, Northridge

TIME: 3:00pm-4:00pm, Monday, December 18, 2017

VENUE: Room 1200, Pudong Campus, 1555 Century Avenue, Shanghai (上海纽约大学 1200 教室，上海市浦东新区世纪大道 1555 号)

HOST: Tao Huang, NYU Shanghai

ABSTRACT OF THE TALK

In this talk we will discuss three related equations for modeling high performance optical systems: the short pulse equation (SPE), the nonlinear Schrodinger equation (NLS) and the complex Ginzburg-Landau equation. In particular, we will derive the SPE in nonlinear metamaterials in both one and two dimensions. We use a multi-scale ansatz to relate the SPE to the NLS, as the pulse width varies from the ultra short regime to the classical slow varying envelope approximation. We study a simple discrete transmission line model that captures the left-handed property of metamaterials. Using a continuous NLS approximation to this discrete model we accurately predict the focusing and defocusing threshold frequency observed in laboratory experiments. Finally, we will discuss some recent numerical results which demonstrate that short pulse fiber lasers with balanced gain and loss, modeled by the complex Ginzburg-Landau equation, can support high-power stable pulses across the zero dispersion point.

BIOGRAPHY

Yannan Shen is Assistant Professor in Department of Mathematics at California State University, Northridge. Her research interests are applied mathematics, complex Ginzburg Landau equation, short pulse equation, and models from physics and engineering, such as optical systems, metamaterials, plasmas, Bose-Einstein condensates, and nonlinear Schrodinger equation. Her research mainly involves existence, stability and dynamics of solitary wave solutions by the method of asymptotics, variational approximations, rigorous analysis, numerical analysis, as well as scientific computing.