

Mini-Workshop on Differential Equations and Applications

Department of Mathematics and Statistics
Auburn University, May 28, 2008

Composition Evolution of Quantum Dots During the Growth of Solid Films

Xiaoying Han, Auburn University

Abstract: In recent years, the layered growth of lattice mismatched semiconductors has attracted interest for the use of these materials as semiconductor quantum dots (QDs). QD growth depends largely on the lattice mismatch between the layers [Lang (2003)]. At a large enough mismatch, layer-by-layer growth becomes impossible [Bauer (1958)] and the layers will relax by changing to a three-dimensional growth mode. This could happen immediately (Volmer-Weber growth [Bauer (1958)]) or after a few monolayers - the ‘wetting layer’ (Stranski-Krastanow growth [Stranski & Krastanow (1928)]). In this talk, we will give a simple model for the time evolution of composition in the wetting layer, which can then be used to determine the island composition.

The Action-Dependent Wave Function Problem: Well Posedness and Efficient Numerical Approximation of Solutions

Amnon J. Meir, Auburn University

Abstract: We describe some results for a mixed (elliptic-hyperbolic) partial differential equation and an efficient multigrid algorithm for the numerical approximation of its solutions. The problem models an equation which arises in atomic physics and describes a new object: an “action-dependent wave function.” This is joint work with Irad Yavneh, Department of Computer Science, Technion - Israel Institute of Technology, Haifa, Israel.

Permanence in nonautonomous competitive systems of ODEs

Janusz Mierczyński, Wrocław University of Technology

Abstract: We give a survey of sufficient conditions for permanence (uniform persistence) in nonautonomous totally competitive systems of ordinary differential equations of Kolmogorov type.

Perron Theorem in the Monotone Iteration Method for Traveling Waves in Delayed Reaction-Diffusion Equations

M.V. Nguyen, University of West Georgia

Abstract: In this talk we revisit the existence of traveling waves for delayed reaction diffusion equations by the monotone iteration method. We show that Perron Theorem on existence of bounded solution provides a rigorous and constructive framework to find

traveling wave solutions of reaction diffusion systems with time delay. The method is tried out on two classical examples with delay: the predator-prey and Belousov-Zhabotinskii models. This is a joint work with A. Boumenir.

Asymptotic Symmetry in Monotone Skew-Product Semiflows with Applications

Yi Wang, University of Science and Technology of China

Abstract: This talk is mainly concerned with the asymptotic symmetry of the monotone skew-product semiflows under a group action. It is shown that any stable minimal set is residually symmetric and any uniformly stable bounded trajectory is asymptotically symmetric. These results are then applied to study the spatio-temporal asymptotics of stable solutions of reaction-diffusion equations on a symmetric domain in time recurrent structures including almost periodicity and almost automorphy. In particular, the 1-covering property of omega limit sets is established for uniformly stable bounded solutions of R-D equations on a ball.

Compact uniform attractors for dissipative non-autonomous lattice systems with delays

Shengfan Zhou, Shanghai Normal University

Abstract: We first prove a sufficient and necessary condition for the existence of a compact uniform attractor for the family of processes corresponding to the non-autonomous lattice dynamical systems with delays. Then we apply this result to prove the existence of a compact uniform attractor for the process associated to some retarded lattice equations. This work has been published in [Compact uniform attractors for dissipative lattice dynamical systems with delays, *Discrete and Continuous Dynamical Systems*, 21(2) (2008), 643-663]. (joined with Dr. Caidi Zhao).