National Institute of Technology Agartala

(An Institute of National Importance by MHRD, Govt. of India)

Agartala, Tripura – 799046

PT-symmetry and its realization in experimental systems: theory and applications

13th February, 2017 to 17th February, 2017

Overview

In recent years, PT-symmetric quantum mechanics has emerged as a frontier area in quantum optics and condensed matter physics due to its myriad applications in designing materials with novel properties that are relevant to photonic technologies. PT-symmetry is a topic that has attracted the attention of mathematicians, quantum field theorists and optics and condensed matter scientists, and each group brings different perspective to the topic. The emphasis of this course will be less on the abstract theoretical constructs, and more on the novel properties of PT-symmetric systems, and how such systems can be realized in the lab. The specific examples that will be discussed in the detail are arrays of coupled optical waveguides and lasers. At the conclusion of the course, the students will be equipped with the background and intuition needed to pursue independent research in this field. This is an opportune time for young students to enter this field because is relatively new, offers tremendous potential for advancing the subject and has applications across a broad range of fields.

Objectives

To provide students with the background and tools needed to pursue research in PT-symmetric quantum mechanics with special attention to realistic systems that can be studied in the lab.

Course details

Lecture 1:Hermitian and non-hermitian operators in quantum mechanics; parity and time-reversal operators.

Lecture 2: Specific examples and the theoretical background needed to study PT-symmetry.

Lecture 3 : Introduction to one-dimensional lattices as a paradigm for PT-symmetric systems, connection to array of optical waveguides.

Lecture 4: Correspondence between coupled mode theory of optical waveguides and PT-symmetry in these arrays; tight binding model and PT-symmetry in the model.

Lecture 5 : Experimental realizations of PT-symmetry in wave guide arrays – theoretical background and experimental considerations.

Lecture 6: Introduction to laser theory and how to incorporate PT-symmetry in the theory.

Lecture 7 : How to characterize and detect PT-symmetric aspects in an experiment? What should one measure?

Lecture 8: Various experimental signatures of PT-symmetry that can be detected in an experiement.

Lecture 9 : Applications of PT-symmetry.

Lecture 10: Conclusions and wrap-up.

You Should Attend If	• UG/PG/PhD students, faculty members in all branch of science and engineering. • Engineers working in different Laser Industries.
Registration Fees	The participation fees for taking the course is as follows: • Participants from abroad: US $350 • Industry/ Research Organizations: Rs. 10000/- • Course fee for non-students (i.e. other academic, industry participants etc.): Rs. 2000/- • Course fee for students: Rs. 1500/- • The course fee will be made half for SC/ST students. The above fee includes all instructional materials and assignments, laboratory equipment usage charges, 24 hrs free internet facility. The participants will be provided with accommodation on payment basis.

Faculty

Gautam Vemuri is the professor of Indiana Univ. Purdue Univ. Indianapolis and his research covers the general area of laser physics and nonlinear optics, with emphasis on two distinct topics - the statistical and nonlinear dynamical properties of lasers, and quantum effect that arise from light propagation in evanescently coupled waveguide arrays. Semiconductor lasers, despite their low cost, compact size, and wide wavelength tunability, suffer from a major drawback that a weak optical feedback into the laser destabilizes them and the output intensity becomes erratic. A major portion of Dr. Vemuri's work is devoted to elucidating these. The current experimental and theoretical effort is on understanding the nonlinear dynamics of diode lasers subject to two spectrally filtered optical feedbacks with special attention to the frequency dynamics of the lasers. On the topic of diffraction management in waveguide arrays, current work is on understanding the physics that arises from competition between wave interference, boundary effects in finite lattices, and disorder. Studies on Anderson localization of light, Bloch oscillations, and PT-symmetry are undertaken in pursuit of this goal. He has been in the Editorial Board Optics and The Indian Journal of Physics.

Course Coordinator

Dr. Ardhendu Saha
Associate Professor
Department of Electrical Engineering
National Institute of Technology Agartala
Phone: +91-9436540988
E-mail: arsagtwave@gmail.com
....
http://www.nita.ac.in/NITAmain/GIAN/GIAN.html