Complex Light

Overview

The last decade has revealed that in many fields in photonics there is a desire to overcome the limitations of the standard Gaussian beam. This yields new applications in quantum physics, sensing and biophotonics including manipulation, imaging and beyond.

Propagation invariant light fields, as the name suggests retain their transverse intensity profile upon propagation. Bessel light fields and Airy light fields are prime examples of such beams. This course will discuss the use of propagation invariant light fields for the enhancement of optical imaging, especially light sheet imaging, optical coherence tomography and applications ranging from cell nanosurgery to optical motion on curved trajectories.

If we consider opaque disordered materials such as paper, paint, and biological tissue, they are completely different from lenses and other clear optical elements. In such systems, all information in the wave front seems to be lost due to multiple scattering. Diffusion describes the propagation of light in such materials not considering the phase information and solely focusing on the intensity. As light waves do not lose their coherence properties even after thousands of scattering events, the transport of light through a disordered material is not dissipative at all, but coherent, with a high information capacity. This leads to the notion that light can be 'engineered or shaped' to propagate through such media. This leads to new concepts for transmission in turbid media, tissue and even multimode fibres.

A vast array of new applications can emerge including novel ultra thin endoscopes, new forms of wavemeters and spectrometers and new physics related to concepts such as Anderson localization.

This course will explore the shaping of light in phase and amplitude to generate complex light (Bessel, Airy, Laguerre-Gaussian modes and also shaped modes for enhanced transmission in scattering media) .

Dates for the Course	**16th January, 2017 to 21st January, 2017**
Host Institute	**IIT Madras**
No. of Credits	**1**
Maximum No. of Participants	**30**
You Should Attend If…	▪ You are an engineer or research scientist interested in learning possible ways to improve the resolution of an imaging technique. ▪ You are a Physicist interested in learning about different types of light waves. ▪ You are a student or faculty from an academic institution interested in learning the basics of complex light, how and where to generate and utilize it.
Course Registration Fees	The participation fees for taking the course is as follows: **Student Participants:** Rs.1000 **Faculty Participants:** Rs.3000 **Government Research Organization Participants**: Rs.5000 **Industry Participants:** Rs.10000 The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges. **Mode of payment: Demand draft in favour of "Registrar, IIT Madras" payable at Chennai** The demand draft is to be sent to the Course Coordinator at the address given below.

	Dr. Shanti Bhattacharya Department of Electrical Engineering IIT Madras Chennai 600036
Accommodation	The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel

Course Faculty

Prof. Kishan Dholakia is a Professor of Physics at the University of St Andrews, Scotland. His research interests lie in shaped optical fields and their use in particle manipulation, in liquid and vacuum environments and their used in optical manipulation, cell nanosurgery and biomedical imaging (especially light sheet imaging).

Dr. Shanti Bhattacharya is an Associate Professor of Indian Institute of Technology, Madras. Her research interests are in diffractive optics, fibre interferometry and Optical MEMS.

Course Coordinator

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