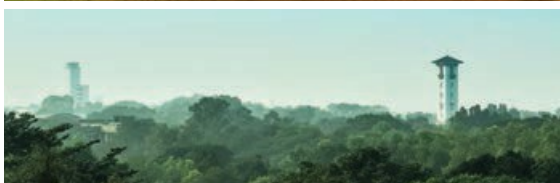


## About IIT Kharagpur



Kharagpur - a dusty town tucked away in the eastern corner of India, famous until 1950 as home to the longest railway tunnel in the world - became the nursery where the seed of the IT system was planted in 1951. IIT Kharagpur started its journey in the old Hijli Detention Camp in Eastern India, where many of the country's great freedom fighters toiled and sacrificed their lives for India's independence. Spurred by the success of IIT Kharagpur, four younger IITs sprouted around the country in the two following decades, and from these five came hundreds of IITians, the brand ambassadors of modern India. It is the success of this one institution at Kharagpur that wrote the story of India's technological odyssey.

IIT Kharagpur takes pride in its relentless effort to provide the platform for both education as well as research in the areas of science and technology, infrastructure designs, entrepreneurship, law, management, and medical science and technology. IITKGP is not just the place to study technology, it is a place where students are taught to dream about the future of technology and beam across disciplines, making differences through research to change the world.

### Program Features/ Structure

Classroom lectures – 80%  
Numerical/ Problem solving, Case study and Activity – 10%  
Panel Discussion- 05%  
Hands-on work at Laboratory -05%

### Program Schedule and Venue

1 week, 9 – 14 September 2019 (9:30 AM – 6 PM)  
IIT Kharagpur – Department of Physics

### Program Fee

Nil for AICTE-QIP sponsored participants  
For others - INR 3,000/- (Three thousand) + GST @18% per participant (includes only participation with lunch & snacks during session and welcome kits)

### Who will benefit (Eligibility)

you are an advanced 4 years BS, MSc, B Tech, MTech, , PhD with good knowledge in quantum Mechanics

### Last day of Registration

**25**  
June, 2019

### Accommodation

Accommodation will be provided to the AICTE-QIP sponsored participants at the campus Guesthouse. For other participants, the same will be provided on chargeable basis as per rule.

## How to Apply

Use the link: <https://erp.iitkgp.ac.in/CEP/courses.htm> to apply ONLINE.



Payment if applicable is to be done **ONLINE** after getting short listed for the program.

## Contact Us

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# AICTE-QIP

## QUALITY IMPROVEMENT PROGRAMME

Indian Institute of Technology Kharagpur  
2019

## Manifestations of Angular Momentum in Light & Quantum Matter

1 Week  
9 – 14 September 2019

## Introduction / Overview

of the central themes in present day science and technology is diverse studies in Classical and Quantum Optics stemming from the light-matter interaction where Nobel prizes bestowed several times in the last two decades. Since the seminal observation of orbital angular momentum of light around two decades back, this twisted beam has opened new area of research with a plethora of applications and implementations in physics, chemistry, biology, mechanics, electronics and communications. Even today, there exist open theoretical and experimental challenges in these fields, especially in experimental realizations of spatially manipulated beams (in terms of intensity and angular momentum), complex manipulation of classical and quantum matter, the amplification of very small effects using weak measurements, and the various intriguing dynamics revealed at ultra-small time scales at different ranges of the electromagnetic spectrum.

## Program Objectives

This short course would introduce different manifestations of classical and quantum angular momentum of light and matter. Physical cases will be highlighted on the spin-orbital coupling and its consequences. The transfer mechanisms of orbital angular momentum between light and matter will be explained along with the physics behind the controlled manipulation of atoms and molecules. Participants will be provided advanced knowledge on the applications of vortex beams in the field of weak measurements, quantum communication and quantum information. In addition, participants will visit our existing advanced laboratories at the department for few physical demonstrations of some of the physics discussed.

## What you will learn

### Program Content

- 1) Basics of angular momentum algebra and manifestations in quantum matter
- 2) Orbital and Spin angular momentum properties of light
- 3) Spin orbit interaction of light
- 4) Angular momentum of light in
  - Manipulation of atoms and particles
  - Femto and Atto-second physics
  - Weak measurements
  - Quantum communication and Information

## About the Faculty

### Sonjoy Majumder

Professor, Department of Physics, IIT-Kharagpur  
**Expertise:** Light-matter interaction, Vortex beam, Ultra-Cold Atoms and Molecules

### Other faculties for the course

#### Debashis Mukherjee,

S N Bose Chair Professor, SNBNCBS, Kolkata  
Ex-Director, IACS, Kolkata

**Expertise:** Molecular many-body theory, theoretical spectroscopy, Finite temperature non-perturbative many-body theories

#### Subhasish DuttaGupta

Honorary Professor, University of Hyderabad  
Adjunct Professor, TIFR

**Expertise:** Spin-Orbit coupling, Non-linear Optics, PT symmetry etc.

#### Prasanta K. Panigrahi

Professor, IISER-Kolkata

**Expertise:** Quantum Computation and Quantum Information, Ultra-cold Boson and Fermion, etc

#### Bimalendu Deb

Professor, IACS, Kolkata,

**Expertise:** Quantum optics, photo-association and Feshbach spectroscopy, optical manipulations of atomic and molecular systems, Bose and Fermi superfluidity with ultracold atomic gases

#### Nirmal K. Viswanathan

Professor, University of Hyderabad

**Expertise:** Singular Optics, Non-diffracting beam etc.

#### Ayan Banerjee

Professor, IISER-Kolkata

**Expertise:** Light matter interaction at the mesoscopic scale employing optical tweezers, biophotonics, precision optical and atomic spectroscopy

#### Nirmalya Ghosh

Professor, IISER-Kolkata

**Expertise:** Optics, Spectroscopy, Bio-photonics, Nano-Optics