

Name of the supervisor: Prof. Bosanta Ranjan Boruah

Brief description of research: Our research group focuses on the study and applications of optical phenomena by developing the necessary theory and the experimental arrangements. Our present research comprises emerging areas such as holographic optical tweezer (area awarded Nobel prize in 2018), high resolution optical imaging (area awarded Nobel prize in 2014) and free space optical communication. Details about the research areas and related publications by the group can be found at the links a) <http://www.iitg.ac.in/physics/fac/brboruah/htmls/MyResearch.html> and b) <http://www.iitg.ac.in/physics/fac/brboruah/htmls/Publications.html>

Possible projects for the new student: The following projects can be offered to new PhD students joining our group in the year 2024-25

- 1) Development of holographic optical tweezer and its applications to understand physical properties of the associated system: This work will build on our existing expertise on optical trapping and computer generated holography.
- 2) Development of a wide-field optical super-resolution microscope: This work concerns imaging beyond the classical resolution limit using fluorescence emission. This project will take benefit from our existing collaborative work with Imperial College London to extend the performance of a super-resolution microscope.
- 3) Development of a robust free space optical communication system : Our group has already developed a novel free-space optical communication system employing wavefront modulation. In this project we will explore other novel approaches to improve the accuracy and information carrying capacity of the light beam.

Each project will involve experimental work preceded by a theoretical analysis of the associated concept. Prior experience in Optics is not a must, provided the student is eager to learn new concepts and techniques and apply the same experimentally to come up with a novel solution.

For more details the prospective student can write email to: brboruah@iitg.ac.in