

QuantOEM – Quantum Mechanics in optical and electron microscopy

From 14th to 19th October 2019

About the Workshop:

One of the consequences of quantum mechanics is that it allows the detection of a target using an incident probe, with very less probability of interaction of the probe and the target. This property could be applied in the field of electron microscopy to generate images of beam-sensitive specimens with substantially reduced damage to the specimen. A reduction of beam-induced damage to specimens is especially of great importance if it can enable imaging of biological specimens with atomic resolution. The application of Scanning and Transmission electron microscopy in medical science in identifying diseases and viruses has provided cost-effectiveness and increased focus on quality control at a microscopic scale in the field of research and industry. However, it should be cautioned that outstanding scientific and regulatory challenges remain and the most transformative applications for this technology are yet to be fully realized. All the aspects of this field will be covered in this workshop with interactive lectures from experts, both from engineering and from medicals backgrounds and with few hands on sessions.

This workshop is designed for biomedical, biotechnology, mechanical, material scientists to learn about the Quantum mechanics in electron microscopy, SEM, TEM, medical applications, and critical issues related to these topics. We hope that the workshop will benefit faculty and researchers from Mechanical Engineering, Materials Science and Engineering, Biomedical Engineering, Biotechnology, Chemical Engineering, and other related domains.

Topics covered:

The six-day workshop provides an overview of:

Introduction to Quantum Mechanics, Boundary value problems; Angular momentum algebra, Spin-1/2 system, CG coefficient; Static EM field, Effect of spin, spin orbit interaction; Rotational and Vibrational spectra, Raman spectroscopy, Stark effect; Classical Optics and Quantum nature of light, The photon picture; Plasmonics and Quantum effects in plasmonics; Applications of Quantum optics and plasmonics; UV-vis spectroscopy; Raman spectroscopy; Introduction to principles of electron microscopy, Specimen preparation techniques for electron microscopy; Basics of Scanning electron microscopy and applications; Basics of Transmission electron microscopy and applications; Analytical and advanced microscopic techniques; Tutorials on Mathematica basics, Spectroscopy and energy splitting, Raman spectroscopy numerical problems. Practical sessions on Specimen preparation, Scanning electron microscopy and Transmission electron microscopy.

Intended participants:

Faculty members and Students from academic institutes; Personnel from R&D organizations. We hope that the workshop will benefit faculty and researchers from Optics, Mechanical Engineering, Materials Science and Engineering, Biomedical Engineering, Biotechnology, Chemical Engineering, and other related domains.

Registration:

For TEQIP participants, registration is free, and accommodation and food are provided as per TEQIP norm. For Non-TEQIP participants, registration fee is there; only lunch and tea are complimentary.

Dr. Priyotosh Bandyopadhyay is an Assistant professor in Department of Physics at IIT Hyderabad. He has completed Ph.D. from Harish-Chandra Research Institute, Allahbad. His research interest is in Electroweak symmetry breaking, Supersymmetric models, Beyond Standard model pheonomenology, CP-violation, Jet-physics, Collider physics, Neutrino Physics, Dark Matter .

Dr. Sai Rama Krishna Malladi is an assistant professor in the department of Materials Science & Metallurgical Engineering specialized in the area of transmission electron microscopy (TEM) with a keen interest in understanding and visualizing the structure- property relationships in materials using *in situ* TEM techniques. His other areas of interest are phase transformations in materials, electrochemistry and corrosion, graphene based supercapacitors and materials for energy applications.

Dr. Shourya Dutta Gupta is an Assistant Professor in the in the department of Materials Science & Metallurgical Engineering. His area of interest are Nanophotonics, Plasmonic nanostructures and nanoparticles, Alternative materials for plasmonics, Alternative fabrication techniques, Nano-optical biosensors, Graphene based devices, Lab-on-a-chip based optical devices and Microfluidic devices.