



**SCHOOL OF CHEMISTRY
UNIVERSITY OF HYDERABAD**



SEMINAR

Name of the Speaker	Dr. Tanveer Ahmed Shaik, Senior Scientist, University of Jena, Germany
Title of the Talk	Biophotonic Techniques for Multiscale Investigation in Life Sciences: From Macro to Nanoscale
Date & Time	09.10.2026 (Friday) 11:30 AM
Venue	Seminar Hall, SoC

ALL ARE INVITED

Date: 06/10/2026

Dr. Anupam Bera
Faculty In-charge

Abstract:

Biophotonics provides label-free access to the biochemical composition of biological systems across length scales, from whole tissues to individual viruses. Most conventional biochemical characterisation methods depend on exogenous labels that can perturb the native properties of the sample. This lecture presents vibrational and optical spectroscopic approaches that avoid this limitation, progressing from the macroscale to the nanoscale.

At the macroscale, I will present fiber-based Raman spectroscopy for intraoperative- style tissue assessment in breast cancer specimens. Combined with straightforward chemometric analysis, this approach discriminated healthy, tumor, and margin regions. I will then present how fiber-based fluorescence lifetime imaging (FLIm) and Raman spectroscopy could be used to detect collagen cross-linking and calcification in engineered tissues intended as vascular grafts and aortic valve replacements.

At the cellular scale, I will introduce optical photothermal infrared (O-PTIR) spectroscopy, which provides submicron-resolution infrared spectra and avoids the strong water absorption that limits conventional infrared spectroscopy of hydrated biological samples. Coupled with chemometrics, O-PTIR enabled the classification of cancer cells and the characterisation of viral infection at the single-cell level.

At the nanoscale, I will describe how, during the COVID-19 pandemic, we combined atomic force microscopy (AFM) with nanoscale infrared (nano-IR) and Raman spectroscopy (Tip-enhanced Raman spectroscopy) to characterise the biochemical composition of SARS-CoV-2 virions.

By spanning tissues, cells, and virions, this lecture aims to give a balanced view of what label-free biophotonic methods can currently resolve and where methodological development is still needed.