



# Short Term Course at IIT-Kanpur

## Introduction to Biomedical Imaging: Tomography and Microscopy Perspectives

(7-11 October 2023), Venue: PBCEC, VH, IIT Kanpur

### Contributors

- Dr. Naren Naik (**Coordinator**; IIT Kanpur )
- Dr. Nitin Mohan (**Co-coordinator**; IIT Kanpur)
- Dr. Samir Biswas (IISER Mohali)
- Dr. Sanjay Gambhir (SGPGIMS Lucknow)
- Dr. Mukesh Jewariya (NPL New Delhi)

- Dr. Tushar Kanti Bera (NIT Durgapur)
  - Dr. C. Chandraprakash (IIT Kanpur)
  - Mr. Jampu Bharadwaj (IIT Kanpur)
  - Mr. A. Jeganath (IIT Kanpur)
  - Mr. Deepak Khushalani (IIT Kanpur)
- Acknowledgement:** Dr. Rahul Bansal (IIT Kanpur)

Time	7 <sup>th</sup> October 2023 (Day 1)	8 <sup>th</sup> October 2023 (Day 2)	9 <sup>th</sup> Oct 2023 (Day 3)	10 <sup>th</sup> Oct 2023 (Day 4)	11 <sup>th</sup> October 2023 (Day 5)
9:00AM					
9:30AM	Registration	<b>D2S1:</b> Contrast enhancement and fluorescence microscopy (Dr. Nitin Mohan)	<b>D3S1:</b> Diffraction limit and super-resolution microscopy (Dr. Nitin Mohan)	<b>D4S1:</b> Tutorial on microscopy imaging analysis (Mr. A. Jeganath, Mr. Deepak Khushalani) (9:00AM-10:15AM)	<b>D5S1:</b> Hands-on for linear diffraction type tomography and regularization (Jampu Bharadwaj, Dr. Naren Naik)
9:45AM	Inauguration, course overview				
10:00AM	<b>D1S1:</b> Introduction to tomography; Requisite signal processing fundamentals (Dr. Naren Naik)	Break		Break	Break
10:15AM					
11:00AM	Break	<b>D2S2:</b> Iterative reconstructions: Least squares, ART and cousins (Dr. Naren Naik)	<b>D3S2:</b> Basics of linear tomography, regularization (Dr. Naren Naik)	<b>D4S2:</b> Nonlinear tomographic reconstruction: Basic framework (Dr. Naren Naik) (10:45AM-12:00PM)	<b>D5S2:</b> : Elastography (Dr. C. Chandraprakash)
11:15AM					
11:30AM	<b>D1S2:</b> Introduction to Microscopy - Lens, Image formation & Uniform illumination (Dr. Nitin Mohan)	Lunch	CT Scanner lab visit	<b>D4S3:</b> Terahertz computed tomography and its prospect (Dr. Mukesh Jewaria) (12:15PM-1:30PM)	Lunch
11:45AM					
12:00PM	<b>D1S3:</b> Signal processing pre-requisites contd., Radon transform and straight-path tomography, analytical reconstructions (Dr. Naren Naik)	<b>D2S3:</b> Photoacoustic tomography(PAT) and microscopy(PAM) (Dr. Samir Kumar Biswas)	Lunch	<b>D4S4:</b> Clinical applications of biomedical imaging (Dr. Sanjay Gambhir) (3-4pm)	<b>D5S3:</b> Electrical Impedance Tomography (EIT) for Human Health Studies and Disease Diagnosis: Technology, Applications and Challenges (Dr. Tushar Kanti Bera)
1:00PM					
2:30PM	Break				
4:00PM	<b>D1S4:</b> Hands-on: DSP basics, Filtered back-projection (FBP) reconstructions (Jampu Bharadwaj, Dr. Naren Naik)	<b>D2S4:</b> Hands-on: ART type reconstructions (Jampu Bharadwaj, Dr. Naren Naik)	<b>D3S4:</b> Hands-on: PA signals, PAT/PAM (Dr. Samir Kumar Biswas)	<b>D4S5:</b> Demo on Microscopy (Including lab visit) (A. Jeganath, D. Khushalani, Dr. Nitin Mohan)	<b>D5S4:</b> Fluorescence based optical and photoacoustic tomography (Dr. Naren Naik)
4:30PM					
6:30PM	<b>D5S5:</b> Summary and Thanks				