

# Recent Advancements in Biophysical Techniques and Virology

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## Overview

Biophysical methods in macromolecules and virus research has witnessed much rapid advancements in recent years. Biophysical techniques used in isolation and characterization of macromolecules, infectious viruses and viral proteins improve the understanding of mechanisms underlying virus replication, infection, and pathogenesis. The experience gained by virologist and biophysicist in last decades lead to the realization that combination of biophysical techniques has the potential to accelerate drug discovery process. However, the fields of cell biology and virology requires substantial knowledge and expertise in biophysical techniques like microscopy, spectroscopy, crystallography, fluorescence, electrophoresis and calorimetry to understand biological systems and viruses. This understanding of fundamental principles of advanced biophysical techniques will underpin our ability to provide new therapeutics to meet the challenges faced by humans in dealing with various diseases. Main aim of the course is to spark the student's interest and curiosity in biophysics with application in cell biology, structure biology and virology and also to develop understanding of virology relevant to viral systems of medical and biotechnological relevance such as Dengue, chikungunya, Zika, HCV and bacteriophages. The course will be interest to each and every scientist working on biological systems, infectious diseases and drug development. It will be very useful to both teachers and students at undergraduate, graduate and postgraduate levels.

The course is organised into 14 hrs lectures and 11 hrs tutorials completed in total of 7 days (April 15-April 21) by two faculties- Dr. Gabriel Lander (GL) and Dr. Shailly Tomar (ST).

## COURSE DETAILS:

DATE AND DAY	TIME	SESSION DETAIL	FACULTY
15 April,2018/SUNDAY	9:30 AM-10:30AM	Overview of Biophysical techniques	GL
	11:00 AM –12:00	Principles of Virology	ST
	2:30 PM-4:30 PM	Practical session: Virus isolation, propagation, Antiviral screening, Cytopathic effects (CPE), Plaque reduction assays and	ST

		RT-PCR	
16APRIL,2018/MONDAY	9:30 AM -10:30 AM	Structural Virology: Cryo-EM, tomography and crystallography	GL
	11:30 AM -12:30PM	Production and biophysical charcaterization of viral proteins: Application in viral vaccine and diagnostics	ST
	2:30 PM-4:30 PM	Practical session with examples: Novel strategies for sample preparation, imaging and processing for atomic structural model	GL
17APRIL,2018/TUESDAY	9:30 AM -10:30 AM	Thermodynamics and binding kinetics (ITC and SPR): Application in antiviral therapy	ST
	11:00 AM –1:00 PM	Electron Microscope optics and cryoEM data collection	GL
	2:30 PM-4:30 PM	Problem solving session with examples: Thermodynamics and binding kinetics of ligand binding by ITC and SPR	ST
18APRIL,2018/WEDNESDAY	9:30 AM -10:30 AM	Symmetry in Macromolecules	GL
	12:00 Noon- 1:00 PM	Recent developments in Fluorescence assays and Differential scanning fluorimetry (DSF)	ST
	2:30 PM-4:30 PM	Practical session with examples: High throughput inhibitor screening	ST
19APRIL,2018/THURSDAY	9:30 AM -10:30 AM	Image reconstruction from electron microscopy of macromolecules	GL
	11:00 AM –12:00 Noon	Quiz	ST
	2:30 PM-4:30 PM	Practical session with examples: practical use of processing and reconstruction softwares	GL
20APRIL,2018/FRIDAY	9:30 AM -10:30 AM	Challanges in	GL

		biophysical characterization of biological molecules	
	11:00 AM –12:00 Noon	Biophysical characterization of Virus-receptor and virus-antibody interaction	ST
	3:30 PM-4:30 PM	Problem solving using Integrated Biophysical Techniques	GL
21APRIL,2018/SATURDAY	9:30 AM -10:30 AM	Validation of cryoEM structures	GL
	11:00 AM –12:00 Noon	Targeting molecular interactions using biophysical techniques: A case study	ST
	2:00 PM-3:00 PM	Exam	ST

## You should attend if

You are BTech/MSc/MTech/PhD, Faculties and scientists from reputed academic institutions, technical institutions and research institutions.

You are an executive engineer, researcher and scientist from manufacturing, services and government organizations including R&D laboratories.

**For registration:** <http://www.gian.iitkgp.ac.in/GREGN>

## THE FACULTY

- 1) Dr. Gabriel C. Lander is Associate professor at The Scripps Research Institute, La Jolla, CA 92037, USA. He has more than 13 years of experience in the field of biophysical techniques. He has expertise in various biophysical techniques including CryoEM that have been used to study molecular machineries of cells and molecular interactions in phage lambda and various bacteriophages. During his Ph.D. he has biophysically characterized the architecture of bacteriophages.
- 2) Dr Shailly Tomar is Associate Professor in Department of Biotechnology, IIT Roorkee. She received her Ph.D. in Virology in 2006 from Dept. of Biological Sciences, Purdue University, West Lafayette, in USA. Her research work focuses on molecular virology, antiviral research, discovery of antiviral molecules against RNA arboviruses such as (Chikungunya, Sindbis, Aura, and Dengue). Her laboratory uses biophysical techniques in combination with biochemistry and molecular virology to elucidate the molecular mechanisms of virus replication proteins and targeting of virus specific enzymes like proteases for antiviral development.