

# WORKSHOP ON ADVANCED MICROSCOPY & SPECTROSCOPY IN MICROBIAL SYSTEMS

February 12-17, 2024

**Last Date of Registration:** January 31st 2024

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**For More Details:** [www.amity.edu/aims/](http://www.amity.edu/aims/)

**Register:**

<https://www.amity.edu/NSPG/WAMSMS2024/>



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AMITY INSTITUTE OF  
MICROBIAL TECHNOLOGY

# ABOUT THE WORKSHOP

Advanced microscopy and spectroscopy play a crucial role in the study of microbial systems, providing scientists with powerful tools to investigate the structure, function, and behaviour of microorganisms at various levels. Key aspects of their role include:

## Visualization of Microorganisms:

Microscopy techniques such as light microscopy, fluorescence microscopy, confocal microscopy, and electron microscopy enable researchers to visualize microorganisms in detail. These techniques help reveal the morphological characteristics, cellular organization, and spatial distribution of microbes, allowing scientists to identify and classify different microbial species.

## Subcellular Imaging:

Advanced microscopy methods, such as super-resolution microscopy and electron microscopy, enable researchers to visualize subcellular structures within microorganisms. This includes observing organelles, protein localization, membrane dynamics, and other cellular components at nanoscale resolution. These techniques help unravel the intricate organization and interactions within microbial cells.

## Live-Cell Imaging:

Microbes often exhibit dynamic behaviors and responses to their environment. Advanced microscopy techniques combined with fluorescent labeling or genetically encoded markers allow scientists to observe and track live microorganisms in real-time. This enables the study of cellular processes, such as cell division, motility, biofilm formation, and microbial interactions, providing insights into microbial physiology and behavior.

## Single-Cell Analysis:

Microbial populations can be highly heterogeneous, with individual cells displaying diverse characteristics and responses. Advanced microscopy techniques, such as fluorescence-activated cell sorting (FACS) and single-cell imaging, enable the analysis of individual cells within a population. This allows researchers to explore cellular heterogeneity, study rare cell types, and investigate phenotypic variations, providing a deeper understanding of microbial systems.

## Spectroscopic Techniques:

Spectroscopic techniques, including Atomic Absorption Spectroscopy, Raman spectroscopy, Fourier-transform infrared (FTIR) spectroscopy, and mass spectrometry, offer valuable insights into the chemical composition and biomolecular structure of microorganisms. These techniques can be used to identify microbial species, analyze microbial metabolites, investigate metabolic pathways, and monitor microbial responses to environmental changes. Spectroscopy is particularly useful for non-destructive, label-free analysis of microbial samples.

## Functional Imaging:

Functional imaging techniques, such as fluorescence resonance energy transfer (FRET) and fluorescence lifetime imaging microscopy (FLIM), provide information about molecular interactions, signaling processes, and enzymatic activities within microbial cells. These techniques enable the study of protein-protein interactions, signaling cascades, ion dynamics, and other functional aspects of microbial systems.



Overall, advanced microscopy and spectroscopy techniques have revolutionized our understanding of microbial systems by allowing researchers to visualize, analyse, and characterize microorganisms at different scales and with high precision. These tools provide valuable insights into microbial structure, function, behaviour, and their interactions with the environment, contributing to diverse fields such as microbiology, ecology, biotechnology, and biomedical research.

This workshop aims to provide innovative platform for hands-on training of Ph.D. and M.Sc. students to become acquainted with unprecedented progress in advanced microscopy and spectroscopy analysis and its potential application in the field of host-microbe and microbe-microbe interactions. This workshop will provide a wonderful opportunity to scientists and young researchers to get in-depth understanding of dynamic interaction between host and associated microbiomes, various spectroscopy analysis tools with state of art microscopy facility at Amity Institute of Microbial Technology (AIMT), Amity University, Noida, Uttar Pradesh.

## WORKSHOP OUTCOME

The proposed workshop aims to provide the hands-on training on the recent advances in microscopy and spectroscopy with special emphasis on microbial and clinical aspects and will cover the following broad topics of current scenario:

- Structure and imaging of microorganisms and their interactions.
- Phase contrast, Confocal and Electron Microscopy for microbiological and other biological specimens.
- Advances in Spectroscopy (UV-VIS and Atomic Absorption Spectroscopy).
- Advances in Dynamic Light Scattering (DLS).



## KEY FEATURES

- Hands-on training on staining methods
- Fundamentals of microscopy analysis
- State of art confocal and electron microscopy applications in host-microbe interaction, microbe-microbe interactions, biological and clinical samples
- Spectroscopy (UV-VIS, AAS and DLS)

Well-established Confocal Laser Microscope (Nikon A1), Atomic Absorption Spectroscopy, Zeta Potential Analyzer and UV-Vis Spectroscopy facility available at Amity Institute of Microbial Technology (AIMT). The major purpose of this facility is to provide cutting-edge instrumentation to scientists and researchers from academic/ research institutes and private industries to carry out quality research and innovation.

**Nikon A1 Confocal Microscopy** along with confocal scanning system with four channels and transmission detector attached to a Nikon Ti-E microscope is available at AIMT. In addition, this advanced confocal microscope permits to examine the different fluorescent samples with greater resolution than conventional fluorescence microscopy. This facility helps in examining biological samples at high resolution and to investigate molecular relations in living cells. Confocal microscopy is a powerful imaging technique used in the analysis of biological samples. It provides high-resolution, three-dimensional images of fluorescently labelled structures within cells and tissues.

**Scanning Electron Microscopy (SEM) Zeiss ( MA EVO -18 Special Edition)** is available at our sister institution Amity Institute of Advanced Research & Studies (Materials & Devices). EVO 18 is perfectly suited to a variety of research applications including fixed microbial samples, Semiconductor and Electronics, Geoscience and Materials. It provides benefit from class leading analytical X-ray geometry & EDS/WDS ports as standard. User experience enhanced topographical information using the five segment BSE detector. Uses variable pressure operation to analyze dry or hydrated samples. Handle large specimens in the spacious chamber with flexible stage travel.

**Particle size & Zeta Potential Analyser model ZEN3690/Malvern** is available at AIMT. Zeta Potential analysis is a technique for determining the surface charge of nanoparticles using Dynamic Light Scattering (DLS). Zeta Potential is an important tool for understanding the state of the nanoparticle surface and predicting the long term stability of the nanoparticle. Nanoparticles have a surface charge that attracts a long-term of ions of opposite charge to the nanoparticle surface. The electric potential at the boundary of the double layer is known as the Zeta potential of the particles and has values that typically range from +100 mV to -100 mV. The magnitude of the zeta potential is predictive of the colloidal stability.



Nanoparticles with Zeta Potential values greater than +25 mV or less than -25 mV typically have high degrees of stability. Dispersions with a low zeta potential value will eventually aggregate due to Van Der Waal inter-particle attractions.

**Atomic Absorption Spectrophotometer, Model Analytik Jena GmbH - novAA ® 350** novAA 350 is available at AIMT. It is a robust, easy to use flame technique AA Spectrometer. Its novel operating concept with clearly structured user interface makes the novAA® 350 the ideal partner for daily laboratory routine.

Atomic absorption spectroscopy (AAS) is a powerful analytical technique that is widely used in various fields, including microbiology.

**UV-VIS Spectrophotometer Shimadzu (UV1800)** available at AIMT. A UV- Vis spectrophotometer measures the light absorption of a substance in a cuvette to determine its concentration, purity, and physical properties. What is being observed spectroscopically is the absorbance of light energy or electromagnetic radiation, which excites electrons from the ground state to the first singlet excited state of the compound or material. The UV-vis region of energy for the electromagnetic spectrum covers 1.5 - 6.2 eV which relates to a wavelength range of 800 - 200 nm.

This workshop aims to expose PhD and M.Sc. students to cutting edge technologies and acquire to know-how on various microscopy methods applied in host-microbe and microbe-microbe interactions and biological studies. This workshop covers lectures by eminent speakers and laboratory work presented by leading experts in the field. Young researchers will be encouraged to learn dos and don'ts to efficiently handle advance microscopes and other related instrumentations.

The above-mentioned objectives will undoubtedly open areas in microbial research that have not been commonly amenable to investigation. The lead and plenary lectures will be delivered by senior scientists/ technocrats from Universities/ Research Organizations / Industries and legal experts with specific time slot for interactive discussions.

***The workshop is expected to be attended by the PhD research scholars and M.Sc. students based on first come first registration for 20 students." bold and distinct.***



### **CHIEF PATRON:**

#### **Dr. Ashok K Chauhan**

Hon'ble Founder President, RBEF

### **PATRON:**

#### **Dr. Atul Chauhan**

Chancellor, Amity University  
President, RBEF  
CEO, AKC Group of Companies

### **CO PATRONS**

#### **Prof. Dr. Balvinder Shukla**

Vice Chancellor  
Professor-Entrepreneurship, Leadership & IT  
Amity University Uttar Pradesh  
Sr. Vice President, RBEF

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President - Amity Science, Technology & Innovation  
Foundation (ASTIF),  
Director General-Amity Directorate of Science & Innovation  
Chancellor, Amity University Chhattisgarh and  
Chair Professor for Life Sciences

### **CHIEF ADVISORS**

#### **Prof. Dr. BC Das**

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Amity Institute of Molecular Medicine  
& Stem Cell Research (AIMMSCR)  
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DEAN, Health & Allied Sciences  
Chairman, University Research Council (URC)  
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Amity University Uttar Pradesh

#### **Prof. Dr. Ajit Varma**

Emeritus Professor,  
Amity Institute of Microbial Technology (AIMT)  
Amity University Uttar Pradesh

### **ORGANISING SECRETARY**

#### **Dr. Amit C Kharkwal**

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### **Organising Committee**

- Dr. Surbhi Dabral
- Dr. Swati Tripathi
- Dr. Monika Gupta
- Dr. Menaka Devi Salam
- Dr. Manpreet Kaur Attri
- Dr. Anil Chandra
- Dr. Arti Goel
- Mr. Vivek Yadav

# INAUGURAL PROGRAMME

**Monday, February 12, 2024, Day 1**

**Venue:** Auditorium, E-2 Block, Amity University Campus, Sector 125, NOIDA

## Session 1

9:00 – 10.15 hrs	REGISTRATION & NETWORKING TEA
10.15 – 10.25 hrs	LIGHTING THE LAMP & SARASWATI VANDANA
10.25 – 10.35 hrs	OPENING REMARKS <b>Prof. Dr. BC Das</b> , Acting Head, AIMT
10.35 – 11.05 hrs	GLIMPSES OF AMITY UNIVERSE <b>Dr. W. Selvamurthy</b> , President, Amity Science and Technology Innovation
11.05 – 11.15 hrs	INTRODUCTION OF WORKSHOP DELEGATES AND PARTICIPANTS <b>Dr. Amit Chandra Kharkwal</b> , Dy. Director AUUP
11.15-11.20 hrs	SPEICAL REMARKS <b>Prof. Dr. Ajit Varma</b> , Emeritus Professor, AIMT
11.20 – 11.30 hrs	SOME THOUGHTS <b>Dr. Ashok K Chauhan</b> Founder President, Ritnand Balved Education Foundation
11.30 – 11.35 hrs	VOTE OF THANKS <b>Dr. Monika Gupta</b> , Astt Prof. AIMT
11.35 – 12.00 hrs	NETWORKING HIGH TEA

## Session 2

12.00 – 1.30 hrs	THEME LECTURE- I Introduction to Microscopy <b>Mr. MS Tanwar</b> , Product Manager - Nikon India Pvt.Ltd.
1.30 – 2.30 hrs	NETWORKING LUNCH (AIMT Conference Room)
2.30 – 5.00 hrs	LABORATORY PRACTICES
5.00 – 5.30 hrs	APPRAISAL & ACHIEVEMENT OF THE DAY AIMT Lecture Hall-412, Amity University
6:00 – 7:00 hrs	CULTURAL PROGRAMME FOLLOWED BY NETWORKING DINNER

## Tuesday, February 13, 2024, Day 2

**Venue:** Seminar Hall, E-2 Block, Amity University Campus, Sector 125, NOIDA

### Session 3

9.30 -11.00 hrs	THEME LECTURE-II Application of Atomic Absorption Spectroscopy for Micronutrient analysis: Advantages and challenges. <b>Dr. Sudhir Reddy</b> , Application Specialist, Analytik Jena India Pvt. Ltd
11.00 –11.30 hrs	NETWORKING TEA
11:30-1:30 hrs	LECTURE Heavy metal analysis in biological sample through AAS <b>Ms. Anita Singh</b> , Director, Ohm Laboratory
1.30 – 2.30 hrs	NETWORKING LUNCH

### Session 4

2.30 –4.30 hrs	LABORATORY DEMONSTRATION CONTD.
4.30 – 5.10 hrs	SPECIAL LECTURE Microbial enzymes: Assay, kinetics, and characterization using UV-VIS spectroscopy. <b>Dr. S. Menaka Devi</b> , Asst Prof., AIMT
5:00 – 5:30 hrs	APPRAISAL & ACHIEVEMENT OF THE DAY AIMT Lecture Hall-412, Amity University

## Wednesday, February 14, 2024, Day 3

**Venue:** Seminar Hall, E-2 Block, Amity University Campus, Sector 125, NOIDA

### Session 5

9.30 -11.00 hrs	THEME LECTURE-II Application of Atomic Absorption Spectroscopy for Micronutrient analysis: Advantages and challenges. <b>Dr. Sudhir Reddy</b> , Application Specialist, Analytik Jena India Pvt. Ltd
11.00 –11.30 hrs	NETWORKING TEA
11:30-1:30 hrs	LECTURE Heavy metal analysis in biological sample through AAS <b>Ms. Anita Singh</b> , Director, Ohm Laboratory
1.30 – 2.30 hrs	NETWORKING LUNCH



**Session 6**

2.30 – 4.30 hrs	LABORATORY DEMONSTRATION CONTD.
4.30 – 5.10 hrs	SPECIAL LECTURE Potential of long noncoding RNA in human cancers. <b>Manoj Garg</b> , Professor, AIMMSCR
5.10 - 5.30 hrs	APPRAISAL & ACHIEVEMENT OF THE DAY AIMT Lecture Hall-412, Amity University

**Thursday, February 15, 2024, Day 4****Venue: Seminar Hall, E-2 Block, Amity University Campus, Sector 125, NOIDA****Session 7**

9:30 – 11.00 hrs	THEME LECTURE-IV Application of SEM and TEM <b>Dr. Manika Khanuja</b> , Asst Prof, Jamia Millia Islamia, New Delhi
11.00 – 11.30 hrs	NETWORKING TEA
11.30 – 1.30 hrs	LABORATORY DEMONSTRATION CONTD.
1.30 – 2.30 hrs	NETWORKING LUNCH

**Session 8**

2.30 – 4.30 hrs	LABORATORY DEMONSTRATION CONTD.
4.30 – 5.10 hrs	SPECIAL LECTURE Working principal and applications of UV-vis spectroscopy. <b>Mr. Nahar Singh</b> , Application specialist, Toshvin Analytic
5.10 – 5.30 hrs	APPRAISAL & ACHIEVEMENT OF THE DAY AIMT Lecture Hall-412, Amity University

**Friday, February 16, 2024, DAY 5****Venue: Seminar Hall, E-2 Block, Amity University Campus, Sector 125, NOIDA****Session 9**

9:30 – 11.00 hrs	THEME LECTURE-V Biophotonics <b>Dr. Dalip Singh Mehta</b> , Professor, IIT Delhi
11.00 – 11.30 hrs	NETWORKING TEA
11.30 – 1.30 hrs	LABORATORY DEMONSTRATION CONTD.
1.30 – 2.30 hrs	NETWORKING LUNCH

<b>Session 10</b>	
2.30 – 4.30 hrs	LABORATORY DEMONSTRATION CONTD.
4.30 – 5.00 hrs	TROUBLESHOOTING SESSION
5.00 – 5.30 hrs	APPRAISAL & ACHIEVEMENT OF THE DAY AIMT Lecture Hall-412, Amity University

**Saturday, February 17, 2024, DAY 6**

**Venue: Seminar Hall, E-2 Block, Amity University Campus, Sector 125, NOIDA**

**Session 11**

9:30 – 11.00 hrs	THEME LECTURE-VI Exploring Multimodal Imaging Approaches in Microbial Systems. <b>Dr. Kavya Dashora</b> , Assoc. Prof., IIT Delhi
11.00 – 11.30 hrs	NETWORKING TEA
11.30 – 1.30 hrs	LABORATORY DEMONSTRATION CONTD.
1.30 – 2.30 hrs	NETWORKING LUNCH
2.30 – 4.30 hrs	FEEDBACK COLLECTION AND DISCUSSION.

**Session 12**

4.30 – 5.30 hrs	VALEDICTORY FUNCTION
5:30 – 6:00 hrs	HIGH TEA



## ABOUT AMITY UNIVERSITY

Amity University, a leading research & innovation driven university, has been ranked among the top 3% universities by QS and Times Higher Education, UK (the world's leading university rankings organisations).

The university is also Asia's only not-for-profit university to be awarded US Regional Accreditation by WASC, USA and QAA, UK - setting a new standard of academic excellence in India. Amity has been ranked among the top universities globally for producing the most employable graduates in a survey conducted among 9,000 employers worldwide by Times Higher Education, UK. Amity University is the flagship institution of Amity Education Group, established over 2 decades ago. Today, Amity has over 175,000 brilliant students across Pre-nursery to Ph.D. levels, pursuing more than 400 Programs in 90 diverse disciplines, ranging from Management to Psychology, besides future focused areas like Renewable Energy, Nuclear Science and Nanotechnology.

The Group is driven by its vision of building a Global Knowledge Network, providing globally benchmarked education. Today, the Group comprises 11 Universities, 28 schools and 16 international campuses across London, Singapore, Dubai, New York, San Francisco, Amsterdam, Mauritius, Abu Dhabi, Sharjah, Tashkent, South Africa, besides India.

Amity's relentless pursuit of excellence is reflected in its steadfast commitment and contribution towards cutting-edge research and innovation. For instance, Amity in the last four years has filed over 1,600 patents. It is also engaged in conducting over 300 hi-end Government-funded as well as international research projects including those funded by Bill & Melinda Gates Foundation, USAID, and Leverhulme Trust, UK.

In the field of management, the University has developed over 3500 case studies in the past years that have been bought across 110 countries by 2300+ leading institutions and organizations like Harvard, Stanford, Oxford, McKinsey, and KPMG. Amity has instituted an extensive scholarship programme, benefiting over 25,000 students so far. These brilliant students have filed 100 patents and published 1100+ scopus-indexed research papers.

Today, the Amity community of outstanding students has exceeded over 120,000 alumni worldwide, who are successfully pursuing their career in top organizations or pursuing further studies at leading institutions in top global universities like Stanford, Oxford, Harvard and Columbia.

**85 acre Amity University Campus, Noida (New Delhi NCR)**

