

# CSIR Integrated Skill Initiative



## Certificate course on Skill Development in Electron Microscopy CSIR-CDRI



This course aims at generating trained human resources ready for employment in industry and academia. It will provide a unique opportunity for skill development and provide a basis for planning future studies in cell biology involving these techniques. The course will improve their job prospects as there is limited expertise available in India while there is a great demand for trained manpower in these areas. Trained candidates will also have an edge while applying for positions in cell biology labs in various research institutes requiring practical experience in these techniques. Candidates may find suitable positions such as Scientists, Technicians, Research assistants, etc in research/diagnostic laboratories and applications/marketing positions in various companies, etc. This training at state-of-the-art facilities will equip candidates to apply for these positions with the requisite theoretical and practical knowledge and experience.

CSIR-CDRI invites applications for “**Certificate course on Skill Development in Microscopy (Electron Microscopy, Confocal and Intra vital Microscopy) and Flow Cytometry**” as per the details given below:

<b>Title of the course</b>	<b>: Certificate course on Skill Development in Electron Microscopy</b>
<b>Duration</b>	<b>: 6 Weeks</b>
<b>No of Seats</b>	<b>: 10</b>
<b>Educational Qualification</b>	<b>: B.Sc./B.V.Sc./B.Tech/B.Pharm./M.Sc./M.Tech./M.Pharm./M.V.Sc./Ph.D./ Qualification may be relaxed for industry sponsored applicants</b>
<b>Age Group</b>	<b>: 21-45 years</b>
<b>Date of Commencement</b>	<b>: 03.06.2019</b>
<b>Venue of the course</b>	<b>: CSIR-CDRI, Lucknow</b>
<b>Course Fee</b>	<b>: Rs. 15000/-</b>
<b>Sponsorship</b>	<b>: Public/private sectors are welcomed for the sponsorship</b>

## **TRAINING CURRICULUM**

### **Electron Microscopy (TEM, SEM)**

#### **Electron Microscopy (TEM, SEM)**

- How to work in the electron microscopy laboratory, safety procedures, maintenance of EMs and ancillary equipment, handling of toxic reagents
- Transmission Electron Microscopy (TEM): principles, magnification and resolution, aspects of image formation, components of TEM, physical basis of contrast; Applications of TEM in biology.
- Biological specimen preparation for TEM: Preparation of coated grids, Negative staining and Embedding techniques (adherent/suspension cells, tissues)
- Visualizing nanostructures; Characterization of viruses and virus like particles by TEM for optimization of vaccines and diagnostic virology
- Obtaining thin sections using ultramicrotomy, contrasting of thin sections
- Basic TEM operation/handling, alignments, aberration corrections, and imaging; Visualizing and understanding cellular ultrastructure
- Scanning Electron Microscopy (SEM): principles of SEM, applications in biology and medicine, components of SEM
- Specimen preparation methods for SEM (powder specimens, adherent/suspension cells, tissues, etc.), critical point drying, sputter coating
- Using various specimen preparation equipments like sputter coater, critical point dryer, high vacuum evaporator, ultramicrotome
- Characterization of drug formulations and nano delivery systems using EM
- Basic SEM operation/handling, astigmatism correction, optimizing parameters for imaging depending on type of specimen and imaging
- Basic principles of CryoEM
- Discussion and troubleshooting

### **Confocal Microscopy**

- Basics of microscopy (bright field, differential interference contrast and phase contrast)
- Microscope designs, optics and essentials of microscope handling
- Introduction to fluorescence microscopy, advantages and drawbacks
- Confocal microscope and its comparison with epifluorescence microscope
- Cell culture techniques with examples of mammalian and parasitic cells
- Fluorescent probes and sample preparation for confocal microscopy
- High resolution Imaging techniques and software assistance in confocal microscopy
- Optical sectioning and 3D reconstruction
- Fluorescence resonance energy transfer and fluorescence recovery after photo-bleaching
- Generation of artefacts and troubleshooting.

### **Intravital Microscopy**

- Principles of Two photon microscopy and other novel concepts of microscopy

- Preparation of samples
- Proper visualization of flurochrome in vivo
- Assessing the intra-vascular interactions
- Injection of flurochrome
- Visualization of cellular structures
- Troubleshooting skills

### **Flow Cytometry**

- Flow Cytometry
- Basics of Flow Cytometry including Instrument Configuration, Resolution and Performance Characteristics.
- Understanding various terminologies like QC, Setting Baseline, PMT Voltages, Spectral Characteristics (Stain Index, Spill Index, Spread Index), Color compensation (Cell-Based, Bead-Based) etc.
- Instruments set up (BD FACS Aria and BD FACS Calibur) and Software overview.
- Assay designing and standardization (Titration, Antigen Density, Non-specific Background, Blocking Buffers, Viability Dyes etc.).
- Essentials of Sample preparation including various controls (Isotype, Fluorescence Minus One-FMO, negative and positive controls).
- Protocol discussion and wet labs (1) cell cycle analysis, (2) Apoptosis (Annexin V-PI assay, JC1 assay), (3) Multicolor immunophenotyping, (4) Nitric Oxide and Reactive Oxygen Species measurement.
- Cell Sorting - Concepts and Terminologies, sort set up, different modes of sorting, pre and post sort purity analysis.
- Data Acquisition, Analysis and Troubleshooting.

### **SALIENT FEATURES OF THE TRAINING**

- About 25% Theory and 75% Practical sessions as per course curriculum
- Small batch size for effective training
- Understanding basic principles
- Lectures assisted with multimedia aids
- Interactive session
- Exposure to diverse sample preparation techniques
- Brief Hands-on practical exposure on the state-of-the-art equipments
- Planning experiments for obtaining meaningful results
- Troubleshooting

### **EVALUATION OF TRAINEES**

Evaluation will consist of the following components

#### **Theory Courses (50 Marks)**

- (a) Continuous assessment through assignments
- (b) Term end examination

#### **Practical Courses (50 Marks)**

- (a) Guided Experiments
- (b) Unguided Experiments

**CERTIFICATION**

Certificate will be issued to the successful candidates for the course