CSIR Integrated Skill India Initiative

Certificate Course on Techniques for 3D structure reconstruction from cryo-electron microscopy dataset of biological samples

Code – IICB-CEM

Cryo-EM technique for 3D structure determination of biological macromolecules is now flourishing in India. The method proceeds through the following steps:

(1) optimization of sample preparation and characterization

(2) sample vitrification (grid preparation),

(3) image acquisition (in high resolution TEM at cryo condition)

(4) 3D-structure determination.

While image collection (steps 3) can be out-soured (there are several facilities with paid services), appropriate sample preparation for structural studies (step 1), sample vitrification/grid preparation(step 2) and 3D structure determination from the image dataset (step 4) need to be done in respective labs. Thus, persons having skills in these areas would be highly demanding. Homogeneous sample preparation is a crucial step for high resolution cryo-EM structure determination. Following sample vitrification and image collection, the images need to be processed computationally. In this training course, we propose to provide training (a) to prepare specimen suitable for structural studies (step 1), (b) sample vitrification/grid preparation (step 2) and (c) Single particle 3D reconstruction techniques to process the images (step 4).

. Training Curriculum :

- **Purification of protein sample**

Cloning in plasmid DNA

Transformation of the recombinant vector into the host bacteria for expression

Extraction and purification of protein

- **Quality assessment of the sample**

Gel electrophoresis (SDS-PAGE) and western blotting

Absorption behaviour of protein

CD and fluorescence spectroscopy

Column chromatography and light scattering

- **Sample vitrification/grid preparation**

Glow discharging of cryo-grids

Plunge Freezing (using vitrobot mark IV)

- **3D structure determination from a sample image dataset**

Movie corrections

Screening the images

Step by step data processing (Primarily using RELION)

2D and 3D classifications

Refinement of the structure

Model building

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Educational Qualifications : UG or PG (in any branch of Science/Technology/Pharmacy) (Pursuing/ Completed degree)

Venue Of the course : CSIR-IICB, Jadavpur Campus

Age group: : 20-35 years *(relaxation for SC/ST/OBC as per GOI rules)*

Course Fee : **Rs. 6,000/- (Inclusive of GST)**

Duration : 2 weeks(16th February 2026-27th February 2026)

Salient Features of the courses:

- Theory and practical sessions are per the course curriculum
- Hand-out information on teaching modules
- Lectures includes the entire process of routine clinical chemistry with multimedia aids
- Hands on training through several practical classes in laboratories
- Exposure to all relevant instruments
- Continuous assessment through theoretical assignments & practical examinations for evaluation
- A certificate will be issued to the successful candidates
- **Seats Available : 10 (*Shortlisting will be based on first come-first serve policy and eligibility criteria of the course*)**
- Due to limited availability of seats, early registration through online application is recommended .
- **Candidates can apply for multiple courses. In such cases, shortlisting will be based on fulfilment of eligibility conditions, availability of seat and number of single choice applicants for the course**
- Admission process is completely online including the payment of fees.
- Once a candidate is shortlisted for a particular course, any request for change of course will not be accepted .
- Candidates cannot take admission simultaneously in two different courses
- **Refunds to the enrolled candidates will be made by the institute in case of cancellation of the course due to low batch strength. Such candidates will be informed about withdrawal of course and refund of fees within stipulated time.**