



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-sourced (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

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 (using latest software)
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 June 2025-27th June 2025)

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 : 07 (*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.**

