

**Title: cryo-Electron Microscopy [3-0-0-6]**

**Pre-requisites, if any: NONE**

*Desired background for taking the course - Physics and mathematics at bachelor level, Molecular biology, Biochemistry or related courses*

**Content** (*List of the topics/sub-topics to be covered in the lectures/practicals/assignments*):

- Introduction to electron microscopy and its biological applications
- Principles and optics of the electron microscope
- Digital image formation
- Fourier analysis of image
- Electron–Specimen Interactions.
- Point spread function and contrast transfer
- Sample preparation: negative staining and cryo-EM
- Single particle reconstruction
- Cryo-ET
- Map validation, visualization, molecular modelling

**Texts / References**

- Three-Dimensional Electron Microscopy of Macromolecular Assemblies (New York, Oxford U. Press). Joachim Frank, 2006
- Electron Tomography, (New York, Springer). Joachim Frank 2006
- Computational Methods for Three-Dimensional Microscopy Reconstruction Gabor T. Herman and Joachim Frank 2014
- Transmission Electron Microscopy Springer Bavid B. Williams, C Barry Carter 2009
- Y Cheng, A Primer to Single-Particle Cryo-Electron Microscopy: Cell 2015, 161, 439-449
- Scheres & Chen (2012) “gold standard” Nature Meth. 9, 853-854