

[SEMC @NYSBC] Winter EM course 2020

Overview

Electron microscopy in combination with image analysis is increasingly powerful in producing 3D structures of individual molecules and large macromolecular complexes that are unapproachable by other methods. This course is focused on the concepts and theories behind electron microscopy. Students are expected to watch Grant Jensen's online course [<https://cryo-em-course.caltech.edu/>], and Peter Shen & Janet Iwasa's CryoEM 101 [<https://cryoem101.org/>] to familiarize themselves with the subject. Each week guest lecturers lead discussions on the practice of solving molecular structures by electron microscopy. The course website may be found here [<http://semc.nysbc.org/the-winter-spring-2020-em-course/>] and will be held at the New York Structural Biology Center at 89 Convent Ave (133rd St).

Grading

For students taking the course for credit, your grade will be determined as follows:

Journal club recitation – 50%
Practical worksheets – 40% (10% x 4)
Attendance – 10%

Course Schedule

Classes will be held in the NYSBC or SEMC conference room (Mondays and Wednesdays, 3:30-5pm).

Jan 6 : Lecture – Introduction & SEMC tour (Ed Eng – NYSBC)

Jan 8 : Practical – Sample Preparation & Support films (Micah Rapp/Ed Eng – COLU/NYSBC)

Jan 13 : Lecture – Basic anatomy of the electron microscope (Micah Rapp – COLU)

Jan 15 : Practical – TEM use

Jan 20 : MLK Jr holiday – No class

Jan 22 : Practical – Journal club

Jan 27 : Lecture – Fourier transforms and Image Formation (Micah Rapp – COLU)

Jan 29 : Practical – Image pre-processing

Feb 3 : Lecture – MicroED (Bill Rice – NYU)

Feb 5 : Practical – Journal club

Feb 10: Lecture – Helical reconstruction (Hernando Sosa – Einstein)

Feb 12 : Practical – Journal club

Feb 17 : President's day holiday – No class

Feb 19 : Practical – Journal club

Feb 24 : Q&A – open forum & primer to SPA

Feb 26 : Practical – Intro to SPA processing

Suggested video schedule

Below you will find a recommended viewing schedule for Grant Jensen's lectures. Please watch the suggested videos before arriving at the indicated date's lecture.

Jan 8 : [Jensen Part 4 - Sample Prep videos](#) : [Unit 2](#) : [CryoEM101 Chapter 1](#) & [Chapter 2](#)

Jan 13 : [Jensen Part 1](#)

- Jan 27 : [Jensen Part 2 & Part 3](#)
Feb 3 : [Jensen Part 7](#)
Feb 17 : [Jensen Rest of Part 4](#)
Feb 24 : [Jensen Part 6](#) (It may be helpful to review videos in Part 2 and 3 that you struggled with)

Journal Club

Graduate students taking the course for credit will be split into teams and assigned an article that corresponds to recent lecture material. Each team will read their assigned articles and create a 30-minute presentation that will be delivered to the rest of the class. The presentation will be highly interactive so be prepared to answer questions. Here are the articles and corresponding dates:

- Jan 22 : “Cryo-electron microscopy of viruses”, Adrian et al., *Nature* 1984 & “A new method for vitrifying samples for cryoEM”, Razinkov & Dandey et al., *Journal of Structural Biology* 2016
- Feb 5 : “The energy dependence of contrast and damage in electron microscopy of biological molecules”, Peet et al., *Ultramicroscopy* 2019 & “CryoEM at 100 keV : a demonstration and prospects”, Naydenova et al., *IUCrJ* 2019
- Feb 12 : “The structure of the TRPV1 ion channel determined by electron cryo-microscopy”, Liao & Cao et al., *Nature* 2013
- Feb 19 : “Molecular architecture of the uncleaved HIV-1 envelope glycoprotein trimer”, Mao et al., *PNAS* 2013 & “Avoiding the pitfalls of single particle cryo-electron microscopy : Einstein from noise”, Richard Henderson, *PNAS* 2013 & “Finding trimeric HIV-1 envelope glycoproteins in random noise”, Marin van Heel, *PNAS* 2013

Contact

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