Module title			Abbreviation
Practical course of electron microscopy and image processing			08-MBC-EMP-172-m01
Module coordinator		**Module offered by**	
holder of the Chair of Biochemistry		Chair of Biochemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

The module "Practical Course Electron Microscopy and Single Image Processing" consists of an electron microscopy part and an image processing part. In the electron microscopy part the participants get to know the different elements of the electron microscope and how they work. Aspects of alignment, focusing and data acquisition will be developed. The participants will then use different preparation methods for electron microscopy (grid preparation, negative contrast and vitrification). The samples are then imaged in an electron microscope. Sample and data optimization are developed and data sets are created for further image processing. In the image processing part, the participants are first introduced to general aspects of computer operation under Linux (basic Linux commands, basic shell scripting). On this basis, the participants determine the structure of a protein complex from a real test data set. They learn step by step how to select good images, how to correct data for image-dependent aberrations and how to normalize, mask and filter image data. With the data prepared in this way, the participants will determine the characteristic views of the complex (2D classification) and combine these with various methods to form a DeNovo model. This model is then refined in an iterative process. In the second part of the image processing practical course the participants apply what they have learned to their own data. At the end of the practical course the participants present the different working steps and exchange experiences. The practical part of the electron microscopy practical course and the image processing practical course on test data will be summarized in a protocol. The results on the own data are presented in the form of a scientific publication, which requires a corresponding literature work and the creation of more complex images.

Intended learning outcomes

The participants will be taught the skills to prepare an already purified biological complex for structure determination with the help of electron microscopy and to independently determine its structure de novo from electron microscopic data. The participants will acquire a practical understanding for the data acquisition at the electron microscope and will be able to plan and carry out a corresponding experiment with technical support in the future. The participants will further develop the following key qualifications in the course: Computer skills (insights into Linux), team skills (working in teams of 2-3 students with varying composition), communication skills (oral and written presentation of results).

Courses (type, number of weekly contact hours, language — if other than German)

P (8)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) log (20 to 30 pages) or
b) oral examination of one candidate each (20 to 30 minutes) or
c) oral examination in groups of up to 3 candidates (15 to 30 minutes per candidate) or
d) presentation (20 to 40 minutes)
Language of assessment: German and/or English
Assessment offered: Once a year, summer semester

Allocation of places

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Additional information

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Workload
300 h
Teaching cycle
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module appears in
Master's degree (1 major) Biochemistry (2017) Master's degree (1 major) Biochemistry (2019) Master's degree (1 major) Biochemistry (2026)