Program of Studies:	**Master Program Bioinformatics**
Name of the module:	**Bioinformatics 3**
Abbreviation:	**BI-M-1**
Subtitle:	-
Modules:	Lecture: 4 h (weekly) Tutorial: 2 h (weekly)
Semester:	1st to 3rd semester / every third semester
Responsible lecturer:	Prof. Dr. Volkhard Helms
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Language:	English
Level of the unit/ Mandatory or not:	Graduate course / mandatory elective
Total workload:	270 h = 90 h of classes (lecture + tutorial), 180 h of private study
Credits:	9
Entrance requirements:	Familiarity with contents of Bioinformatik I and II. The students will have to complete programming assignments e.g. with Python.
Aims/Competences to be developed:	The students will get familiar with modern concepts for the integrated computational analysis and representation of cellular proteomic data. An ambitious element of this advanced lecture is to integrate knowledge from different fields of bioinformatics. The course focusses on the principles of algorithmic techniques for the treatment of networks and discusses their application to important biological problems. The assignments are very important to support the lecture. - Parts of the assignments are programming assignments, where the students implement and apply algorithms and statistical methods on biological data. In doing so they learn with assistance or independently important programming techniques for a later self-contained research. The result should be reasonably interpreted - Other assignments contain mathematical derivations or algorithmic processing.
Content:	The course will cover methodological aspects of integrated biology and systems biology: - protein-protein interaction networks (mathematical graphs, Bayesian networks) - analysis of protein complexes (density fitting, Fourier transformation) - transcriptional regulatory networks (Boolean networks) including epigenetic modifications and micro RNAs - dynamic simulation of cellular processes (differential equation solvers, stochastic simulations) - metabolic networks (linear algebra)

Assessment/Exams	Access to participate in the final exam: at least half of the points of the assignments. Solutions have to be returned at the beginning of the following week`s lecture. In addition, each student has to solve one of these problems on the blackboard. Students need to pass the written final exam that will be scheduled near the end of the semester or the re-exam that will be scheduled at the beginning of the following semester.
Grade:	Grade of the exam
Literature:	V. Helms, Principles of Computational Cell Biology, Wiley (2019)