Program of Studies:	**Master Program Bioinformatics**
Name of the module:	**Bio-Reaction Engineering**
Abbreviation:	**B-M-4**
Subtitle:	-
Modules:	Lecture: 2 h (weekly)
Semester:	2nd semester / every summer semester
Responsible lecturer:	Prof. Dr. Christoph Wittmann
Lecturer:	Prof. Dr. Christoph Wittmann, Dr.-Ing. Michael Kohlstedt
Language:	English and German
Level of the unit/ Mandatory or not:	Graduate course / mandatory elective
Total workload:	135 h = 30 h of classes (lecture), 15 h classes (tutorials) and 90 h private study
Credits:	6
Entrance requirements:	None
Aims/Competences to be developed:	- Learning the basics of bio-reaction engineering and biochemical engineering processes in biotechnology - Obtaining technical and constructive knowledge for the construction of reactors and peripheral facilities including accompanying analysis - Acquiring comprehensive skills for linking individual procedural elements to overall procedures - Acquisition of theoretical and practical skills to qualitatively record bio-reaction and process engineering processes, to describe them with the help of mathematical model equations and to use them for simulations of biotechnological processes.
Content:	- Thermodynamics of biological processes - Mass and energy balances - Basics in kinetics and stoichiometry - Enzyme kinetics - Kinetics of cell growth and product formation - Fundamentals of mass and heat transport - Diffusion and reaction - Design and construction of bioreactors - Construction and operation of bioreactors - Online measurement and process control - Advanced Processing: Recycling and in-situ product removal - Advanced Processing: Immobilized Biocatalysts

Assessment/Exams	1 written exam, exercises, protocols
Grade:	Exam
Literature:	- Biological Reaction Engineering: Dynamic Modelling Fundamentals with Simulation Examples (Dunn, Jl., Heinzle, E., Ingham, J., Přenosil, JE., Wiley, 2003) - Bioreaction engineering principles (Villadsen, J., Nielsen, J., Liden, G., Wiley, 2016) - Bioverfahrensentwicklung (Storhas, W., Wiley-VCH, 2013) - Industrial biotechnology: Microorganisms (Wittmann, C., Liao, JC, Wiley-VCH, 2016) - Industrial biotechnology: Processes (Wittmann, C., Liao, JC, Wiley-VCH, 2016)