

# QBio502: From Data to Knowledge

<b>Module Responsible:</b> Prof. Dr. Andreas Weber			<b>Version:</b> 02/01/2021	
<b>Module Organizer:</b> Prof. Dr. Andreas Weber			<b>Type:</b> Compulsory	
<b>Lecturer:</b> Prof. Dr. Andreas Weber				
<b>Total Working Time</b> 180 h	<b>Credit Points</b> 6 CP	<b>Contact Time</b> 60 h	<b>Self Study</b> 120 h	<b>Duration</b> 1 Semester
<b>Course Components</b> Lecture: 3 SWS Exercise: 1 SWS		<b>Group Size</b> P: 40 P: 20	<b>Frequency</b> Every Winter Semester	
<b>Learning Competencies:</b> The students are able to select appropriate analytical methods and instruments to effectively and critically solve analytical questions in biochemistry, molecular biology and structural biology. They can name the physical laws on which the respective measurement method is based, describe observed phenomena and explain physical relationships. Students can compare alternative measurement methods with each other, specify the methodological limits and justify the selection of a suitable measurement method. They will be able to understand the different types of data produced, data processing, and data analysis. Students can design proper experimental strategies, including proper sampling and sample preparation, selection of external and internal standards as well as proper negative and positive controls.				
<b>Content:</b> DNA-Analytics: <ul style="list-style-type: none"> <li>• Classical and next-generation DNA sequencing methods</li> <li>• Application of NGS to quantitative and qualitative analysis of genome structure and gene expression</li> <li>• Establishment of metabolic pathways and Genetic Networks via Gene Expression Analysis</li> <li>• Determination of the Function of Genes via their Network Position</li> <li>• Determination of Biomarkers for Diseases</li> </ul> Proteomics: <ul style="list-style-type: none"> <li>• Targeted vs. Untargeted Quantification of Proteins</li> <li>• Mass Spectrometry</li> <li>• Chromatography</li> <li>• HPLC</li> <li>• 2D Gel Electrophoresis</li> <li>• Label-free and label-based quantification</li> <li>• Analysis of protein interaction and post-translational modification</li> <li>• Cryo-EM</li> </ul>				

- NMR Spectroscopy
- X-Ray Crystal Structures

**Metabolomics:**

- Targeted vs. Untargeted Quantification Strategies
- Mass Spectrometry
- Chromatography
- Optical tests
- Steady-state and dynamic analysis of metabolism
- Cell-specific and subcellular metabolism
- Genetically-encoded metabolite sensors
- Databases
- Assays
- Screenings

**Organismic Level**

- Quantitative Imaging
- FACS and Flow Cytometry

**Conditions of Participation:**

Passed modules QBio201: Molecular Mechanism of the Cell, QBio301: Cell Bioenergetics and QBio303: Metabolism

**Examination:**

Learning portfolio consisting of

- Written Exam (50% of the final grade)
- Exercises (50% of the final grade)

**Prerequisites for Awarding Credits for this Module:**

- Passing Exercises (50 % of Exercise Sheets)
- Passing Written Exam

**Factor for the Overall Grade:**

The grade is weighted according to the credit points (CP) in the overall grade.

**Language:**

English

**Literature:**

**Further Information:**