

# QBio304: Applied Bioinformatics

**Module Responsible:**

Prof. Dr. Björn Usadel

**Version:**

02/01/2021

**Module Organizer:**

Prof. Dr. Björn Usadel

**Type:**

Compulsory

**Lecturer:**

Prof. Dr. Björn Usadel

**Total Working Time**

180 h

**Credit Points**

6 CP

**Contact Time**

60 h

**Self Study**

120 h

**Duration**

1 Semester

**Course Components**

Lecture: 2 SWS

Exercise: 2 SWS

**Group Size**

P: 40

P: 20

**Frequency**

Every Winter Semester

**Learning Competencies:**

Students can enumerate major bioinformatics databases and standard tools used in common workflows, and they can list the major content in some of these. Students can explain how quick pattern matching can be used to solve some simple biological problems and are able to conduct such analyses in practice.

Students are able to explain the differences in modern sequencing technologies and judge when these would be appropriate. Students can describe the problem of multiple testing and confidently choose different methods to overcome this problem. They can apply R and Bioconductor to analyse modern NGS data and they are able to practically run similarity searches and multiple alignments using state of the art tools.

At the end of the course, students will be able to plan experiments for the practical analysis of typical large-scale biological data sets.

**Content:**

Lecture:

- The lecture will introduce and recapitulate modern omics technologies and their inherent bioinformatic/statistical challenges.
- A second section will focus on the analysis of the corresponding data using R and, on the statistics, underlying the data analysis.
- The final section will introduce major databases and their applications as well as biological pathway tools and how these help in defining possible hypotheses.

Practical Course:

- Analysis with R
- Introduction to Bioconductor
- Analysis of RNAseq datasets
- Visualization of data and biological pathway analyses
- Application of major tools, including BLAST and multiple sequence alignment tools
- Application of „simple“ pattern matching to shape biological hypotheses

**Conditions of Participation:**

Passed Module QBio104 and QBio204

**Examination:**

Project Work

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

Passing Project Work

**Factor for the Overall Grade:**

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

**Language:**

English

**Literature:****Further Information:**