Course Specifications

Valid as from the academic year 2016-2017

Bioinformatics (O000105)

Course size  
Credits 5.0  Study time 150 h  Contact hrs 45.0 h

Course offerings and teaching methods in academic year 2016-2017
A (semester 1)  seminar: practical PC room classes 30.0 h
lecture 15.0 h

Lecturers in academic year 2016-2017
De Neve, Wesley  TW06  lecturer-in-charge
Van Messem, Arnout  WE02  co-lecturer

Offered in the following programmes in 2016-2017  credits offering
Bachelor of Science in Molecular Biotechnology  5  A

Teaching languages
English

Keywords
Algorithms, Bioinformatics, Command line, Computing, Data analysis, Linux, Problem solving, Programming, Python, Scripting

Position of the course
Bioinformatics, sometimes called The New Biology, is an interdisciplinary field of study that develops tools and algorithms for analyzing biological data, combining techniques from the domain of computer science, statistics, mathematics, and engineering. It has evolved into a basic scientific discipline that is essential not only for fundamental biological research but also for medical diagnosis, cancer research, drug development, and agriculture.
Recent technological advances have led to the generation of huge amounts of biotech data at an ever-increasing pace. This data avalanche has created an urgent need in the field of biotech for scientists and engineers with strong computational skills. As a result, this course aims at introducing students to some of the fundamental tools and algorithms that are at the core of computational pipelines for automated processing of biotech data.

Contents
This course deals with selected computational topics, focusing on automated processing of biotech data. These selected computational topics may include, but are not limited to:
- principles of Unix-based operating systems;
- interactive command line usage;
- shell scripting and regular expressions;
- databases and SQL;
- cloud computing and Web development;
- an introduction to Big Data; and
- machine learning algorithms.
In addition, the automated processing of biotech data may include, but is not limited to, genomic data compression, splice site prediction, prediction of drug-target interaction, and gene expression analysis.

Initial competences
Knowledge of a high-level programming language.
Knowledge of algorithmic design and analysis.

Final competences

(Approved)
The student is able (1) to make use of Unix-based operating systems, (2) to automate the processing of biotech data through interactive usage of the command line and shell scripting, (3) to communicate with biotech databases through the use of SQL, and (4) to apply machine learning techniques to biotech data. Furthermore, the student is able (1) to setup and operate computational pipelines for automated processing of biotech data, deploying bioinformatics tools and algorithms based on either explicit programming or machine learning, and (2) to subsequently interpret the obtained results.

Conditions for credit contract
Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract
This course unit cannot be taken via an exam contract

Teaching methods
Lecture, seminar: practical PC room classes

Learning materials and price

References

Course content-related study coaching

Evaluation methods
end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period
Written examination with open questions, skills test

Examination methods in case of periodic evaluation during the second examination period
Assignment

Possibilities of retake in case of permanent evaluation
evaluation during the second examination period is possible in modified form

Extra information on the examination methods
The non-periodic evaluation cannot be retaken during the second examination period. Therefore, the final score for the second examination period is computed twice. The first computation takes into account both the score of the non-periodic evaluation (that is, the score obtained during the first examination period, on a maximum of 8) and the
score of the second examination period (on a maximum of 12). The second computation only takes into account the score of the second examination period (on a maximum of 20). The final score for the second examination period is then equal to the maximum of the above two computations.

**Calculation of the examination mark**

Periodic evaluation (60%) + non-periodic evaluation (20% hands-on sessions + 20% project). To qualify for passing this course, both the score of the periodic and the non-periodic evaluation should be at least equal to 8/20. If that is not the case, the total course score will be subject to an upper limit of 7/20.