Bioinformatics

2025 - 2026

Is part of the next programmes:

- M0012004 Master of Computer Science: Software Engineering
- M0003002 Master of Biology: Evolution and Behavioral Biology
- M0012005 Master of Computer Science: Data Science and Artificial Intelligence
- M0012006 Master of Computer Science: Computer Networks
- M0003002 Master of Biology: Evolution and Behavioral Biology
- M0048004 Master of Computer Science: Software Engineering
- M0047002 Master of Biology: Global Change Biology
- M0047001 Master of Biology: Biodiversity, Conservation and Restoration
- M0048005 Master of Computer Science: Data Science and Artificial Intelligence
- M0048006 Master of Computer Science: Computer Networks
- M0090001 Master of Teaching in Science and Technology: Biology
- U0001008 Courses open to exchange students in Sciences
- U0001008 Courses open to exchange students in Sciences

Course Code:	2002WETBIN
Study Domain:	Computer Science
Semester:	2E SEM
Contact Hours:	0
Credits:	6
Study Load (hours):	168
Contract Restrictions:	Exam contract not possible
Language of Instructions:	ENG
Lecturer(s):	T Kris Laukens
Examperiod:	exam in the 2nd semester

1. Prerequisites *

speaking and writing of:

- English

general notion of the basic concepts of

molecular biology

specific prerequisites for this course

Students without basic background in (molecular) biology will be invited to attend a dedicated introductory lesson.

2. Learning outcomes *

- Acquiring insight in handling and analysis of molecular biologica data using computational techniques.
- Understanding the underlying principles of a selection of computational techniques and models that are frequently used in bioinformatics.
- Being able to select the appropriate technique to solve a given problem, and being able to apply it.
- Knowing how to use, access, search the most important public molecular biological databases.

3. Course contents *

The bioinformatics course aims to give students essential insights in the most important computational techniques used for the analysis of molecular (system) biological data. The student will also learn how to select the right strategy for a given task.
Part I. Scope of Bioinformatics
1. introduction
2. essential background
3. databases
Part II. Analysis of Biomolecules
4. pairwise sequence alignment
5. multiple sequence alignment
6. sequence search
7. profiles and motifs
8. phylogenetic trees
9. protein structure
Part III. Analysis of Living Systems
10. molecular functions
11. genome analysis
12. multi-omics
13. network biology
14. human disease

The practical sessions give students a chance to apply some of the discussed algorithms to solve concrete problems.

4. International dimension *

- This course stimulates international and intercultural competences.

5. Teaching method and planned learning activities

5.1 Used teaching methods *

Class contact teaching

- Lectures
- Practice sessions
- Laboratory sessions

Personal work

- Exercises

5.2 Planned learning activities and teaching methods

The theoretical part follows the structure outlined under section 3, in chronological order. Exercises are given throughout the theoretical lessons and partially solved in group.

5.3 Facilities for working students *

6. Assessment method and criteria *

6.1 Used assessment methods *

Examination

- Written examination without oral presentation

Other assessment methods

- Written assignment

6.2 Assessment criteria *

The evaluation is based on the exam, in which following criteria are applicable:
A. Course content (10 points / 20): [written exam, open book]

- **understanding** the **course contents**: how do presented algorithms and techniques work? Why is a given technique used in a specific situation? What are the limitations of a given technique?
- **insight** in the **course**: How are the different techniques related to each other? What are major outstanding challenges?
- **insight** in the **applications**: How can bioinformatics techniques be used to improve or scientific understanding of biological systems?

B. Practicum insights (5 points / 20) [practicum report and discussion]

- **knowledge** and **understanding** what / why / how things have been done during the **practicum session**

C. Exercises skills (5 points / 20) [written exam, open book]

- **skills** to independently complete an **exercise**, based on theory seen in the course, and of the same type as exercises done in class

The evaluation is carried out with open book, and all paper-based course material can be used. Digital or electronic tools are not allowed.

7. Study material

7.1 Required reading *

Course material / handouts will be supplied by the lecturer.

7.2 Optional reading

The following study material can be studied voluntarily :

Interesting books and websites will be mentioned during the lessons.

8. Contact information *

Advanced database research and modelling (ADReM) Lab.
Dept. Mathematics & Computer Science
University of Antwerp
Middelheimlaan 1, G.111
B-2020
Antwerpen, Belgium
T +32 (0)3 265 33 10
E kris.laukens@uantwerpen.be

9. Tutoring

We recommend the student to start working early to understand the course contents. This will facilitate understanding the relationships between different chapters.
The lecturer is accessible via e-mail, blackboard or after appointment to further explain parts that are not entirely understood.