Computer Science (COMP) 625

Algorithms for Bioinformatics (Revision 1)

Status:	Replaced with new revision, see the **course listing** for the current revision
Delivery mode:	**Individualized study online**. Delivered via Brightspace.
Credits:	3
Areas of study:	Information Systems or Science
Prerequisite:	None
Precluded:	None

Faculty:	**Faculty of Science and Technology**
Notes:	To take this graduate-level course, you must apply and be approved to one of the graduate programs or as a non-program **School of Computing and Information Systems** or **Centre for Science** graduate student. Minimum admission requirements must be met. Undergraduate students who do not meet the admission requirements will not normally be permitted to take this course.
Coordinator:	**Srijak Bhatnagar**

Overview

Bioinformatics is an interdisciplinary field that develops computational methods and software tools for understanding biological data, especially when data sets are large and complex. COMP 625: Algorithms for Bioinformatics focuses on the algorithms that are essential for bioinformatics, with practical projects using Python in the Unix/Linux environment.

Outline

Part I: Fundamentals

- Unit 1: Introduction to Bioinformatics
- Unit 2: Introduction to Python Programming and Environment
- Unit 3: Cellular and Molecular Biology Fundamentals
- Unit 4: Basic Processing of Biological Sequences

Part II: Basic Sequence Algorithms

- Unit 5: Pattern Finding Algorithms
- Unit 6: Pairwise Sequence Alignment
- Unit 7: Sequence Searching Algorithms
- Unit 8: Multiple Sequence Alignment
- Unit 9: Phylogenetic Analysis
- Unit 10: Motif Discovery Algorithms
- Unit 11: Probabilistic Motifs and Stochastic Algorithms

Part III: Advanced Algorithms

- Unit 12: Hidden Markov Models
- Unit 13: Graph Algorithms
- Unit 14: Assembling and Matching Reads

Learning outcomes

Upon successful completion of this course, you should be able to

- explain the objectives and principles of bioinformatics data analysis from a computing and algorithm perspective.
- design and implement algorithms and programs for sequence analysis, searching, alignment, and assembly tasks for analyzing and understanding bioinformatics data.
- exploit different programming libraries in processing and analysis of bioinformatics data.
- develop prototypes of bioinformatics data analysis applications.

Evaluation

To **receive credit** for COMP 625, you must achieve a course composite grade of at least **B– (70 percent)** and a grade of at least 60 percent on each assignment and the final project.

The weighting of the composite grade is as follows:

Activity	Weight
Assignment 1	15%
Assignment 2	30%
Unit quizzes	20%
Final project	35%

Activity	Weight
Total	**100%**

Materials

Digital course materials

Links to the following course materials will be made available in the course:

Rocha, M., & Ferreira, P. G. (2018). *Bioinformatics algorithms: Design and implementation in Python* (1st ed.). Academic Press.

Important links

- **Future Course Offerings**
- **Important Dates and Deadlines**
- **MSc CIS Contact Information**

Opened in Revision 1, February 7, 2025

Updated June 16, 2026
