Biology (BIOL) 520

Microbial Genomics (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
Area of study:	Science
Prerequisite:	**BIOL 325** or equivalent. If you are concerned about not meeting the prerequisite for this course, contact the course coordinator before registering.
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 **Centre for Science** graduate student. Minimum admission requirements must be met. Undergraduate students who do not meet admission requirements will not normally be permitted to take this course.
Coordinator:	Dr. Shawn Lewenza

Overview

Low-cost DNA sequencing technology has generated tremendous numbers of bacterial genome sequences, creating a bottleneck in researchers' ability to understand and integrate this information. This three-credit course covers fundamental aspects of microbial genomics. You will learn how to sequence DNA, assemble and annotate genomes, and examine the many applications of genomics to further your understanding of genomes and species. You will also explore the biotechnology potential of synthetic biology or genome engineering.

Outline

- Unit 1: Introduction to Microbial Genomics
- Unit 2: Basics of Microbial Genetics
- Unit 3: Methods to Analyze Bacterial Genomes
- Unit 4: Bioinformatic Tools for Browsing and Comparing Bacterial Genomes
- Unit 5: Transcriptomics and Proteomics
- Unit 6: Metagenomics and Microbial Ecology
- Unit 7: Microbial Evolution
- Unit 8: Identification of Gene Promoters and Regulons
- Unit 9: Applications of Microbial Genomics
- Unit 10: Ethical Implications of Genomics

Learning outcomes

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

- describe how bacterial genes and genomes are sequenced, assembled, and annotated.
- recover genome sequence files from various databases.
- perform genome analyses and comparisons between multiple genomes.
- design genome-level experiments to provide a systems biology perspective.

- explain how genomics is applied to identify complex bacterial communities.
- synthesize the evolutionary forces and their effect in shaping bacterial genomes and species.
- evaluate and employ the methods to identify bacterial promoters and regulons.
- appraise the potential benefits of microbial genomics applications.
- critique the ethical and biosafety implications of bacterial genomics technologies.
- read and evaluate primary research articles in the field of microbial genomics.

Evaluation

To **receive credit** for BIOL 520, you must achieve a course composite grade of at least **B– (70 percent)** and complete all assignments, the final project, and the final exam.

The weighting of the composite grade is as follows:

Activity	Weight
Assignments 1–4 (12.5% each)	50%
Final project	25%
Final exam	25%
Total	**100%**

The **final examination** for this course must be requested in advance and written under the supervision of an AU-approved exam invigilator. Invigilators include either ProctorU or an approved in-person invigilation centre that can accommodate online exams. Students are responsible for payment of any invigilation fees. Information on exam request deadlines, invigilators, and other exam-related questions, can be found at the **Exams and grades** section of the Calendar.

Materials

Links to all course materials will be made available in the course.

Important links

- **Important Dates and Deadlines**
- **MSc ESS Contact Information**
- **MSc ESS Program Regulations**

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery modes may vary from their individualized study counterparts.

Opened in Revision 1, July 16, 2025

Updated June 10, 2026