

# Robert Williamson

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## RHIT BIO431 - Genomics & Proteomics

### Course Info

#### Course Description

Exploration of the methodologies used to generate systems-level sets of genetic and protein data, and the tools used to access and analyze the prodigious amounts of data emerging from such projects. The application of these technologies to investigate biological questions and model complex biological systems is also discussed.

**Prerequisites:** BIO 205 or BIO 210 or consent of instructor

#### Instructor

Robert Williamson - [Robert's schedule](#)

Office: Moench F205

[Book a meeting with Robert](#)

### Schedule

You are assumed to have a working knowledge of basic genetics, evolution, and DNA replication for this class. If you need a review you should ask for additional sources.

**Week 1 - What is -omics, Phylogenomics**

**Week 2 - Sequencing and Alignment**

**Week 3 - ATAC seq**

**Week 4 - QTL and GWAS**

**Week 5 - Expression networks**

**BREAK**

**Week 6 - Protein networks**

**Week 7 - ENCODE Project**

**Week 8 - Epigenomics**

**Week 9 - TBD**

**Week 10 - Machine Learning**

## **Course Management**

### **Course Objectives**

Upon completion of this course, students will be able to:

1. **Describe** the use of -omics methods in biological research.
2. **Explain** the kinds of problems that -omics methods can answer.
3. **Use** several -omics techniques.
4. **Formulate** an approach to explain -omics methods to an expert audience.

### **Texts**

Most of the reading for this course will be peer-reviewed journal articles. Readings will be provided on moodle, teams, or as a link here.

### **Reading effectively**

Assigned readings will be assumed knowledge for our discussions in class, you should come prepared to discuss these and have questions about them ready each day. These readings might evolve over the course of the quarter to better reflect the interests of the class. You should regularly check the course schedule to ensure you are not missing any key readings.

## **Assessments**

Assessment in this class will be based on:

- Homework assignments (20%)
- Methods presentations (15% + 25% + 10% = 50%)
- Participation in class (including pre-class readings) (30%)

### **In-Class Participation and Attendance**

You are expected to participate in discussions, activities, and some group work as part of class. This grade will reflect your participation in activities and assessments of reading. This is a senior-level elective, I assume a high level of professionalism and engagement. Except in extreme circumstances missing class is not an option. Each missed class will result in a loss of 5% of your participation grade. If you miss more than 3 classes you will fail the class.

Each student will be assigned one model organism at the start of the quarter. It is your job to find a paper that applies the week's method or topic to that organism. The first day of class each week will involve a "model system round up", where we will discuss the applications each student found for the techniques of the week. You should come ready to explain the paper's main questions, how they used the technique, and any points of confusion you have about the paper. The goal of this activity is to practice talking about the details of complex scientific methods and communicating when we all have a base of knowledge but different perspectives.

### **Homework**

Throughout the quarter you will be assigned homework to practice analyzing or generating data. Grading will be based on your ability to communicate your approach to the science and accuracy of results. You should be using all the skills you have developed during your career at Rose including writing, data presentation, and statistical analyses. Figures should follow appropriate scientific standards.

### **Methods Presentations**

#### *Description*

On an assigned day you teach the class about a topic in -omics research. This will involve 2 parts, a lecture and an activity.

Your lecture will cover:

- How the technique works
- Kinds of questions the technique is used to answer
- Strengths of the technique
- Weaknesses of the technique

This lecture will follow the template provided on moodle.

You must also design an activity for the class to practice using the technique. This activity should help reinforce the points above.

You are expected to fill the entire 2 hour class period, you can decide how to split that time between lecture and activity.

During the quarter you will be expected to give two of these lessons. See above for a breakdown of how each presentation contributes to your grade.

More details will come here as the term progresses.

## Course Administrative Info

### Formatting guidelines

Assignments will generally be submitted and returned via gradescope, the link and instructions for our gradescope page can be found on moodle.

### Concerns or Feedback

I strongly encourage students to document special academic needs with staff at the Office of Student Affairs and/or the Counseling Center, and then to contact me as soon as possible so that we can work together to provide recommended academic accommodations while protecting your privacy.

If you have any concerns about any course matters, you should tell someone. You can email your instructor, speak to your instructor, or leave anonymous feedback in Moodle. You can also contact the [department head](#), [Student Affairs](#), or another Rose employee you feel comfortable with.

This syllabus is subject to revision with prompt notification of enrolled students.