

Microbial Bioinformatics - BIOL 388 - Syllabus

SUNY Geneseo
Spring 2020
W 1:30 pm - 4:20 pm
ISC306

Instructor: Logan Peoples
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Office hours: Thursday 3-4:30 pm, Friday 9:30-11 am

Course Description

Biological research increasingly depends on the use of DNA sequencing and the processing of big data. This hands-on, computer-based course will provide an introduction to the analysis of microbial sequence data using bioinformatics tools. The major outcome of this course is to learn how to not be afraid of a pile of A's, C's, G's, and T's should they come across your desk. The skills learned will empower students to know where to start should they decide to use genome sequencing in their own research.

Each student will work with a particular microbe throughout the course to learn how to:

- 1) Evaluate DNA sequencing quality
- 2) Assemble genomes
- 3) Evaluate genome quality and completeness
- 4) Place their microbe in a phylogenetic context
- 5) Determine genomic potential
- 6) Understand 16S rRNA community and metagenomic sequencing
- 7) Apply these techniques to a truly unknown, novel microbe

Requirements

There are no texts required. However, a working computer is required, along with the ability to not destroy said computer when it doesn't do what you want it to do. If you do not have access to a functioning laptop that you can bring to class, please let the instructor know as soon as possible so we can make alternative accommodations. For assistance with your computer or mobile device, visit the CIT HelpDesk in Milne Library. CIT provides self help guides on a range of computer issues, including access to the campus network, Canvas, printing, software guides, and other resources. The CIT Self Help Guides at wiki.geneseo.edu/display/cit/CIT+Self+Help can be helpful in finding quick solutions to basic technology issues.

Grading

Assignment 1	5 pts
Assignment 2	5 pts
Assignment 3	5 pts
Assignment 4	5 pts
Presentation 1, on given microbe	20 pts
Presentation 2, on novel microbe	20 pts
Write up on novel microbe	20 pts
Participation	<u>20 pts</u>
Total	100 pts

Schedule

The schedule is tentative and subject to change. It is expected that you check Canvas for materials and any updates to the schedule.

Week	Day	Subject	Tool	Assignment due
1	22-Jan	Introduction to bioinformatics	Command line	-
2	29-Jan	Experimental design	Introduction to NCBI, BLAST, FASTA	-
3	5-Feb	Evaluating DNA sequencing quality	FastQC, Trimmomatic	Assignment 1 due
4	12-Feb	Genome Assembly	SPAdes, QUAST	-
5	19-Feb	Genome Completeness	CheckM, identification of 16S gene	Assignment 2 due
6	26-Feb	Phylogenetics	BLAST, Muscle, SILVA, FastTree, iTOL	-
7	4-Mar	Genomic capacity	PROKKA, IMG, dbCAN	Assignment 3 due
8	11-Mar	Comparative genomics	ANI, Roary, IMG, MAUVE	-
9	18-Mar	SPRING BREAK - NO CLASS	-	-
10	25-Mar	Introduction to R	R	Assignment 4 due
11	1-Apr	16S rRNA gene community sequencing	PhyloSeq, R, DeSeq2, IMNGS	-
12	8-Apr	Presentation on microbe provided	-	Presentation 1
13	15-Apr	Introduction to metagenomics	Megahit, Metabat	-
14	22-Apr	Moveable genetic elements	VirFinder, MSGIP, ANTISMASH	-
15	29-Apr	Find and run a new tool, work day	-	-
16	6-May	Presentation on novel microbe	-	Presentation 2, Write up

Attendance and tips for success

Attendance is highly encouraged and required insofar as it is part of your participation grade. This course will be hands-on and based like a research project. Be prepared and excited to not understand what you're looking at. Revel in that feeling.

Students with Disabilities

SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. Requests for accommodations including letters or review of existing accommodations should be directed to the Office of Disability Services in Erwin 22 (disabilityservices@geneseo.edu or 585-245-5112). Students with accommodation letters should contact their faculty members as early as possible in the semester to discuss specific arrangements. Additional information on the Office of Disability Services is available at www.geneseo.edu/dean_office/disability_services.

Academic Dishonesty & Plagiarism

Students are expected to adhere to the University's policy on academic dishonesty and plagiarism, located in the student handbook. Academic dishonesty and plagiarism have serious consequences, and if you're struggling in class, please ask for help rather than resort to academic dishonesty! Academic dishonesty will result in a zero on the assignment or exam. In addition, a report will be filed to the department chair and Dean of the College, and a record of academic dishonesty will be placed in the student's file at the Dean of Students Office.

Bias-Related Incidents

SUNY Geneseo strives to provide a space where everyone feels welcome to learn and grow in their identities as well as in their role as students, faculty, and staff. If in the unfortunate instance you experience an incident of bias, we encourage you to reach out to the Chief Diversity Officer (routenberg@geneseo.edu) and/or our University Police Department. In trying to create an environment that facilitates growth through diverse thoughts and ideas, reporting incidents of bias - including threats, vandalism, and microaggressive behaviors - can help bring a better understanding of our campus climate as well as provide opportunities for learning and restoring harm.

Disability Accommodations

SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. Requests for accommodations including letters or review of existing accommodations should be directed to the Office of Disability Services in Erwin Hall 22 or disabilityservices@geneseo.edu or 585-245-5112. Students with letters of accommodations should submit a letter to each faculty member at the beginning of the semester and discuss specific arrangements. Additional

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Well-Being and Mental Health

Concerns about academic performance, health situations, family health and wellness (including the loss of a loved one), interpersonal relationships and commitments, and other factors can contribute to stress. Students may experience a range of challenges that can impact your mental health and thus impact your learning; common examples include increased anxiety, shifts in mood, strained relationships, difficulties related to substance use, trouble concentrating, and lack of motivation, among many others.

Students are strongly encouraged to communicate their needs to faculty and staff and seek support if they are experiencing unmanageable stress or are having difficulties with daily functioning. SUNY Geneseo offers free, confidential counseling for students at the Lauderdale Center for Student Health and Counseling. The Dean of Students (585-245-5706) can assist and provide direction to appropriate campus resources. For more information, see health.geneseo.edu and www.geneseo.edu/dean_students.