

BINF 402 / BIOL 418

Bioinformatics & Computational Biology II

Spring 2024

School of Systems Biology
George Mason University
Manassas, VA

Instructor: Chris Lockhart

Email: clockha2@gmu.edu

Phone: Microsoft Teams

Office: Virtual

Office Hours: By appointment (<https://calendly.com/chrislockhart/office-hours>)

Meeting Place: Zoom

Meeting Time: Mondays, 4:30-7:10pm

Course Website: Blackboard

Credits: 3

Course Description

Continuation of BINF 401. Studies in-depth several algorithms and methods used in bioinformatics and computational biology. Students will learn sequence alignment and assembly algorithms, hidden Markov models, classification and prediction methods, and genome annotation. These techniques will then be applied to current bioinformatics problems. Programming assignments are incorporated in the course program.

Prerequisites: [BINF 401](#)

Course Material

Pevsner, J. (2015) *Bioinformatics and Functional Genomics*. 3rd edition. Wiley-Blackwell.

Tentative Course Topics

Lecture	Topic
1	Syllabus & expectations Review of biological principles
2	Introduction to Python

3	Manipulation of biological sequences Strings, collections, and loops
4	Manipulation of biological sequences, part 2 Conditional statements & IO Problem set #1 assigned
5	Biopython
6	Biopython, part 2 Problem set #1 due
7	Sequence annotation
8	Midterm exam
9	Introduction to machine learning Problem set #2 assigned
10	Bag models, kmers, and prediction
11	Clustering algorithms Problem set #2 due
12	Hidden Markov models Problem set #3 assigned
13	Compartmental models
14	Physics-based models Stochastic models Problem set #3 due

Each lecture is a 2½ hour presentation with a 10-minute break.
Final exam will be administered during exam week.

Course Policies

Grading scale (points):

Letter Grade	Percentage
A+	≥ 97
A	94-96.9
A-	90-93.9
B+	87-89.9
B	84-86.9
B-	80-83.9
C+	77-79.9
C	74-76.9
C-	70-73.9
D	60-69.9
F	< 60

Grading:

- 10% - Participation
- 15% - Problem set #1

- 15% - Problem set #2
- 15% - Problem set #3
- 20% - Midterm exam
- 25% - Final exam

Participation policy: Class participation will be met by attending class and completing weekly in-class quizzes/exercises. To earn a full participation grade, you must be in class to complete at least 10 out of 13 quizzes (no quiz will be administered the week of the midterm exam).

Late assignments and make-up work: In case of illness or quarantine, please contact me to set up a plan for make-up work. Except for extensions granted due to emergency, illness, quarantine, work-related, or other documented reasons, late assignments will be penalized by the number of days late, and late assignments will not be accepted after assignments are reviewed in class.

Course recordings: All synchronous meetings in this class will be recorded to provide necessary information for students in this class. Recordings will be stored on Zoom and will only be accessible to students taking this course during this semester.

Other considerations: If there are any schedule issues related to religious holidays, please inform me the first week of class.

Course Logistics

Content distribution: The course uses Blackboard for distributing lecture materials, submission of problem sets, and grading. Blackboard can be accessed by visiting <https://mymason.gmu.edu> and logging in with your MasonID and password.

Virtual classroom and office hours: Zoom will be used for online lectures and office hours. Zoom lecture links will be distributed by the instructor.

Communication: I will use Mason email to distribute class updates and communicate with students (see Email section in Student Responsibilities). If you wish, please share your name and gender pronouns with me and how best to address you in class and via email. I use he/him for myself, and you may address me as Chris or Dr. Lockhart in email and verbally. Communication over email is largely preferred, and I will respond to student emails promptly within 48 hours.

Course Technology Requirements

Software and hardware: This course uses Blackboard as a learning management system available at <https://mymason.gmu.edu>. Students are required to have regular, reliable access to a computer with an updated operating system (recommended:

Windows 10 or Mac OS X 10.15 or higher) and a stable broadband Internet connection (cable modem, DSL, satellite broadband, etc., with a consistent 1.5 Mbps download speed or higher). Activities and assignments in this course will use web-conferencing software (Blackboard Collaborate and/or Zoom). In addition to the requirements above, students are required to have a device with a functional camera and microphone.

This course also requires students to produce Python code. My recommendation is to download Python3 through the Anaconda distribution (<https://www.anaconda.com/>). We will be discussing the acquisition of Python in class.

Technical help: If you have difficulty with accessing Blackboard, please contact the ITS Support Center at (703) 993-8870 or support@gmu.edu. If you have trouble with using the features in Blackboard, email courses@gmu.edu.

Student Responsibilities

Email: Students must use their Mason email account to receive important University information, including communications related to this class. Per University policy, I will not respond to messages sent from or send messages to a non-Mason email address.

Academic integrity: The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow always are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using the appropriate format for this class. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me, or consult the Academic Integrity website at <https://oai.gmu.edu/>.

Disability accommodations: Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu | Phone: (703) 993-2474.

Student Services

University writing center: Take advantage of the Writing Center as you work on written assignments in this course. You can book a free 45-minute appointment to meet with a tutor on Zoom or to submit a draft for written feedback. Tutors will work with you on any phase of a writing project. They can help you develop your ideas, provide feedback on a draft, answer your questions, and show you strategies for brainstorming, organizing, drafting, revising, and editing. To schedule an appointment, go to writingcenter.gmu.edu, register with the center, and make an appointment using the online scheduler. Watch this short video (<https://youtu.be/LA-B0Szo28>) for more detailed guidance on making an appointment and send any questions to wcenter@gmu.edu.

University Libraries: University Libraries provides resources for distance learning students (See the Library website: <https://library.gmu.edu/for/online>).

Counseling and psychological services: The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance (See the Counseling and Psychological Services website: <https://caps.gmu.edu>).

Family Educational Rights and Privacy Act (FERPA): The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights (See the Registrar's Office website: registrar.gmu.edu/ferpa/).

Course Materials and Student Privacy

Video recordings of class meetings that are shared only with the instructors and students officially enrolled in a class do not violate FERPA or any other privacy expectation. Video recordings that only include the instructor (no student names, images, voices, or identifiable texts) may be shared without violating FERPA (but see University Policies: Privacy, for some qualifications and recommendations). All course materials posted to Blackboard or other course site are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.

Video conferencing or recordings: Video recordings - whether made by instructors or students — of class meetings that include audio, visual, or textual information from other students are private and must not be shared outside the class. Live video conference meetings (e.g. Collaborate) that include audio, textual, or visual information from other students must be viewed privately and not shared with others in your household or recorded and shared outside the class.