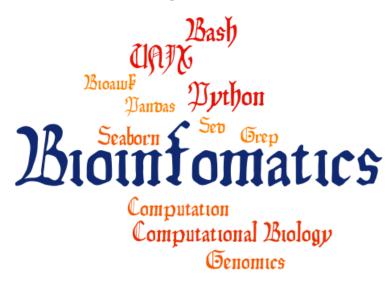# BINF 2111/2111L - Introduction to Bioinformatics Computing Syllabus

Instructor: Richard Allen White III, Ph.D.
Office Hours: TH 5:15-6:15 pm EST or by appointment.
Contact: rwhit101@charlotte.edu
Office: NCRC Kannapolis (by appointment), Main Campus Charlotte - 347

Lab Instructor: Madeline Bellanger
Office Hours: TH 5:15-6:15 pm EST or by appointment.
Contact: mbellang@charlotte.edu
Office: NCRC Kannapolis (by appointment)

Teaching Assistant: Andra Buchan
Office Hours: TH 5:15-6:15 pm EST or by appointment.
Contact: abuchan@charlotte.edu
Office: NCRC Kannapolis (by appointment)

Essential course details:
- *Credits:* 4 credit class
- *Meeting times:* T/TH 11:30-12:45, TH lab 2:30-5:15 pm EST
- *Office Hours:* TH 5:15-6:15 pm EST or by appointment.
- *Semester:* FALL 2022 August 21rd to December 15th, 2022
- *Location:* Main/Uptown Center Campus - Bioinformatics building 217

- ***Style of instruction:*** Face-to-face Instructional Method
- ***Textbooks:*** None required for this course
- ***Website for the course:*** https://github.com/raw-lab/BINF2111
- ***CANVAS link:*** https://uncc.instructure.com/courses/176613/
- ***Prerequisite:*** *BINF1101/1101L*

Course description

The aim of this course is to introduce programming methods commonly used in bioinformatics. This course introduces students to the UNIX environment, bash shell scripting, text manipulation (sed/grep/bioawk), and python scripting. Fundamentals of each scripting language are introduced in the context of real-world bioinformatics data analysis problems.

Learning objectives

- Use and understand UNIX command line environment
- Use built-in UNIX commands to manipulate files and data
- Text and file manipulation (sed, grep, bioawk, python)
- Basic knowledge and use of github
- Use bash shell scripts to drive pipelines of bioinformatics programs
- Use of supercomputer for running bash shell scripts (basic slurm)
- Use python scripts to read, manipulate and write bioinformatics datafiles

Instructional Methods

The course will be presented in a lecture format which will include the following elements as appropriate: presentation of concepts, theories and examples in a standard lecture format, interactive demonstrations of methods, and opportunities for student questions and discussion. Students will get hands on experience in UNIX, Bash, Sed/grep/bioawk, Github, Python programming and bioinformatics.

Grading Plan

Students will primarily be evaluated on their ability to successfully write assigned code. Understanding of bioinformatics workflows and programming core concepts presented in class will be assessed through short answer

quizzes. Assignments and quizzes will be given weekly throughout the semester. The final examination will consist of both short answer questions and a coding exercise.

Lab assignments: 30% (12 Lab assignments, 2.5% each, late assignments will NOT be graded, two lowest will be dropped)
Daily Quizzes: 40% (two lowest scores will be dropped)
Mid-term Exam: 10% (5% lecture/lab)
Final Exam: 10% (5% lecture/lab)
Classroom attendance/participation: 10%

Zero credit lab must be taken concurrently with the course
One grade for both BINF 2111 and 2111L

Grading

Grades are scaled on 100% total possible, where 100 to 90% is an A, 89 to 80% is a B, 79 to 70% is a C, 69 to 60% is a D, <59% is an F. Pass or No credit with a grade of satisfactory (S) or unsatisfactory (U) are available. To exercise this option, the student must declare their intention to take a Pass/No Credit option by completing the appropriate form at the Office of the Registrar by the end of the eighth calendar day in the semester; this form requires the approval of the chair of the student's major department. Courses completed with the grade of Honors or Pass will count toward the hours needed for graduation, but they will not be considered in the computation of the grade point average. For further information on grading policy, please refer to this website (https://provost.uncc.edu/policies-procedures/academic-policies-and-procedures/grading-undergraduate-effective-until-fall-2021)

Any grade in-between will be rounded to the next highest grade. For example, 89.1 or 89.6% would be an A. While grades are important and you should strive to get the highest marks. The knowledge you take with you and gain will last a lifetime.

Extra credit

Extra credit may be provided at the instructor's discretion. There are no guarantees of extra credit. It is not recommended to rely on extra credit to improve or pass the course.

Academic integrity

All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are outlined in the Code. The Code is available from the Dean of Students Office or [online](https://legal.uncc.edu/policies/up-407) (https://legal.uncc.edu/policies/up-407).

Attendance

Attendance and participation are critical to learning process and is required. Students are encouraged to work directly with the instructor regarding class absences for medical appointments, sickness, military/court orders, or personal and family emergencies, such as a death in the immediate family, where a student can provide an instructor with appropriate supporting documentation of the absence.

Instructor absences or tardiness

If I am late in arriving to class, you must wait a full 20 minutes after the start of class before you may leave without being counted absent, or you must follow any written instructions I may give you about my anticipated tardiness. The instructor will provide a surrogate instructor on his behalf in an emergency, which will be announced via email, Canvas website and on the course website (https://github.com/raw-lab/BINF2111).

Withdrawing from the course

Students are expected to complete all courses for which they are registered at the close of the add/drop period. If you are concerned about your ability to succeed in this course, it is essential to make an appointment to speak with the instructor as soon as possible. The University policy on withdrawal allows students only a limited number of opportunities available to withdraw from courses. You must understand the financial and academic consequences that may result from course withdrawal (https://provost.uncc.edu/policies-procedures/academic-policies-and-procedures/withdrawal-and-cancellation-enrollment-policy).

An environment of non-discrimination and diversity

All students and the instructor are expected to engage with each other respectfully. Unwelcome conduct directed toward another person based upon that person's actual or perceived race, actual or perceived gender, color, religion, age, national origin, ethnicity, disability, or veteran status, or for any other reason, may constitute a violation of University Policy 406, The Code of Student Responsibility (https://legal.uncc.edu/policies/up-406). Any student suspected of engaging in such conduct will be referred to the Office of Student Conduct.

This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is indicated on the class roster, please let me know. Feel free to correct me on your preferred gender pronoun. If you have any questions or concerns, please do not hesitate to contact me.

Mental healthcare and positive self-care

Mental health concerns or stressful events may reduce your ability to participate in daily activities or diminish academic performance. It is common for college students to experience challenges that may interfere with academic success, such as academic stress, sleep problems, juggling responsibilities, life events, relationship concerns, or feelings of anxiety, hopelessness, or depression. If you or a friend is struggling, we strongly encourage you to seek support. Helpful, effective resources are available on campus at no additional cost. You can learn more about the broad range of confidential mental health services available on campus via the Counseling and Psychological Services (CAPS) website at https://caps.uncc.edu/.

Title IX reporting of sexual harassment or other related reporting

UNC Charlotte is committed to providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) have experienced or experiences any of these incidents, know that you are not alone. UNC-Charlotte has staff members trained to support you in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with civil protective orders, and more.

Please be aware that all UNC Charlotte employees, including faculty members, are expected to relay any information or reports of sexual misconduct they receive to the Title IX Coordinator. This means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, the instructor is expected to report the information to the Title IX Coordinator (https://cm.maxient.com/reportingform.php?UNCCharlotte&layout_id=125). Although the instructor expected to report the situation, you will still have options about how your case will be handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone confidentially, you can contact the following on-campus resources, which are not required to report the incident to the Title IX Coordinator: (1) University Counseling Center (counselingcenter.uncc.edu 7-0311); or (2) Student Health Center (studenthealth.uncc.edu 7-7400). Additional information about your options is also available at titleix.uncc.edu under the "Students" tab.

Disability accommodations

Students in this course seeking accommodations for disabilities must first consult with the Office of Disability Services and follow the instructions of that Office for obtaining accommodations. Accommodations will be provided to students presenting documentation from the Office Of Disability Services (ODS). Please check the ODS website (https://ds.uncc.edu/) for more details.

FERPA Notification

In establishing University Policy 402, Student Education Records, UNC Charlotte adheres to a policy of compliance with the Family Educational Rights and Privacy Act of 1974, also known as FERPA. This federal law affords students the following rights concerning their education records. For details, see the FERPA Annual Notification posted on the Office of Legal Affairs website. All questions concerning this FERPA Annual Notification may be directed to the Office of the Registrar's attention.

Generative AI (FM/LLM/NPL)

Using generative AI in the form of foundation models (FMs) and their subset of FMs called large language models (LLMs) is prohibited during quizzes and exams. They can be used in labs and training for quizzes and exams. This includes examples chatgpt, bard, DALL-E, Midjourney, DeepMind, or other.

Policies related to COVID-19 (Aug 25ᵗʰ 2021 update)

Students are expected to attend every class and remain in class for the duration of the session when it is safe to do so in accordance with university guidance regarding COVID-19. Failure to attend class or arriving late may impact your ability to achieve course objectives which could affect your course grade. An absence, excused or unexcused, does not relieve a student of any course requirement. Regular class attendance is a student's obligation, as is a responsibility for all the work of class meetings, including tests and written tasks. Any unexcused absence or excessive tardiness may result in a loss of participation points.

Students are encouraged to work directly with their instructors regarding their absence(s). For absences related to COVID-19, please adhere to the following:

- **Complete your Niner Health Check** each morning.
- **Do not come to class if you are sick**. Please protect your health and the health of others by staying home. Contact your healthcare provider if you believe you are ill.
- **If you are sick**: If you test positive or are evaluated by a healthcare provider for symptoms of COVID-19, indicate so on your Niner Health Check to alert the University. Submit a copy of your Niner Health Check notification email to your instructors. Upon learning that you have tested positive or have been diagnosed for symptoms of COVID-19, either from your reporting or from Student health Center testing or diagnosis, representatives from Emergency Management and/or the Student Health Center will follow up with you, and your instructors will be notified of the need for accommodations, as necessary.
- **If you have been exposed** to COVID-19 positive individuals and/or have been notified to self-quarantine due to exposure, indicate so on your Niner Health Check Links to an external site. to alert the University. Representatives from Emergency Management and/or the Student Health Center will follow up with you as necessary. Submit a copy of your Niner Health Check notification email to your instructors. If you need any

additional support verifying your absence after communicating with your professors, contact [Student Assistance and Support Services](https://sass.uncc.edu/)

[Links to an external site.](https://sass.uncc.edu/).
    (https://sass.uncc.edu/
[Links to an external site.](https://sass.uncc.edu/))

 To return to class after being absent due to a self-quarantine period, students should submit a copy of their Niner Health Check clearance email to their instructor(s). To return to class after being absent due to a COVID-19 diagnosis, students should submit an online request form to Student Assistance and Support Services (SASS). Supporting documentation can be attached directly to the request form. It should be from a student's health care provider or the Student Health Center, clearly indicating the dates of absences and the date the student can return to class. Instructors will be notified of such absences.

If you are absent from class due to a COVID-19 diagnosis or quarantine, as the instructor, I will do the following to help you continue to make progress in the course: Provide lecture slides or any other materials needed to facilitate learning on a CASE-BY CASE BASIS. As this is a team related course, teammates should discuss deliverables required to reach goals. The instructor determines the final decision for approval of all absences and missed work.

Course Calendar

    The course calendar represents a tentative plan. Topics will be adjusted as the instructor sees to do so based on the comprehension and mastery of the material of the students.

COURSE CALENDAR (Tentative Plan)

Week 1 (Aug 21rd)   Introduction to UNIX and command line

Week 2 (Aug 28th)   UNIX commands (cut, grep, etc)

Week 3 (Sep 4th)   Sed/grep/bioawk file manipulation

Week 4 (Sep 11th)   Regular expressions

Week 5 (Sep 18th)   Bash shell scripting basics

Week 6 (Sep 25th)   Bash shell/slurm - SuperCPU operations

Week 7 (Oct 4th)   Github introduction and markdown

Week 8 (Oct 9th)   **Mid-term Exam**

Week 9 (Oct 16th)   Basic Python Commands (Part I)

Week 10 (Oct 23th)   **No Classes - Student Recess**

Week 11 (Oct 30th)   Basic Python Commands (Part I)

Week 11 (Nov 6th)   Python loops, lists, and basic file methods

Week 12 (Nov 13th)   Python functions, dictionaries, regular expressions

Week 13 (Nov 20th)   **No Classes - Thanksgiving**

Week 14 (Nov 27th)   Python - Pandas and Seaborn/Review of course

Week 15 (Dec 4th)   **Final exam on Thursday Dec 7th**