Biochemistry (BCH) 709

Introduction to Bioinformatics Fall 2024 (Section 1001)

Fall, 2024

Course Information

Instructor Information

Instructor: Dr. Won C. Yim
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Office hours: 10:30 – noon, Thursday or by appointment.
To make an appointment, please e-mail Dr. Yim.

Course Description

As contemporary biologists, the integration of computers into our daily work has become indispensable. The electronic manipulation and analysis of DNA, RNA, and protein data are now routine tasks. , the amount of sequence data being entered into databases is growing exponentially, and with the advancements in sequencing technology on the horizon, this growth will only accelerate. Given the vast volume of new data, manual analysis by individual researchers is no longer feasible. Consequently, computational biology has emerged over the past 15 years as a crucial field focused on storing, manipulating, and extracting valuable insights from this data. Despite its importance, computational biology courses are typically reserved for advanced study and are often not included in the undergraduate curriculum. We aim to bridge this educational gap by offering a course that introduces students to bioinformatics earlieAdditionallyr in their academic journey. This knowledge is not just beneficial; it is essential for any student pursuing a degree in biology or medical sciences.

Short Description: A comprehensive course in bioinformatics emphasizing terminal usage, investigative problem-solving skills, and enhancing computational analysis capabilities within the molecular biosciences.

Course Pre/Co-requisites

Course Prerequisite: BCH 400 or equivalent; two semesters of general biology; BCH 413, 613 or consent of the instructor as pre- or co-requisites. It is **STRONGLY** recommended that students complete an undergraduate **Molecular Biology course** (e.g., BCH/BIO 405) prior to enrolling in BCH 709.

Course Prerequisite or Corequisite: None.

Course Corequisite: None.

Required Texts/Course Materials

List of required course materials for reading, in-class work, writing, homework, viewing, and listening, including calculators, specialized materials or equipment, and computer software.

- Laptop (Mac / Windows OS)

- Keyboard
- Internet connection
- Chrome / Edge / Safari / Explorer
- SLACK

Class Procedures/Structures

In person class: This course will be offered through in-person participation at MoWe 9:00AM - 10:15AM at PMB 16.

General meeting: General meeting will be offered through SLACK and need to be arranged.

Course Prerequisites

- http://bch709.plantgenomicslab.org/
- Computer with ethernet port or wifi (If in case you bring your **desktop**, please do not bring your monitor. we have a monitor in our classroom) Online introduction to Linux. Students must complete one of the following online tutorials (or both) before class begins.
- UNR affiliated email **<ID>@unr.edu or <ID>@nevada.unr.edu** - How to Activate
- Setup your computer
- Setup Slack ID
- Register GitHub
- Please register by using UNR email DataCamp
- Please fill this form

Student Learning Outcomes

- **Overall SLO:** This course emphasizes extensive use of the terminal, investigative approaches, and problem-solving. Students will regularly use computers to analyze data, write and run code, troubleshoot, summarize, and engage in discussions.
- **SLO1:** Through terminal usage, students will demonstrate the ability to design experimental bioinformatics strategies using cutting-edge methods to address biological questions.
- **SLO2:** Through computational exercises and in-class discussions, students will demonstrate a solid understanding of advanced bioinformatics topics.
- **SLO3:** Through written and oral summaries, students will critically evaluate and articulate the key points of primary research articles.
- **SLO4:** Students will demonstrate the ability to summarize and lead effective discussions on primary research literature.
- **SLO5:** Students will demonstrate proficiency in analyzing RNASeq and related experiments using state-of-the-art methods to explore biological questions.

Course Requirements

1. Students must attend all scheduled classes (on both Monday and Wednesday) or watch the recorded online material by Friday noon of the same week.
2. Complete all assignments, including bioinformatics exercises, that align with the course objectives.
3. Participate in the exams. There will be one midterm and one final exam, both of which will be written and conducted on the computer. The midterm will cover material from the first half of the course, and the final will cover the second half. Additionally, the final exam will include a written bioinformatics analysis. Both exams will have a three-day window for completion. Further details can be found in the WebCampus course section.

Grading Criteria, Scale, and Standards

Points will be distributed as follows:

Class Participation	100
Homework Assignments	400
Presentation and Discussion	150
Midterm exam	200
Final exam	250
Total	1200

Within each category above, the grading scale will be:

Rating:	**Percentile:**	**Letter grade:**
Excellent	**90-100%**	**A**
Good (acceptable for graduate work)	**80-89%**	**B**
Fair (unacceptable for graduate work)	**70-79%**	**C**
Poor	**60-69%**	**D**
Failing	**< 60%**	**F**

Late Work / Make-up Exams / Participation Policies

A penalty of 20 % per day will be imposed on a pro rata basis for any late work or attendance. *You will be graded on the quality of the assignments listed below and the quality and quantity of your participation in class discussions. Final grades may be adjusted at the discretion of the instructor.*

No make-up exams allowed. *If you cannot finish exam due to circumstances beyond your control, the instructor kindly requests the professional courtesy of being notified of your absence ahead of time.* ***Email only***

Class participation points will be deducted for each unexcused absence (10 points per class missed without informing the instructor before the class meets)*. For a full description of UNR's class attendance policies, please see: "*https://www.unr.edu/administrative-manual/3000-3999-students/3020-class-absence-policy*."* ***Email only***

Attendance*. You are required to attend lecture/online sessions. If you cannot attend due to circumstances beyond your control, the instructor kindly requests the professional courtesy of being notified of your absence ahead of time. (Dr's notes etcs).* ***Email only***

Plagiarism Policy

Plagiarism—using someone else's work and presenting it as your own—is a serious academic violation and will not be tolerated in this class. Plagiarism is defined as submitting the language, ideas, thoughts, or work of another as your own, or aiding in plagiarism by allowing your work to be used in this manner. "The work of another" includes not only entire papers or articles but also any information, ideas, sentences, or phrases that originate from sources other than your own mind. This includes books, articles, websites, videos, documents, lecture notes, or handouts from other courses, and any other materials used in your paper. All these must be properly acknowledged with references in the text or footnotes, along with a bibliography that provides complete publication information for all sources. Even if you paraphrase someone else's ideas without quoting them directly, you must still acknowledge the source. Citations are also required for little-known facts and statistics. Ignorance is not an excuse for plagiarism. If you're unsure whether you need to cite a source or how to do so, consult the course instructor.

Course Calendar or Topics Outline

Week	Date	Days	Subject
Week1	8/26/2024	Monday	Introduction
Week1	8/28/2024	Wednesday	Introduction to Bioinformatics
Week2	9/2/2024	Monday	Labor Day
Week2	9/4/2024	Wednesday	Linux Environment and command line
Week3	9/9/2024	Monday	Linux Environment and command line
Week3	9/11/2024	Wednesday	Gene family analysis and phylogenetics (David Alvarez-Ponce, PhD)
Week4	9/16/2024	Monday	Conda, Compile & Software Installations
Week4	9/18/2024	Wednesday	Conda, Compile & Software Installations
Week5	9/23/2024	Monday	GitHub and server

Week5	9/25/2024	Wednesday	Sequencing methods and strategies
Week6	9/30/2024	Monday	Sequencing methods and strategies
Week6	10/2/2024	Wednesday	Sequence manipulation
Week7	10/7/2024	Monday	Sequence manipulation
Week7	10/9/2024	Wednesday	Introduction of R & R plotting (Tong Zhou PhD)
Week8	10/14/2024	Monday	Transcriptome assembly
Week8	10/16/2024	Wednesday	RNA-Seq
Week9	10/21/2024	Monday	Midterm Exam
Week10	10/23/2024	Wednesday	R in RNA-Seq / DESeq2 / EdgeR
Week10	10/28/2024	Monday	R in RNA-Seq / DESeq2 / EdgeR
Week11	10/30/2024	Wednesday	Viral variant identification in NGS data (Richard Tillet, Ph. D)
Week11	11/4/2024	Monday	BLAST search and gene alignment
Week12	11/6/2024	Wednesday	Genome assembly & annotation & structure
Week12	11/11/2024	Monday	Veterans Day
Week13	11/13/2024	Wednesday	Variant analysis
Week13	11/18/2024	Monday	Transcriptome analysis (Genome based)
Week14	11/20/2024	Wednesday	Nextday is Thanksgiving
Week14	11/25/2024	Monday	Transcriptome analysis (Genome based)
Week15	11/27/2024	Wednesday	Enrichment analysis
Week15	12/2/2024	Monday	Presentation & Discussions
Week16	12/4/2024	Wednesday	Presentation & Discussions
Week16	12/9/2024	Monday	Class Review
Week17	12/11/2024	Wednesday	Prepday
Week17	12/16/2024	Monday	Final Exam

Zoom & SLACK Etiquette or Netiquette Expectations

Participation During Zoom Meetings

Portions of our class will take place synchronously via Zoom. During these meetings, students are expected to pay attention, participate in small groups, and engage with the material. If possible, find a quiet space without interruptions/background noise.

Video: Your video should be on during class—if you aren't able, please email me ahead of time. Make sure your face can be seen clearly. Note that your instructor and classmates will be able to see you, and prepare accordingly (i.e., be fully dressed, avoid lying down in bed, etc.). Note that UNR has loaded campus-themed virtual backgrounds into all Zoom accounts that can be used to hide your surroundings, if desired.

Audio: Your audio should be on when you join class, and you should immediately mute yourself upon entering the session (if you are not already muted). You can unmute yourself when you want to participate. Turning on your microphone is a good way to indicate you want to add to the discussion, but you can also use the hand-raising symbol. Your audio should be on the whole time you're in your breakout room.

Chat Function: Please use the chat tool to ask questions or contribute ideas, but stay on topic to the information being presented.

Discussion and video meeting through SLACK

Any class related questions are allowed through SLACK. You are required to chat with instructor in class channel only. **Direct message will not be allowed and will be ignored. Assignments and exam related questions are not allowed through SLACK.**

University Policies

Statement on Academic Dishonesty

"The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: UAM 6,502."

Statement of Disability Services

Use either the traditional or online statement, in addition to the last sentence regarding third party materials.

For Traditional and Seated Classrooms:

"Any student with a disability needing academic adjustments or accommodations is requested to speak with me or the Disability Resource Center (Pennington Achievement Center Suite 230) as soon as possible to arrange for appropriate accommodations."

For Online Courses:

"If you are a student who would normally seek accommodations in a traditional classroom, please contact me as soon as possible. You may also contact the Disability Resource Center for services for online courses by emailing drc@unr.edu or calling 775-784-6000. Academic accommodations for online courses may be different than those for seated classrooms; it is important that you contact us as soon as possible to discuss services. The University of Nevada, Reno supports equal access for students with disabilities. For more information, visit the Disability Resource Center."

This course may leverage 3rd party web/multimedia content, if you experience any issues accessing this content, please notify your instructor.

Statement on Audio and Video Recording

Student-created Recordings

"Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission

to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded."

Instructor-created Recordings

Class sessions may be audio-visually recorded for students in the class to review and for enrolled students who are unable to attend live to view. Students who participate with their camera on or who use a profile image are consenting to have their video or image recorded. If you do not consent to have your profile or video image recorded, keep your camera off and do not use a profile image. Students who un-mute during class and participate orally are consenting to have their voices recorded. If you do not consent to have your voice recorded during class, keep your mute button activated and only communicate by using the "chat" feature, which allows you to type questions and comments live.

Statement on Maintaining a Safe Learning and Work Environment

The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit the Equal Opportunity and Title IX page**.**

In addition to the required information listed above, it is strongly recommended that the syllabus include:

- Methods for communicating with students outside the classroom regarding matters such as class cancellations, meeting times, or room changes
- More detail about what constitutes academic dishonesty, with a concrete list or examples of "dos and don'ts" in the context of the class
- **Statement for academic success services:** "Your student fees cover usage of the University Math Center (https://www.unr.edu/university-math-center), (775) 784-4433; University Tutoring Center (https://www.unr.edu/tutoring-center), (775) 784-6801; and University Writing & Speaking Center (https://www.unr.edu/writing-speaking-center), (775) 784-6030. These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student."

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