Biochemistry (BCH) 709

Introduction to Bioinformatics **Fall 2022 (Section 1001)**

Fall, 2022

Course Information

Instructor Information

Instructor*:* Dr. Won C. Yim
Office: Howard Medical Science Room 216
Tel: 775-784-9447
Email: wyim@unr.edu
Office hours*:* 10:30 – noon, Thursday or by appointment.
To make an appointment, please e-mail Dr. Yim.

Course Description

As contemporary biologists, we have entered an age where the use of computers in our daily work has become all but essential. The manipulation and analysis of DNA, RNA, and protein data by electronic means has become a routine task. Further, the amount of DNA, RNA and protein sequence data we are putting into databases every day is expanding at a geometric rate, and with coming advances in sequencing technology, this rate is only expected to increase. With all this new data, analysis by individual humans is simply not possible. Thus, in the past 15 years, computational biology has emerged as a field concerned with storage, manipulation, and extraction of valuable information from all this new data. However, because computational biology is an emerging field, organized courses are generally saved for higher-level study, and often are not required parts of an undergraduate curriculum. We seek to fill this void in education and create a course that will introduce students to bioinformatics at an earlier point in their education. This knowledge will prove to be not simply useful, but essential, for any student considering a degree in any area of biology and medical science.

Short description: In-depth knowledge for bioinformatics with the extensive use of terminal, investigation and problem-solving skill, improving bioinformatics understanding and computational analyze skills 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 MW 9:00 – 10:10 AM at FA234.

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

Course Prerequisites

Course Prerequisite:

https://github.com/plantgenomicslab/BCH709

- 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 affilated 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 will be taught with the extensive use of terminal, investigation and problem-solving. Students will be using computers in most sessions to analyze data, write/run code, troubleshoot, summaries and discuss.
- **SLO1:** Through terminal, students will demonstrate the ability to design experimental strategies using state-of-the-art methods/approaches to address biological questions.
- **SLO2:** Through computational work and in-class discussions, students will demonstrate a working understanding of advanced topics in bioinformatics.
- **SLO3:** Through written and oral summaries, students will demonstrate the ability to evaluate the salient points of primary research articles critically.

- **SLO4:** Students will demonstrate the ability to summarize and effectively lead discussions of primary research literature.
- **SLO5:** Students will demonstrate the ability to analyze RNASeq and related experiment using state-of-the-art methods/approaches to address biological questions.

Course Requirements

1. Students are required to attend all scheduled classes (both Monday and Wednesday) or required to watch online recorded material until class scheduled Friday noon.

2. Complete assignments (including in bioinformatics exercises) associated with course objectives.

3. Prepare a Term paper, 4 – 5 pages written "mini-review" of bioinformatics from a list provided by the instructor. Our review will summarize the state-of-the-art in a particular topic area while citing both seminal historical and modern, cutting edge references that have defined major advances in the field.

4. Participate in the exam. There will be one midterm and one final exam. Both will be written and will use the computer. Each will test your knowledge of material for one half of the course (i.e., the midterm will test the first half of the semester, and the final will test the second half). In addition, the final exam will include a written analysis of bioinformatics. Both exams will have three days period to complete. More information can be found in the WebCampus course section

Grading Criteria, Scale, and Standards

Points will be distributed as follows:

Class Participation	150
Homework Assignments	400
Presentation and Discussion	150
Term paper	150
Midterm exam	150
Final exam	200
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 (copying all or part of someone else's work and passing it off as your own) is a serious form of academic misconduct and will not be tolerated in this class. Plagiarism is defined as submitting the language, ideas, thoughts, or work of another as one's own; or assisting in the act of plagiarism by allowing one's work to be used in this fashion. "The work of another" does not just mean whole papers or articles copied from another source. It includes any information, ideas, sentences, or phrases that came from somewhere other than your own head (i.e. books, articles, internet sites, videos, documents, lecture notes or handouts from other courses, and any other sources used in your paper). These must be properly acknowledged by providing references either in the text or in a footnote, along with a bibliography giving the complete publication information for all sources used in your paper. Even if you paraphrase someone else's ideas and do not quote them directly, you still must acknowledge your source. Citations should also be given for little known facts and statistics. ***Ignorance is not an excuse for plagiarism. If you are not sure whether you need to provide a source for a piece of information or how to cite a source, ask the course instructor.***

Course Calendar or Topics Outline

Week	Date	Days	Subject
Week1	8/29/22	Monday	Introduction
Week1	8/31/22	Wednesday	Introduction to Bioinformatics
Week2	9/5/22	Monday	Labor Day
Week2	9/7/22	Wednesday	Linux Environment and command line
Week3	9/12/22	Monday	Linux Environment and command line
Week3	9/14/22	Wednesday	Linux Environment and Cloud
Week4	9/19/22	Monday	Conda, Compile & Software Installations
Week4	9/21/22	Wednesday	GitHub and server
Week5	9/26/22	Monday	Sequencing methods and strategies
Week5	9/28/22	Wednesday	Sequence manipulation
Week6	10/3/22	Monday	RNA-Seq
Week6	10/5/22	Wednesday	Transcriptome assembly
Week7	10/10/22	Monday	Transcriptome algorithms
Week7	10/12/22	Wednesday	Small RNA (Tong Zhou PhD)
Week8	10/17/22	Monday	R in RNA-Seq / DESeq2 / EdgeR
Week8	10/19/22	Wednesday	Introduction of R & R plotting (Tong Zhou PhD)
Week9	10/24/22	Monday	Midterm Exam
Week10	10/26/22	Wednesday	Viral variant identification in NGS data (Richard Tillet, Ph. D)
Week10	10/31/22	Monday	BLAST search and gene alignment
Week11	11/2/22	Wednesday	Gene family analysis and phylogenetics (David Alvarez-Ponce, PhD)
Week11	11/7/22	Monday	Database & file format
Week12	11/9/22	Wednesday	Genome assembly & annotation & structure
Week12	11/14/22	Monday	Genome structure
Week13	11/16/22	Wednesday	Variant analysis
Week13	11/21/22	Monday	Transcriptome analysis (Genome based)
Week14	11/23/22	Wednesday	Nextday is Thanksgiving
Week14	11/28/22	Monday	Transcriptome analysis (Genome based)
Week15	11/30/22	Wednesday	Enrichment analysis
Week15	12/5/22	Monday	Presentation & Discussions
Week16	12/7/22	Wednesday	Presentation & Discussions
Week16	12/12/22	Monday	Class Review
Week17	12/14/22	Wednesday	Prepday
Week17	12/19/22	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 COVID-19 Policies

COVID-19, COVID-19 Like Symptoms, and Contact with Someone Testing Positive for COVID-19

Students testing positive for COVID 19, exhibiting COVID 19 symptoms regardless of vaccination status will not be allowed to attend in-person instructional activities and must leave the venue immediately. Students should contact the Student Health Center or their health care provider to receive care and who can provide the latest direction on quarantine and self-isolation. Contact your instructor immediately to make instructional and learning arrangements.

Accommodations for COVID 19 Quarantined Students

For students who are required to quarantine or self-isolate due to 1) COVID 19 infection or 2) exposure while not vaccinated, instructors must provide opportunities to make-up missed course work, including assignments, quizzes or exams. In courses with mandatory attendance policies, instructors must not penalize students for missing classes while quarantined.

Failure to Comply with Policy (including as outlined in this Syllabus) or Directives of a University Employee

In accordance with section 6,502 of the University Administrative Manual, a student may receive academic and disciplinary sanctions for failure to comply with policy, including this syllabus, for failure to comply with the directions of a University Official, for disruptive behavior in the classroom, or any other prohibited action. "Disruptive behavior" is defined

in part as behavior, including but not limited to failure to follow course, laboratory or safety rules, or endangering the health of others. A student may be dropped from class at any time for misconduct or disruptive behavior in the classroom upon recommendation of the instructor and with approval of the college dean. A student may also receive disciplinary sanctions through the Office of Student Conduct for misconduct or disruptive behavior, including endangering the health of others, in the classroom. The student shall not receive a refund for course fees or tuition.

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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