COURSE SYLLABUS

Bioinformatics for Biologists (BSC 4434)

Summer semester 2022

Instructor: Jessica Liberles, Ph.D., Department of Biological Sciences

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Class hours: M/W 10-1:20 PM

Classroom: AHC5- 201

Office hours: Tuesday 9-1 PM

Office: Zoom link on Canvas

Prerequisites: BSC1010, BSC1011, PCB3063

COURSE DESCRIPTION

Introduction to bioinformatic resources/methods for biologists, including development and implementation of a research project. Accessing, searching, retrieving, and analyzing data, including sequence alignment, phylogenetic analysis, and protein structure prediction.

COURSE OBJECTIVES

In Bioinformatics for Biologists you will learn the theory behind fundamental bioinformatics methods, while identifying how to strategically apply these applications. Thus, this course has one theoretical part and one applied part each week. Project based learning will be frequently used.

At the end of the course, you will be able to:

- ✓ Use bioinformatics tools to study biology
- ✓ Recognize how to correctly apply bioinformatics tools to different situations
- ✓ Describe common bioinformatics algorithms
- ✓ Determine which combination of data and bioinformatics algorithm is appropriate to address a certain biological question
- ✓ Identify the characteristics and limitations of bioinformatics tools to critically analyze the results obtained
- ✓ Interpret the results of bioinformatics analyses in a biological context
- ✓ Be familiar with peer-review and the importance of reproducible research

Students will be assigned a group project. For the project, groups of 4 students will form a research team and together investigate an assigned specific question using bioinformatics methodology. The project is written up as a research paper.

RECOMMENDED

TEXTBOOK: Bioinformatics, 4th Edition
Andreas D. Baxevanis (Editor), Gary D. Bader (Editor), David S. Wishart (Editor)
ISBN: 978-1-119-33558-0 May 2020 656 Pages

Computer access at home and preferably able to bring laptop or Macbook to class

COURSE OUTLINE

Part I – Learn to do Bioinformatics (5 classes)

The first part of the class will be at high pace and based on pre-recorded lectures that must be studied before class and activities completed in class. The high pace is needed to build a foundation necessary for doing any type of bioinformatics research for part II.

This course follows a "flipped" instructional model, in the sense that lectures and other material for Part I will be presented in online Modules. Students are expected to study these modules before coming to class as specified in the schedule below.

The activities are designed to have a mix of tasks to be done individual and in a group of 4. The class also includes shorter interactive lectures based on the modules and the activities. These lectures will integrate the results of the activities in a greater bioinformatics and biological context.

The instructor will be assisting with activities, providing demos, and discussion in the smaller groups during activity time.

The activities will be completed during class time sometimes by each student and sometimes as a group. The completed activities are submitted in Canvas and will be checked for a completion grade.

Grading components (Part I)

- Attendance (25p per class)
- Quizzes (in class) (Quiz 1 is 40p, Quiz 2 and 3 are 30p each)
- Test (in class)
    - Applied part: online test, multiple choice (100p)
    - Theory part: written theory test (multiple choice, short answer, essay questions) (100p)
- Activity completion (25p per class)

Part II – Do Bioinformatics to Learn (6 classes)

The second part of the course is a research simulation. Based on a learning profile survey during Part I, you will be placed into groups. Each group will be assigned a research project and each person in the group will have a specific objective to complete. The group project can only be completed if the group collaborates to integrate the different objectives and together writes a research paper that presents, analyzes, and discusses the project and its results.

Grading components (Part II)

- Attendance (25p per class)
- Draft (50p)
- Final paper (175p)
- Final exam (in class)
    - Applied part: online test, multiple choice (75p)
    - Theory part: theory test (multiple choice, short answer, essay questions) (75p)

GRADING

PART I

Activity completion (25p/class)	100p
Quizzes (Q1: 40p, Q2 & Q3: 30p)	100p
Test 1 (applied and theory)	200p
Attendance (4 x 25p)	100p
Total Part I	**500p**

PART II

Project draft	50p
Project paper final	170p
Final exam	150p
Attendance (5 x 25p)	125p
Total Part II	**500p**
FINAL TOTAL (Part I + Part II)	**1000p**

GRADE SCALE

NOTE: The tentative point scale shows the optimal scenario. It is not absolute but serves as a guide. The point scale may need to be adjusted based on difficulty levels of quizzes and tests.

Grade	Points Per Credit Hour	Tentative point scale
A	4.00	>925
A-	3.67	>895-925
B+	3.33	>865-895
B	3.00	>825-865
B-	2.67	>795-825
C+	2.33	>765-795
C	2.00	>695-765
D	1.00	>595-695
F	0.00	<595

TENTATIVE SCHEDULE

	Day	Dates	Focus	Activity module
Part I	1	May 9	Introduction Databases	Module 1
	2	May 11	BLAST NCBI Command line Quiz1	Module 2
	3	May 16	Multiple Sequence Alignments Phylogenetic trees Tree analysis Quiz 2	Module 3
	4	May 18	Protein domains and structure Protein modeling Prediction Quiz 3	Module 4
	5	Jun 1	**Project launch** Introduction and Background	
	6	May 26	Finish introduction and background Draft 1	
		May 30	*Memorial day*	
Part II	7	Jun 1	**Test**	**Applied and theory**
		Jun 3	Just a deadline no class	**Draft 1 deadline 6/3 at 11:59 PM**
	8	Jun 6	SQL, PolyPhen-2, accuracy and hypothesis testing	
	9	Jun 8	AlphaFold, cBioPortal Write paper	
	10	Jun 13	Finish paper	
	11	Jun 15	**Final exam**	**Applied and theory**
		Jun 16	Just a deadline no class	**Final paper due 6/17 at 11:59 PM**

University closed
Quiz
Test
Project deadline

SYLLABUS HONESTY STATEMENT

FIU defines academic misconduct in the Student Conduct and Honor Code (Code) as, “any act or omission by a Student, which violates the concept of academic integrity and undermines the academic mission of the University in violation of the Code.” Code violations include, but are not limited to: academic dishonesty, bribery, cheating, commercial use, complicity, falsification, and plagiarism. The Code is available here: https://studentaffairs.fiu.edu/get-support/student-conduct-and-academic-integrity/student-conduct-and-honor-code/index.php

STUDENTS WITH DISABILITIES STATEMENT

The Disability Resource Center collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The DRC provides FIU students with disabilities the necessary support to successfully complete their education and participate in activities available to all students. Students that have a diagnosed disability and plan to utilize academic accommodations are asked to please contact the Center at 305-348-3532 or visit the DRC,

located at the Graham Center GC 190. Students are required to contact their instructor regarding their accommodations so the proper arrangements with the DRC office can be made (preferably during the first week of lab). Official written documentation from the DRC office must be provided to your instructor.

LIBRARY

The library provides access to literature and Web of Science, a large database of peer reviewed literature with a great search feature. It may also have laptops for rent.

COVID-19 INFORMATION

As cases and hospitalizations due to the Omicron variant continue to increase in our community, we must unite and take necessary steps to prevent further spread.

a) Daily and before arriving to campus, complete the P3 app. If you are not given the green check mark to enter campus, then stay home, and contact me by email by forwarding your P3 app email notification advising you to stay home.

b) Please check your FIU email account and your Canvas course at least once a day. Email and Canvas are the official ways for the university, and your professors, to contact you.

c) If you do not feel well and/or have tested positive for COVID-19, please do not come to class, immediately complete the P3 app to notify the COVID Response Team and contact me by email by forwarding your P3 app email notification as soon as you can. In order to receive an excused absence for P3 failure/COVID-19, you must complete the P3 app and forward the email notification. If directed to stay home by the P3 app, that email notification will serve as your excused absence when you forward it to me. The make-up policies are outlined in this syllabus (see below).

d) FIU is following current CDC Guidance. Please refer to the link where you can access their most current information.

e) Please take every precaution to keep yourself and others healthy. Per CDC guidelines, you are encouraged to get vaccinated and strongly advised to wear a mask indoors and in public including all FIU facilities.

f) Missing excessive days may lead to failing a class or a grade of incomplete.

g) For me to assist you in achieving your goals, it is important for you to contact me as soon as you experience any events that might disrupt your course participation. For up-to-date information about COVID-19, please see the repopulation.fiu.edu FAQs.

h) Please be advised that classes may be audio and visually recorded and/or subject to course capture for future access by students in this course. Your attendance/participation in this course constitutes consent to such recordings, which will only be used for educational purposes by students in the course and securely stored in University systems. If there is a concern regarding the recording and use of such recording, please contact FERPA@fiu.edu.

MAKE-UP POLICY

While attendance is not mandatory, if you miss class, you will miss a learning opportunity. If you have an excused absence, let your instructor know as soon as possible. Remember, if you fail the P3 app you must forward the email to your instructor for the absence to be excused.

For unexcused absences:

- Catch up on the study material on the class website and read the recommended parts of the textbook. Reach out to the instructor if you have any questions or need assistance.
- If you miss ONE in-class activity without an excused absence, it must be completed and emailed to the instructor before the following class or it will result in Zero points. If you miss TWO in-class activities, contact your instructor.
- If you miss a quiz or a test without an excused absence, you will get Zero points.
- Team player points will be affected by missed classes.

For excused absences:

- Catch up on the study material on the class website and read the recommended parts of the textbook. Reach out to the instructor if you have any questions.
- Missed in-class activities: Review the activity guides and complete the activities. Reach out to your instructor and LAs for assistance during office hours or to schedule an appointment. When you have completed the activity, e-mail it to your instructor.
- Missed quizzes and tests: Contact your instructor to schedule a make-up quiz or test.
- For long-term or multiple excused absences, an individual project will be accommodated instead of the group project. Contact your instructor.

Syllabus is subject to change at the discretion of the Professor