

COURSE SYLLABUS

Bioinformatics for Biologists (BSC 4434)

Spring semester 2018

Class hours: Tuesday & Thursday 12:30-1:45

Academic Health Center 5 212A,B

Office hours in AHC4-311 or AHC4-385: Monday 10-12, Thursday 10-12

Prerequisites: BSC1010, BSC1011, PCB3063

Instructor: Jessica Liberles, Ph.D.

Department of Biological Sciences

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COURSE DESCRIPTION

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

COURSE OBJECTIVES

Bioinformatics for biologists teach the theory behind fundamental bioinformatics methods while also guiding how to strategically apply these applications. Thus, this course has one theoretical part and one applied part each week. Project based learning is frequently used.

At the end of the course students are expected to be able to:

- Use bioinformatics tools to study biology
- Recognize how to apply different bioinformatics tools
- Describe common bioinformatics algorithms
- Define what data is needed for a certain question
- Critically analyze different bioinformatics tools and their results
- Discuss the results in a biological context
- Be familiar with peer-review and the importance of reproducible research
- Have an idea of the command-line interface

Students will be assigned a group project. For the project, groups of 3-4 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 and peer-reviewed. More details to follow.

REQUIRED

- **TEXTBOOK:** BIOINFORMATICS AND FUNCTIONAL GENOMICS, 3rd edition
Author: Jonathan Pevsner ISBN-13: 978-1118581780
Publication Date: October 26, 2015 Publisher: Wiley-Blackwell
- **USB MEMORY:** For storing data generated to be used again in class.
- A notebook for the exercises only

TENTATIVE SCHEDULE

	Week	Dates	Focus	Reading list (to be read before class)
Part 1	1	Jan 9	Introduction Basic Molecular Biology Basic Bioinformatics	Chap 1
		Jan 11		
	2	Jan 16	Genomes Database Sequence alignments & BLAST	Chap 2 p. 19-42 Chap 3 p. 69-78, 94-112
		Jan 18 Q1		
	3	Jan 23 E1	Finding and retrieving sequence information Bash/command line Assembling a Dataset	Chap 4 p. 121-135, 138-160
		Jan 25		
	4	Jan 30	From the model of evolution to phylogenetic trees	Chap 6 p. 205-221 Chap 7 as instructed
		Feb 1 Q2		
	5	Feb 6 E2	Tree analysis	Catch up
		Feb 8		
	6	Feb 13 E3	Proteins: domains and structure Protein modeling 1	Chap 12 p. 551-578 Chap 13
		Feb 15 Q3		
	7	Feb 20 E4	Proteins: domains and function Protein modeling 2 Predictions	Catch up
		Feb 22		
	8	Feb 27 E5	Prediction of disease causing SNPs Pathways & interactions Pathways, regulation, interactions	Chap 14 p. 682-686
		Mar 1 Q4		
	9	Mar 6	Theory test	
		Mar 8	Applied test 1	
		Mar 13	***SPRING BREAK***	
		Mar 15		
Part 2	1	Mar 20	Project launch	Project related literature + Textbook sections announced in class
		Mar 22	Project	
	11	Mar 27	Project	Draft 1: For within group feedback on each section including reproducibility
		Mar 29	Draft 1 due at 23:59	
	12	April 3	Project	Draft 2: For feedback from another group including reproducibility
		April 5	Draft 2 due at 10 AM (before class) & Peer-review 1 performed in class and due at end of class	
	13	April 10	Peer review 2 performed in class.	Peer review: is the writing sound, does the protocol work, anything missing or unclear?
		April 12	Project	
14	April 17	Project Project due at 23:59	Project revision: Improve based on the peer review. Respond to peer review comments	
	April 19	Applied test 2		
FINALS WEEK April 23-28				

¹Tuesdays marked with **E** will have a check that you are on pace with the exercises since they build upon each other. There are 5 Es.

²Thursdays marked with **Q** will have either a quiz or a discussion component based on previous lectures. The quizzes and discussions count towards your grade. There are 4 Qs.

GRADING

BSC 4434

	Weight		Weight
4 Q Thursday quiz or discussion	10%	Keeping pace on exercises (5 E)	10%
Theory test	10%	Attendance Mandatory	10%
Applied test 1	10%	Project Draft 1 & 2	5%
Applied test 2	10%	Project Peer-review	5%
Final exam	15%	Project final	15%

GRADE SCALE

Grade	Points Per Credit Hour
A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
D	1.00
F	0.00

ABOUT THE CLASS

1. **Be prepared and attend every class** – familiarize yourself with the material prior to class and study it after class. *Attendance is mandatory!*
2. **Learn to do bioinformatics** – the first part of the class will be at high pace and based on the textbook. The high pace is needed in order to build a foundation necessary for doing any type bioinformatics.
3. **Do bioinformatics to learn** – the second part is project based. Each student will perform an applied bioinformatics study aimed to learn about a specific protein or gene involved in disease or phenotype.
4. **Missed exams, tests, deadlines** – if you miss an exam, a test, or a deadline you must provide proper documentation in order to take the exam/test at a different time or to get an extended project deadline. If an exam falls on a religious holiday that you observe, let the instructor know during the first two weeks of class and the exam date will be changed.
5. **Focus!** – in the computer lab, we are doing bioinformatics and web searches must be appropriate to the topic. Phones are kept silent and out of sight (this is the default – if your specific situation necessitates incoming phone access during class, let the instructor know).
6. You are expected to know the relevant parts of the **FIU student Handbook** that apply to you (undergraduate or graduate) and oblige in appropriate behavior.
7. **Early Alert** – in an effort to help you succeed in your academic courses, FIU utilizes an Early Alert system. Instructors are now able to notify students' academic advisors if there are concerns about class performance. If an alert is submitted, your academic advisor will send you a message via your Student Dashboard (accessed via your MYFIU page) to discuss ways to improve your performance. Please respond to any communication you receive from your academic advisor

about an early alert. Our goal with this program is to help you to be successful by identifying any issues as early on as possible and working to address them.

****Syllabus is subject to change at the discretion of the professor****