BIOL-3951 / COMP-3550 / BIOL-7941
Introduction to Bioinformatics
Course Outline - Fall 2015

Instructor: **Dr. Lourdes Peña-Castillo**
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Email: **Use Desire2Learn (D2L) shell's email. Email will be replied within two working days.**

Lectures: **M T R 1:00 – 1:50 pm (Location SN2064)**
Labs: **W 2:00 – 5:00 pm (Location SN-3001)**
Office Hours: **Monday, Tuesday 10:00 – 11:00 am**

Course Description:
        The course will focus on the fundamental concepts, ideas and related biological applications of existing bioinformatics tools. This course will provide hands-on experience in applying bioinformatics software tools and online databases to analyze biological data, and it will also introduce scripting language tools typically used to automate some biological data analysis tasks.

Educational Goals:
1. Understand the basis (concepts and algorithms) underlying current bioinformatics tools.
2. Understand biological data and questions being addressed by bioinformatics methods.
3. Acquire hands-on experience with bioinformatics tools and online databases.
4. Learn the basics of linux command-line tools and the use of bioinformatics libraries to automate biological data analysis tasks.
5. Appreciate the interdisciplinary nature of bioinformatics.

Course Activities:
1. Two practical assignments
2. Nine lab submissions or quizzes
3. Two midterm exams, and one final exam
4. **BIOL7941 only:** a term project

Prerequisites:
        The course is intended for a mixed audience of students with different backgrounds. Appropriate information will be introduced/reviewed in the lectures and labs, and very little Biological or CS knowledge will be assumed. Thus, who should take this class?
1. Life sciences (Biology/Biochemistry/Medicine) students with an interest in computers.
2. CS students with an interest in Biology.

Prerequisites as listed in the University Calendar:
(BIOL2060 or BIOC2101, and one Computer Science course at the 1000-level or above excluding COMP1600 and COMP2000); or
(COMP 2500 or COMP 2710, and one Biology course at the 1000-level or above excluding BIOL2040 and BIOL2041); or
permission of the course instructor.

Suggested textbook:
Understanding Bioinformatics by Marketa Zvelebil and Jeremy O. Baum. Garland Science. 2008.
        [this book will be henceforth referred in course materials as UB]

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Reference Texts:

See reading list provided in D2L.

TopHat Account (for in-class participation):

Student Account to be created at https://app.tophat.com/register/student/

Evaluation Scheme:

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Assignments (2)	20%
Lab work and quizzes	25%
Midterm exams (1 best out of 2)	25%
Final exam	30%

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Assignments (2)	20%
Lab work and quizzes	20%
Midterm exams (1 best out of 2)	20%
Final exam	20%
Term Project	20%

Semester Plan

Week	Monday	Tuesday	Wednesday	Thursday	Friday
1	**September 7**		*Lectures begin* No Lab	What's bioinformatics?	11
2	Sep 14 Challenges, models and myths.	Sequences	Command-line Tutorial	Sep 17 Information Resources and Databases	18
3	21 Sequence Comparison	Scoring matrices	Sep 23 *Last day to add* Lab1: Finding gene information	Sep 24 Scoring matrices	25
4	28 Optimal Sequence Alignment	Optimal Sequence Alignment	Lab2: Disease Gene Prioritization	**Oct 1** Heuristic Sequence Alignment	2
5	Oct 5 Heuristic Sequence Alignment	Multiple Sequence Alignment	Lab3: Sequence Alignment	Oct 8 Multiple Sequence Alignment	9
6	Oct 12 *Thanksgiving* **Fall Break Begins**	Oct 13	14 *Lectures resume* Lab4: MSA	Oct 15 *(follow Tuesday schedule)* Midterm 1	16
7	Oct 19 Review	Next generation sequencing	21 Lab5: MSA	Oct 22 Genome Assembly	23
8	Oct 26 Read mapping	Read mapping	28 *Last Day to Drop* Lab6: Genome	Oct 29 Identifying genomic variants	30

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			Assembly		
9	**Nov 2** Identifying genomic variants	Gene expression	Lab7: Genome Assembly	Nov 5 Gene expression	6
10	Nov 9 Multiple testing correction	Multiple testing correction	**11** *Remembrance holiday (No Lectures)*	Nov 12 Midterm II	13
11	Nov 16 Review	Functional / Pathway Analysis	18 Lab8: Read Mapping	Nov 19 Functional / Pathway Analysis	20
12	Nov 21 Protein expression	Protein expression	Lab9: Microarray Re-annotation	Nov 26 Metagenomics	27
13	Nov 30 Emergent Fields	**Dec 1** Emergent Fields	Project Presentation	Dec 3 Q&A	4 *Lectures end*
14	Dec 7		9 **Final exams begin**	Dec 10	11
15	Dec 14		16		18 **Final exams end**

Notes:

→ All assignments and written reports are due prior to the beginning of the class on the specified dates. Assignments will be submitted in electronic format using the Dropbox application in D2L. **No late assignments will be accepted.**

→ In-class participation will be credited by using TopHat.

→ Course materials, news and communications will be available from the Desire2Learn system.

→ In the event of university closure on the day of a test, the test will be given in the next class meeting.

→ All written materials delivered must comply with the expectations set out in the University Calendar (Section 6.8.3 under University Regulations).

→ All grades will be assigned according to the University Calendar (Section 6.8.2 under University Regulations).

→ If, for special circumstances (such as medical or bereavement), you miss a deadline for a grade item, notify your professor within 72 hours of the missed deadline, providing any necessary related documentation (if documentation is required). Failure to do this might result in a mark of 0% for that grade item. For more information regarding medical notes and the information to be in them, please see Section 6.14.6 under University Regulations in the University Calendar or consult the Registrar's Office. A bereavement note should include the officiating parties name, the date of the service and the relationship to the student.

→ From section 6.11 of the University Calendar: "A student is expected to adhere to those principles which constitute proper academic conduct. Academic misconduct cannot be condoned or even appear to be condoned. A student has the responsibility to know which actions, as described under Academic Offences, could be construed as dishonest or improper.". Note that when two or more students submit identical or nearly identical work claiming it is their own, it is a clear sign of improper academic conduct.

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→ Although changes to this document are not intended at this time, any part of this course outline can be subject to change, particularly during the first two weeks of classes. In this case, students will be notified in class. Students should be aware that the latest version of the course outline will be available through the D2L shell for the course.