

## BIOL 388/BIOL 488 Bioinformatics

- Days/Times: Mondays and Wednesdays 2:45 - 4:00
- Classroom: Crown Center 105
- Prerequisites: BIOL 282
- Instructor: Dr. Heather Wheeler [hwheeler1@luc.edu](mailto:hwheeler1@luc.edu)
- Instructor Office Hours: Mondays 12:30 - 2:30 in LSB 324
- TA: Jeff Ng [jng2@luc.edu](mailto:jng2@luc.edu)
- TA Office Hours: Tuesdays 1:00 - 3:00 in Doyle 212

### **Objectives:**

- Gain a familiarity with current areas of research, data repositories and tools used in the field
- Develop the ability to master new analysis tools and critique their utility
- Cultivate the facility to understand multidisciplinary questions and identify solutions
- Increase familiarity with reading and presenting primary scientific literature

**Course Materials:** The required textbook for this course is *Concepts in Bioinformatics and Genomics* by Drs. Jamil Momand and Alison McCurdy (ISBN: 9780199936991). This book is available in print as a paperback as well as an e-book. If you order from [www.oup.com/us/he](http://www.oup.com/us/he), use promo code **BAGSHA2017** to receive 20% off your order. Other materials include course slides, papers from the scientific literature and online resources. Slides, supplemental readings and links to online resources will be made available through Sakai.

**Discussions, Office Hours & Seeking Help:** To meet at a time other than scheduled office hours, you must email the instructor or TA to schedule a day and time in advance; we cannot meet with students that just “drop by”. Another route to get assistance is to ask questions via email, **please cc: instructor and TA**. We will do our best to respond to emails within 24 hours. There are many forums where you can post your questions or search for questions. When you encounter a problem, error message, etc., you can always try and **Google it!**

**Students with Special Needs:** Any student with special needs or difficulties in learning and completing course assignments is strongly encouraged to contact the instructor as soon as possible. Please refer to the Student Handbook for student rights and available resources pertaining to assistance with special needs or disabilities.

**System Requirements:** Students must have access to their own computer with administrative rights. This means that the student can download and install software on the machine. In addition, the student must have access to a reliable internet source, wired or wireless. The software presented in the course will be cross-platform, i.e. able to work on Mac OS, Windows, and Linux.

**Academic Integrity:** While you are encouraged to interact with fellow students and use outside resources (the web, journal papers, etc.), **your assignments are to be your own work**. Plagiarism and cheating will not be tolerated (see University policy: [http://www.luc.edu/academics/catalog/undergrad/reg\\_academicintegrity.shtml](http://www.luc.edu/academics/catalog/undergrad/reg_academicintegrity.shtml)) and will be reported to the college. **STUDENTS FOUND TO PRESENT SOMEONE ELSE'S WORK AS THEIR OWN WILL RECEIVE A ZERO FOR THE HOMEWORK/TEST. ANY STUDENT WHO REPEATS SUCH AN ACTION WILL RECEIVE A FAILING GRADE (F) FOR THE COURSE. THIS**

MEANS IT IS NOT ACCEPTABLE TO:

- photocopy or copy/paste others' work,
- share files via file transfer (i.e. GoogleDocs, Box, Dropbox, sftp, etc.)
- email your assignment to another student to look at, and
- any other action that is deemed unethical by Loyola University Chicago or the instructor.

**Grading:**

- **Homework: 50 pts** (10pts each). Homework assignments will be exercises, many using software and web resources; these tools can include those discussed in class materials and challenges to find new tools.
- **Exams: 35 pts** (10pts Exam 1, 10pts Exam 2, 15pts Final Exam). Exams will cover the material included in the course materials (slides/textbook/etc.), homework assignments, and any assigned supplemental reading. See syllabus for indication of material covered in each exam. The final exam is cumulative.
- **Position paper: 10 pts**. We will expand our discussion of bioinformatics to also include some of the ethical issues in the field, specifically in relation to genome editing and synthetic genomics. Students will be required to submit a 2-3 page, single-spaced paper that includes a concise scientific review (based upon provided readings) and a discussion (opinion) of the ethical issues surrounding the topic. Grades will not be based on the opinion taken; instead, grades will be based on your ability to summarize the ethical issues and convey your opinion.
- **Class Participation: 5 pts**. We will regularly work on in-class exercises that will help prepare you for homework and exams. Your attendance and participation will be documented. Excessive absences and/or lack of active participation when present could result in lost points.

Note: Individual assignments, in-class exercises, and exams may include opportunities to earn bonus points.

**The following scale will be used for determining the final grade for the course:**

A ≥90pts    B+ ≥84pts    B- ≥77pts    C ≥70pts    D+ ≥64pts  
A- ≥87pts    B ≥80pts    C+ ≥74pts    C- ≥67pts    D ≥60pts    F <60pts

**Late/Missed Assignment Policy:** ALL HOMEWORKS ARE DUE VIA SAKAI BY **2:45PM ON THE DUE DATE** (the start of class). ASSIGNMENTS AFTER THIS TIME WILL NOT BE ACCEPTED. MISSING TESTS WILL ONLY BE PERMITTED UNDER SPECIAL CIRCUMSTANCES (e.g., medical emergencies, educational events, court dates, religious holidays, etc.); ARRANGEMENTS MUST BE MADE IN ADVANCE WHEN APPLICABLE AND A NEW TEST WILL BE ADMINISTERED. DOCUMENTATION OF THE ABSENCE IS REQUIRED.

**Section 488 Students:** Students enrolled in section 488 (graduate level credit) will have an additional component to their first homework assignment worth 5 additional points. They will turn in their Homework 1 assignment earlier than those in section 388 and subsequently assist in grading and identifying additional solutions and/or common errors made in the undergraduates' Homework 1. Thus, for graduate students, Homework 1 will be worth 15 pts and the Final Exam worth 10 pts.

Homework 1 is like a treasure hunt and requires you to thoroughly explore NCBI databases to familiarize yourself with the types of information available. **Yes, this means Homework 1 is time consuming and should be started ASAP!**

Fall 2017

### Course Schedule

Date	Topics	Readings	Due via Sakai at 2:45PM
8/28	Introduction to Bioinformatics Biology Basics	Chapter 1	
8/30	NCBI UniProt	Chapter 2	
9/4	<b>No class: Labor Day</b>		
9/6	Molecular Evolution Substitution Matrices	Chapter 3 Chapter 4 (skim math)	Homework 1 (Sec 488 only)
9/11	Computational Primer Pairwise Sequence Alignment	Chapter 5	Homework 1 (Sec 388 only)
9/13	Pairwise Alignment Exercises		
9/18	BLAST Multiple Sequence Alignment	Chapter 6	Homework 1 Grading (Sec 488 only)
9/20	BLAST/MSA Exercises		
9/25	Phylogenetics	Chapter 8	
9/27	Introduction to Python	Chapter 13	Homework 2
10/2	<b>Exam 1 (material 8/28-9/25)</b>		
10/4	Python Village Exercises		
10/9	<b>No class: Mid-Semester Break</b>		
10/11	BioPython		
10/16	Sequencing	Chapter 9.1 – 9.6	Homework 3
10/18	Genome Editing & Synthetic Genomics	Suppl. Reading & Video	
10/23	Genome Assembly & Annotation	Chapter 9.7 Suppl. Reading	
10/25	Genome Rearrangements	Chapter 9.8	
10/30	Human Population Genetics	Chapter 9.9 – 9.10	Position Paper
11/1	Linkage Disequilibrium Pattern Identification	Chapter 9.11 – 9.13	
11/6	GWAS Workshop 1	Suppl. Reading	
11/8	GWAS Workshop 2		
11/13	Nucleic Acid Assays		Homework 4
11/15	Primer Design	Suppl. Video/Slides	
11/20	<b>Exam 2 (material 10/4-11/15)</b>		
11/22	<b>No class: Thanksgiving Break</b>		
11/27	Protein Structure Prediction	Chapter 7	
11/29	Transcriptomics	Chapter 10	
12/4	Regulatory Motifs		
12/6	Protein-Protein Interaction Networks	Suppl. Reading	Homework 5
<b>Friday 12/15</b>	<b>FINAL EXAM 4:15-5:30PM (cumulative)</b>		

*This schedule is subject to change at discretion of the instructor. Changes will be published to the class via Sakai.*