

11:126:484 & 16:137:617- Tools for Bioinformatic Analysis
Wednesdays 12:10-3:20pm

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Location: Zoom and in-person

In person classes will meet in Foran Hall Rm. 124.

Zoom classes will be announced ahead of time. This will be a synchronous class meaning this class will meet in real time. Zoom link is posted in the class CANVAS site. This is hands on lab-based course. You will need to be on your computer station during the class- smartphones, tablets, i pads won't do nor will listening to class while driving or working. **Attendance is MANDATORY**

Virtual Classroom Behavior: Students should make every attempt to arrive in the virtual classroom on time. Please have your **cameras ON and audio muted** when you join in. Please use raise hand function of Zoom in case of questions when instructor asks you to. Please DO NOT use chat function of Zoom to text each other- it should be used to speak to TA or instructor. Please familiarize yourself with "Share Screen" as well as "Ask for Help" function of Zoom. It is best to find a quiet corner and use headphones for your meet time. **You are expected to stay for the entire length of the class time- you will be doing a hands-on dry laboratory exercise each week and you can leave only at the end of lab period or when you have finished and uploaded the lab.**

Classroom Behavior for in person classes: Students should make every attempt to arrive in the classroom on time. If too many students arrive late it is disruptive to rest of the class. So please be courteous to your fellow students. In case you have to leave early, please do so very quietly without disturbing the class. The use of cell phones, ipods, mp3 players etc. in the classroom is unacceptable. Please make sure your cell phones are turned off or silent during the class. **You are expected to stay for the entire length of the class time- you will be doing a hands-on dry laboratory exercise each week and you can leave only at the end of the lab period or when you have finished and uploaded the lab.**

Any misconduct will be dealt as per Rutgers University's code of student conduct found at <http://judicialaffairs.rutgers.edu/university-code-of-student-conduct>. Students are expected to abide by all Rutgers University regulations with regards to academic misconduct.

Covid Safety Procedures for in person classes: In order to provide everyone with a safe learning environment, I ask that you abide by the following rules for attending class.

- You must be vaccinated to attend this class. I would like you to know that I am vaccinated.
- Please make yourself aware of and follow all Rutgers Community Safety Practices- <https://coronavirus.rutgers.edu/health-and-safety/community-safety-practices/>.
- When you come to campus to attend class, be sure to renew your Campus Pass on MyRutgers.
- If you feel unwell, DO NOT attend class. Let me know and I will work with you to make up work.

- **MASKS are MANDATORY for this class.** I will be wearing a mask while I am lecturing. Every student in this class will also be expected to wear an appropriate mask (exhaust valves not permitted), properly cared for, and worn, covering both the mouth and nose, as detailed in the Rutgers Community Safety Practices. Please come to class prepared. If you forget, a disposable mask will be provided. I will not begin each class session until everyone is wearing a mask.
- Please let me know if you cannot clearly hear what I am saying. Speaking through a mask is challenging. If you let me know I can modify my mask and speech to be more clear.
- Please wash your hands, or sanitize them before coming to class and after departing.

Technology Requirement and Course Site:

For Zoom sessions: You will need a computer (laptop or desktop; both windows or Mac operating system should work) and high-speed internet. Zoom link is posted on CANVAS site under modules. Please make yourself aware of how to navigate several functionalities of Zoom.

Although most of the work can be done on either windows or Mac but for you will need WINDOWS based machine to finish protein visualization lab, drug discovery lab and project. If you DO NOT have access to windows machine- your option is to install “VIRTUAL BOX” or “VMware” on Mac and then try installing these programs. I am not expert in this so will not be able to help.

For in person session: Laptops are not required as the class is held in computer lab and each student has a designated computer station.

Course Site: Both undergraduate and graduate sections have one course canvas site. All the relevant materials including weekly lectures, labs, quizzes, projects etc. will be posted on it. All submissions and grading is done online as well. It is your responsibility to make sure that you are enrolled in my CANVAS class and to check it regularly for updates. Any emergency announcements regarding class including but not limited to any class cancelation will also be posted via CANVAS.

Class Structure: This class consists of three components each week (except when noted on tentative schedule). Attendance is mandatory. Absence must be notified ahead of time when possible or as soon as possible. All absences must accompany a bonafide reason and documentation.

1. Lecture: Short background/ review of tools and techniques covered in the dry lab exercises.
2. Demonstrations: Every week we learn a new tool. Your TA will demonstrate how to navigate this tool and database. Lectures and demos are not recorded especially for in person class therefore it is in your advantage to pay attention to these.
3. Dry Laboratory Exercises: Demonstrations will be followed by dry laboratory exercises that student will start as **in class assignments**. You may work in small groups. You are expected to stay and try to finish all the lab activities during the class and upload on CANVAS before leaving. In case the lab is not finished it can be taken home as take-home assignment and must be uploaded by the due date. Late submissions will be penalized; and no submission will be accepted beyond two weeks delay. Only under extenuating circumstances with bonafide reason and documentation, and timely communication with the instructor, an extension to this deadline will be provided.

Course Textbook: Following are **recommended** books for the course, additional material will be provided in the class:

1. Bioinformatics and Functional Genomics, Jonathan Pevsner (Author), Wiley-Blackwell; 2nd edition (May 4, 2009) ISBN: 0470085851
2. Introduction to Genomics, Arthur M. Lesk (Author), Oxford University Press; 2nd edition (April 26, 2012) ISBN: 019956435
3. Understanding Bioinformatics. Marketa Zvelebil and Jeremy O. Baum (Authors); Garland Science; 1st edition (2008) ISBN: 0815340249.

Course Description Learning Objectives:

This course introduces the students to various bioinformatics tools and databases used to study and complement biological data. This course involves a mixture of lecture, seminar and hands on activities. The learning objectives for this course are as follows:

1. To obtain the ability to critically examine biological meta- databases such as NCBI, Ensembl etc.
2. To understand bioinformatic methods of DNA and RNA sequence analysis.
3. To understand computational methods that aid in studying protein structure, domains & motifs.
4. To utilize *in silico* methods to design and explore drug like candidates.
5. To recognize interdisciplinary approach to biological discovery process.
6. To be able to interpret current scientific literature in the field of bioinformatics (for graduate students)

Assessment: You will be evaluated as follows:

(A) In Class Dry Lab Exercises and Assignments (25% of grade)

You will be evaluated based on in-class dry lab exercises and take home assignments. Each lab exercise and/or assignment will be given in the beginning of the class and will be due before next class. You will need to upload your lab assignments on CANVAS site. Late submissions will be penalized by deduction of 10 points/per week delay from the total score. No submission will be expected after two weeks.

If for some reason you are unable to finish your work, you **MUST** notify the instructor and TA by email before next class to ask for an extension. This extension is only one-time favor and should be asked for only under extenuating circumstances like power outages, medical condition etc. The extension will only be provided for one extra week.

(B) Exam (25% of grade)

There will be one closed book exam and will involve written as well as practical section. Written exam may contain questions ranging from multiple choice questions; labeling diagrams, and short answer questions. Practical exam will involve mini dry lab exercises similar to the one done during the classes. There will be no make-up exam except under extreme emergency with prior notice and adequate documentation of a bona fide emergency. The format of the make-up exam may be different from the original exam.

(C) Computational Drug Discovery Module- Lab Reports (25% of grade)

Students will be taught dry lab techniques used in a computational drug discovery research projects. This will be a three-week module. Each week a new technique will be taught, and associated lab will comprise of independent guided activities. Students will complete these activities and put together three mini lab reports. Detailed directions for lab report will be provided in the class.

(D)Journal Club, Oral Seminar Presentation and Discussion (25% of grade)

Graduate students in MBS program enrolled in 11:137:617 course will present an oral seminar.

Each graduate student will be assigned a primary literature article based on applied bioinformatics. The student will prepare and give 30 min presentation of the article that should include background, significance, methodology, results and conclusion/ critique. You are expected to go in search of additional primary literature articles and/or review articles and other reference material in order to gain in depth understanding of the assigned paper. Oral presentations will be followed by 5-10 min discussion and q/a session. All the students are expected to participate in the discussion and ask question.

Undergraduate students enrolled in 11:126:484 will form small groups of three-four students and work together to lead a discussion on assigned journal club articles. You are not expected to make a presentation rather focus should be on understanding the paper and being able to explain it to the peers. The format of these discussions would be more open and round table kind. All the students in the group will work together and the instructor will ask at random from one to explain one of the figures of the paper; in addition to explaining hypothesis, bit of background and overall conclusion. All the students will together critique the paper/technology. All the students are expected to participate in the discussion and ask question.

Academic Integrity: Students are responsible for reading and complying with Rutgers University academic integrity policy. To view the Rutgers University's Academic Integrity Policy go <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The academic integrity/ honesty policies hold good for all in-class work, quizzes, projects and take-home assignments. Plagiarism, cheating or other violations of Rutgers University's Academic Integrity Policy will be subject to appropriate penalty based on the infraction.

Accommodations for Students with Disabilities: Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>.

Tentative Lecture-Laboratory Schedule

Week	Date	Topic & Assignments	Assignments
I	1/19	Introduction Course Policies and Syllabus Assigned Reading	Week 1- Take Home Assignment
II	1/26	Biological Information & Databases I	Lab 1: NCBI
III	2/2	Biological Databases II (Asynchronous)	Lab 2: Ensembl
IV	2/9	Sequence Alignment I	Lab 3: BLAST
V	2/16	Sequence Alignment II	Lab 4: MSA using MAFFT & T-Coffee
VI	2/23	Structural Bioinformatics I- Protein Structure and Families	Lab 5: InterProScan & Prosite
VII	3/2	Structural Bioinformatics II- Protein Structure Visualization	Lab 6: PDB & DS Visualizer
VIII	3/9	RNA Expression	Lab 7: RNA Expression Virtual Lab and GEO
IX	3/16	Spring Break- No Classes	
X	3/23	MID-TERM EXAM (Written and Practicum)	
XI	3/30	Computer Aided Drug Design & Discovery (CADD)- <i>In Silico</i> screening	Lab 8: <i>In Silico</i> Screening @ Pubchem and Drug Bank
XII	4/6	CADD: <i>In Silico</i> Docking	Lab 9: <i>In Silico</i> Docking @ Argus Lab
XIII	4/13	Journal Club, Presentations, Discussion	Lab Report I DUE
XIV	4/20	Journal Club, Presentations, Discussion	Lab Report II DUE
XV	4/27	Journal Club, Presentations, Discussion	Lab Report III DUE