11:126:484 & 16:137:617- Bioinformatics-Tools for Genomic Analysis
Wednesday 3:55-6:55pm- Foran 124;
Spring 2016

Instructor: Dr. Sonia Arora
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Office Hours: Monday, Tuesday: 10am- 12:30pm
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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)

Course Policies

Attendance: Attendance is mandatory as this is a laboratory based course.

Classroom Behavior: Students should make every attempt to arrive in the classroom on time. In case you are late or have to leave early, please do so very quietly without disturbing the class. The use of cell phones, i pods, mp3 players etc. in the classroom is unacceptable. Students are expected to abide by all Rutgers University regulations with regards to academic misconduct.

Academic Integrity:
The university's policy on Academic Integrity is available at http://academicintegrity.rutgers.edu/academic-integrity-policy. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.

- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

ACCOMODATIONS 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/

Sakai & Turnitin: Weekly lecture notes, lab assignments and other documents regarding project, seminar, practice exam etc. will be posted on sakai. It is your responsibility to make sure that you are enrolled in my sakai 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 sakai. Turnitin portal will be used for uploading term projects- details will be given during the class. Rutgers give access to turnitin to all students- please make sure you have an account on turnitin.com.

Evaluation: You will be evaluated as follows:

(A) In Class Dry Lab Exercises and Assignments

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. Late submissions will be penalized by deduction of 10 points/per week delay from the total score.

(B) Exam

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) Structural Bioinformatics Term Project

Students will be using dry lab techniques taught in the class to complete a structural genomics project (details given during the class). You will discuss your results in a written project report. The project report should be written as a scientific paper that has following sections: Title, Introduction, Materials and Methods, Results,

Discussion and References and should include in-text citations. The project report should be uploaded at turnitin.com by the deadline indicated in the schedule.

(D) Oral Seminar Presentation (graduate students enrolled in 11:137:617)

Graduate students in MBS program enrolled in 11:137:617 course will present a journal club seminar. Each graduate student will be assigned a discussion topic that will focus on tools for genomic and proteomic studies. It is student's responsibility to collect relevant and in depth background information about the topic and then present its history, development and current application in a power point format. Students should also discuss how is bioinformatics/computational biology a part of the tool/technique discussed. findings with conclusions and critique.

Though, only graduate students are required to do oral presentation- all the students (graduate and undergraduate) must participate in the discussion of the topic.

Grading Scheme:

11:126:484

Labs and Assignments: 30%
Exam: 30%
Term Project: 30%
Seminar Discussion: 10%

01:137:617

Labs and Assignments: 25%
Exam: 25%
Term Project: 25%
Seminar Presentation & Discussion: 25%

Tentative Lecture-Laboratory Schedule

Date	Topic & Assignments
01/20	Introduction Biological Information & Databases I Lab 1: NCBI
01/27	Biological Databases II Lab 2: Ensembl & UCSC-Genome Browser
02/03	DNA Sequence Analysis I Lab 3: BLAST
02/10	Seminar Presentation DNA Sequence Analysis II Lab 4: Advanced BLAST & Multiple Sequence Alignment
02/17	Protein Structure Analysis I Lab 5: UniProt, InterProScan & Prosite
02/24	Seminar Presentation Protein Structure Analysis II Lab 6: PDB & D5 Visualizer
03/02	Seminar Presentation Term Project- Computer Aided Drug Design & Discovery Virtual Screening
03/09	EXAM (100 Points)- Covers material discussed in weeks 1-6
03/13-03/20	Spring Break- No Classes
03/23	Seminar Presentation Term Project: Molecular Docking I
03/30	Seminar Presentation Term Project: Molecular Docking II
04/06	CLC Bio Main Workbench Workshop I
04/13	CLC Bio Main Workbench Workshop II
04/20	Seminar Presentation Project Week
04/27	Seminar Presentation Project Week
05/04	No Class- Term Project Report DUE by 4pm