New York City College of Technology
School of Arts and Sciences
Department of Biological Sciences

BIO 3352 AND BIO 3352L:
BIOINFORMATICS II HYBRID COURSE SYLLABUS

Course title:	Bioinformatics II
Course code:	BIO 3352 and BIO 3352L
Credit Hours:	4 credit hours; 4 hours combined laboratory and lecture per week; 2 hours online modules per week; 15 weeks total.
Prerequisite:	BIO 3350
Text:	*Bioinformatics and Functional Genomics, Third Edition, 2015,* by Jonathan Pevsner, Wiley- Blackwell. The course will use various published articles and reviews, as well as internet-based sources as reference text.
Official Course Description *(from the College Catalog)*	This course is a continuation of Elements of Bioinformatics (Bioinformatics I – BIO 3350). Advanced topics in structural bioinformatics, functional genomics, and evolutionary processes. The course covers molecular evolution and phylogenetics; protein structure and stability, protein folding and computational structure prediction of proteins; proteomics; protein-nucleic acid interactions; RNA bioinformatics, microarray and expression data; and systems biology. The lab component of the course introduces computational tools used to implement analysis of sequence, structural and functional data.

Course Mechanics	This course is run as hybrid. At the beginning of the semester, the class will assemble for the first face-to-face meeting, where the instructor will explain in detail the policies and procedures of the course. The class will meet once every week. Parts of this course will also be conducted online via *Blackboard* on a weekly basis. The face-to-face component of the course will be held at the designated time and classroom (schedule to be provided). Attendance is absolutely required. Aside from serving as the venue to introduce new topics, the face- to-face meeting will also provide an opportunity for students to discuss any difficulty they are having regarding the online component of the course. Students must access their *Blackboard* accounts at least 3 times per week and show active participation in Discussion Boards. The Discussion Board Rubric in the following section will be used to assess participation and contribution to the learning community in the *Blackboard* Discussion Boards. Assignments and quizzes online and/or in-class, will be given periodically. Timely completion of assignments is critical to success in the course. For the final research project students are encouraged to work in groups. Topics will be announced in the first weeks of the course to allow plenty of time for preparation and research. The instructor will guide the groups with discussions in class and in office hours.

Course Objectives and Student Expectations

Students are expected to be able to work both independently and regularly, as well as collaborate with fellow students on group projects. This upper-level course is fast paced, and covers a diverse set of topics, and therefore students must be able to keep up with the work assigned in class, in order to be successful in the course. Discussion boards will be utilized, in order to communicate with fellow students regarding current assignments and group projects. Students are expected to be able to work both independently and regularly, as well as collaborate with fellow students on group projects. This upper-level course is fast paced, and covers a diverse set of topics, and therefore students must be able to keep up with the work assigned in class, in order to be successful in the course. Discussion boards will be utilized, in order to communicate with fellow students regarding current assignments and group projects.

Course Objectives	Upon completion of the course, the students will be able to: 1. Use well-established and widely used bioinformatics tools and platforms (e.g., ClustalW, R, GSEA, Gene Ontology). 2. Use basic programming languages (e.g., Unix bash commands, AWK) to perform straightforward computational tasks. 3. Understand the theory and statistical background of commonly available bioinformatics tools, so that they are able to judge the validity of the results provided by these tools. 4. Navigate through internet-based biological databases and genomic browsers. 5. Use online resources to search for scientific literature in the field of bioinformatics. 6. Comprehend specific methodologies and results described in current bioinformatics literature.
Technology Prerequisites	1. Students should have access to and be able to use Firefox, Chrome, Internet Explorer or any appropriate web browser. 2. Students will need a City Tech email account and should be comfortable using it. Students will also need access to CUNY's Blackboard service. Accounts and passwords to the CUNY Portal should be arranged prior to the beginning of the

	semester. 3. Students should check if their e-mail address on Blackboard is the e-mail address they check most. The instructor will send e-mail announcements only via Blackboard.
College Policy on Absence-Lateness	A student may be absent <u>without penalty for 10% of the number of scheduled class meetings during the semester</u> as follows: Class Meets Allowable Absence: **<u>1 meeting/week - 2 classes</u>** Students are responsible for making up any missed work on days that they are absent. If a student's class absences exceed this limit the instructor will alert the student that a grade of WU may be assigned. Unless otherwise indicated by the instructor, two times late is treated as one absence.
Online Resources	<u>Support</u> 1. CUNY's Blackboard resource can be accessed via the CUNY Portal, at: http://portal.cuny.edu/portal/site/cuny/index.jsp 2. A Beginner's Guide to Blackboard, as well as help on other resources such as Wiki and Wimba, can be found here: http://websupport1.citytech.cuny.edu/websupport1/It/online/students/index.htm 3. iTEC department for Blackboard support, email at: ITEC@citytech.cuny.edu

Learning Outcomes for Gen ED, CUNY Common Core, CUNY Flexible Core

Gen ED Learning Outcomes

Students in this course will:

1. expand and deepen their knowledge by:
    - learning to value knowledge and learning;
    - understanding and appreciating the range of academic disciplines that constitute the interdisciplinary field of computational genomics/biology, and comprehending their relationships in this field of study;
    - using this course as a forum for the study of values and ethical principles that are at play in the rapid development

of the field of bioinformatics, as well as for the study of basic and applied sciences that inform the physical world.
    - engaging in an in-depth, focused, and sustained program of study of computational genomics;
    - pursuing disciplined, inquiry-based learning through online activities and lab exercises;
    - acquiring tools for lifelong learning, such as the proper and efficient ways to utilize existing scientific data and information to gain knowledge.
2. acquire and use tools needed for communication, inquiry, analysis, and productive work by:
    - communicating effectively using written, oral, and visual means;
    - understanding and employing quantitative analysis to describe and solve problems, both independently and cooperatively;
    - employing scientific reasoning and logical thinking;
    - using creativity to solve scientific problems.
3. work productively within the diverse discipline of computational genomics and related fields by:
    - gathering, interpreting, evaluating, and applying information from a variety of sources, as displayed in their final research projects;
    - understanding and navigating complex systems that support research and practice in computational genomics;
    - resolving complex issues creatively by employing multiple sources of information, systems, and tools.
4. understand and apply values and ethics in personal and professional domains by:
    - demonstrating intellectual honesty and personal responsibility;
    - demonstrating intellectual agility;
    - working in teams effectively;

- transforming biological information into knowledge.

CUNY Common Core Learning Outcomes

Students in this course student will:

- identify and apply fundamental concepts and methods of biological and informatics sciences;
- use computational genomics tools of to carry out collaborative laboratory investigations;
- gather, analyze, interpret and present data in effective written reports;
- identify and apply research ethics in gathering and reporting scientific data.

CUNY Flexible Core Learning Outcomes

Students in this course student will:

- identify and apply fundamental concepts and methods of biological and informatics sciences to explore the scientific world;
- demonstrate how tools of biological sciences and quantitative technologies to analyze problems and develop solutions;
- articulate and evaluate the impact of genomic and computational technologies on the contemporary worlds, such as issues of personal privacy, security, and ethical responsibilities;
- understand scientific principles underlying matters of policy or public concern in which science plays a role.

Course Coordinator and Instructor

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GRADING POLICIES

BIO3352 is an intensive 4-credit science course with a laboratory component. Class presentations of research projects and completion of assignments/quizzes are required. Optional assignments for extra credits may be offered during the semester. Student performance on this course will be evaluated as follows:

Lab/Lecture

ASSIGNMENT	**DESCRIPTION**	**POINTS**
In class participation	Weekly attendance	5%
Online participation	Active participation on online activities (based on Blackboard)	20%
Online quizzes	Online quizzes	10%
Assignments	Homework assignments based on computer lab	10%
Research Project	(breakdown below)	30%
	15-minute in class presentation (10%)	
	Midterm report (10%)	
	Final report (10%)	
Exam 1	Midterm exam	10%
Exam 2	Final Exam	15%
Total		100%

NOTE: Letter grades will be determined using a standard percentage point evaluation as outlined below:

A:	93-100
A-:	90-92.9
B+:	87-89.9
B:	83-86.9
B-:	80-82.9
C+:	77-79.9
C:	70-76.9
D:	60-69.9
F:	Below 60

Policy on Academic Integrity

Academic dishonesty includes any act that is designed to obtain fraudulently, either for oneself or for someone else, academic credit, grades, or any other form of recognition that was not properly earned. Academic dishonesty, which will not be tolerated in this course and at City Tech, encompasses the following:

Cheating

Defined as intentionally giving, receiving, using or attempting to use unauthorized materials, information, notes, study aids, including any form of unauthorized communication, in any academic exercise. It is the student's responsibility to consult with instructors to determine whether or not a study aid or device may be used.

Plagiarism

Plagiarism is intentionally and knowingly presenting the ideas or works of another as one's own original idea or works in any academic exercise without proper acknowledgement of the source. The purchase and submission of a term paper, essay, or other written assignment to fulfill the requirements of a course, and violates section 213-b of the State Education Law. This also applies to the submission of all or substantial portions of the same academic work previously submitted by the student or any other individual for credit at another institution, or in more than one course.

Course Policy on Academic Integrity

Cheating and plagiarism will not be tolerated in this course. Penalties are the following. Cheating in in-class exams or quizzes will merit an automatic zero for the exercise. Copying from classmates' lab worksheets and other take-home or online assignments will also merit an automatic zero for the exercise. Repeated violations will be reported to the Chair and the Dean, and may result in a final grade of "F" in the course, or even expulsion from the College. If you are unsure whether any of your actions constitute cheating or plagiarism, please consult the instructor for guidance.

Discussion Board Rubric

Class participation on discussion boards will account for 15% of the course grade. This grade will be assigned based on how often a student posts, but most importantly upon the quality of what is being posted. Make sure that your posts and replies contribute to the discussion, are relevant to the topic discussed and are original.

- Single word replies (e.g., yes/no) will be automatically considered "unacceptable".
- Rephrasing of other students' posts will be automatically considered "unacceptable".

Participation on 5 discussion boards is required, and postings will be evaluated based on the rubric below. In each board you can receive a maximum of 3 points TOTAL, and in all 5 discussion boards you can receive 3*5=15 points total, that is 15% of the course grade.

Score (weights)	Criteria	Outstanding (30)	Excellent (20)	Very Good (10)	Poor (5)	Unacceptable (0)
30 (max) * 30% = 9 max	Originality and relevance of posts (30%)	Evidence of original thought apparent throughout the post. Mention more than 4 specific points related to the topic discussed and state an opinion. Cite references to the discussed topic. Present new ideas that reflect high-level critical thinking.	Evidence of original thought apparent throughout the post. Mention at least 2 specific points related to the topic discussed and state an opinion. Cite references to the discussed topic.	Allusion to an original idea. Mention 2 specific points related to the topic discussed and state an opinion. No clear connection to the discussed topic.	Random original thoughts. Lack of cohesion among ideas presented. Rephrasing of other students' posts.	No evidence of original thought. Rephrasing of other students' posts.

30 (max) * 30% = 9 max	**Responses to original post and to others (30%)**	Agrees/disagrees with previous posts with adequate explanation. Response to more than 4 previous posts by other students. Support of opinion with examples. Introduce new topic or idea for discussion and provide additional evidence to support their opinions. Respect the views of peers by using academic and non-threatening language.	Agrees/disagrees with previous posts with adequate explanation. Response to at least 3 previous posts by other students. Support of opinion with examples. Introduce new topic or idea for discussion. Respect the views of peers by using academic and non-threatening language.	Agrees/disagrees with previous posts with adequate explanation. Response to at least 2 previous posts by other students. Support of opinion with examples. Respect the views of peers by using academic and non-threatening language.	Agrees/disagrees with previous posts without providing explanation. Response to at least 1 previous post by other students. No respect for the views of peers.	No responses to original post and to other students' posts.
30 (max) * 15% = 4.5 max	**Writing quality and clarity (15%)**	Writing is extremely clear, comprehensible, engaging and appropriate for the given audience. No grammar, punctuation or spelling errors.	Writing is clear, comprehensible and appropriate for the given audience. No grammar, punctuation or spelling errors.	Writing is generally clear. Issues with structure and style may be present. A few (1-2) minor grammar, punctuation or spelling errors may be present that do not impede understanding.	Issues with structure and style are present. More than 3 grammar, punctuation or spelling errors are present and impede understanding.	Issues with structure and style make the post difficult to understand. Frequent (more than 5) grammar, punctuation or spelling errors are present.

30 (max) * 25% = 7.5 max	Timeliness (25%)	All required posts, made early and throughout the discussion. Participation occurred more than 5 days during the week.	All required posts, made early and throughout the discussion. Participation occurred maximum 5 days during the week.	All required posts. Some made slightly before deadline, not in time for others to read and respond. Participation occurred maximum 3 days during the week.	Some required posts missing. Most made slightly before deadline without allowing for response time. Participation occurred less than 3 days during the week.	All required posts are missing. No participation.
TOTAL: 9+9+4.5+7.5= 30 points MAX						

LECTURE AND LABORATORY SCHEDULE

Week	Lecture/Laboratory	Chapter
1	**LECTURE/LAB** Introduction to the course, and class mechanics/policies. Multiple Sequence Alignment (MSA). **ONLINE**: Online Activity 1	6
2	**LECTURE/LAB** Molecular Phylogeny and Evolution. Generating phylogenetic trees. **ONLINE**: Online Quiz on MSA	7
3	**LECTURE/LAB** DNA **ONLINE**: Online Quiz on Phylogeny	8
4	**LECTURE/LAB** RNA **ONLINE**: Online Activity 2	10

5	**LECTURE/LAB** Genome Sequencing. **ONLINE**: Online Quiz on DNA/RNA	9
6	**ONLINE**: Recap previous chapters	
7	**LECTURE/LAB** Next Generation Sequencing (NGS). **ONLINE**: Online Activity 3	9
8	**ONLINE**: Recap for exam **Midterm Exam**	
9	**LECTURE/LAB** Gene Expression I **ONLINE**: Online Quiz on NGS	11
10	**LECTURE/LAB** Gene Expression II **ONLINE**: Online Activity 4	11
11	**LECTURE/LAB** HTML **ONLINE**: Online Activity 5	
12	**LECTURE/LAB** UNIX **ONLINE**: Online Activity 6	
13	**LECTURE/LAB** Invited Speaker or Extra lab **ONLINE**: Online Activity 7	
14	Prepare for presentations **In-class project presentations**	
15	Recap for exam **Final Exam**	