

DATE: October 31, 2021

TO: Anne Marie Sowder, Chair of College Council Curriculum Committee

FROM: Curriculum Subcommittee
Henry Africk (Chair), Allison Berkoy and Zhou Zang

RE: Final Report for Proposal 21-04: Changes to Biomedical Informatics Program

PROPOSAL OVERVIEW:

The Biological Sciences department is proposing multiple changes to the Biomedical Informatics Program that include changing course prerequisites, contact hours to one course, adding a writing intensive designation to a course, and removing the verbiage for good standing criteria from the College Catalog.

RATIONALE:

The proposal will help address several current shortcomings of the BS in Biomedical Informatics. An extra contact hour will be added to BIO 4050 (Biomedical Informatics Colloquium), an upper level BIB core course. The extra contact hour would allow for longer in-class discussion of the topics, especially since class capacity will increase from 16 to 24 students due to high demand. This would benefit the students academically by allowing a more comprehensive evaluation of the diverse research themes and offering a better appreciation for current trends in the field. Also a writing intensive (WI) course designation will be added to the course. Finally, MED 4229 needs to be removed as a prerequisite as the department has no plans to continue offering this course. The department also proposes changes to the prerequisites of other courses, including BIO 4250 and BIO 4910. These changes will help address some of the limitations imposed by the prerequisites currently in place. Finally, other minor changes include fixing the course title for BIO 3450 and removing good-standing GPA requirements and verbiage about the number of times students can repeat a course.

STRENGTHS:

1. The changes to BIO 4050 will allow for more time for student presentations and a more comprehensive coverage of the material in the course.
2. The changes in the prerequisites are needed since one of the prerequisites is a course that will no longer be offered.
3. The removal of the GPA requirement clarifies the requirements for students to progress through the program.

WEAKNESSES:

None.

SUBCOMMITTEE ACTIVITIES:

The subcommittee discussed the proposal with the proposers, the provost, a member of the provost's office and the dean in a meeting on Friday, October 30, 2021. Some minor changes were made to the original proposal.

New York City College of Technology, CUNY

CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](#) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

Title of Proposal	Changes to Biomedical Informatics Program
Date	3/11/21
Major or Minor	Major
Proposer's Name	Christopher Blair
Department	Biological Sciences
Date of Departmental Meeting in which proposal was approved	May 6, 2021
Department Chair Name	Andleeb Zameer
Department Chair Signature and Date	Andleeb Zameer-signed 8/27/2021
Academic Dean Name	Justin Vazquez-Poritz
Academic Dean Signature and Date	 9/8/21
Brief Description of Proposal (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body).	The Biological Sciences department is proposing multiple changes that include changing course prerequisites, contact hours to one course, adding a writing intensive designation to a course, and removing the verbiage for good standing criteria from the College Catalog.
Brief Rationale for Proposal (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body).	The proposal will help address several current shortcomings of the BS in Biomedical Informatics. The department continues to make improvements, but there are additional concerns that need to be resolved. Ultimately, all of the proposed changes will benefit the students and provide them with a comprehensive introduction to the field.
Proposal History (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list).	New submission.

Please include all appropriate documentation as indicated in the Curriculum Modification Checklist.

For each new course, please also complete the New Course Proposal and submit in this document.

Please submit this document as a single .doc or .rtf format. If some documents are unable to be converted to .doc, then please provide all documents archived into a single .zip file.

ALL PROPOSAL CHECK LIST

Completed CURRICULUM MODIFICATION FORM including:	
• Brief description of proposal	x
• Rationale for proposal	x
• Date of department meeting approving the modification	x
• Chair’s Signature	x
• Dean’s Signature	x
Evidence of consultation with affected departments List of the programs that use this course as required or elective, and courses that use this as a prerequisite.	
Documentation of Advisory Commission views (if applicable).	
Completed Chancellor’s Report Form .	x

EXISTING PROGRAM MODIFICATION PROPOSALS

Documentation indicating core curriculum requirements have been met for new programs/options or program changes.	
Detailed rationale for each modification (this includes minor modifications)	x

Description of Proposal

This proposal consists of a series of both major and minor curriculum changes to the BS program in Biomedical Informatics.

1. BIO 4050 (Biomedical Informatics Colloquium)
 - At present, the course has 2 contact hours per semester. The department is proposing to increase the number of contact hours to 3, which will substantially benefit students.
 - Change course number to BIO 4550.
 - Add a writing intensive (WI) designation to the course.
 - Change the course description to remove the verbiage about the course being offered only once per year. Due to high demand, BIO 4050 is now offered in both the spring and fall semesters.
 - Remove MED 4229 as a prerequisite for the course.
2. BIO 4250 (Molecular Evolution and Phylogenetics)
 - Change prerequisite
3. BIO 4910 (Independent Research Study in Biomedical Informatics: Information Literacy)
 - Change prerequisite
4. BIO 3450 (Biomedical Data Analysis I)
 - Change course name
5. Good-standing criteria for BIB students
 - Remove GPA requirement and verbiage about the number of times a student can repeat a course.

Rationale for Proposal

The department is proposing several changes to BIO 4050 (Biomedical Informatics Colloquium), an upper level BIB core course. The course has a seminar structure (unique in the department), in that classes consist either of synchronous (invited speakers) or pre-recorded talks (which approximately last between 1hr 10 min and 1hr 20min) about current research and applications in biomedical informatics. In addition to the weekly lectures, every week students lead an in-class discussion of the topic presented the previous week (approximately 20-30 min long). Based on our experience during past semesters, the 20-30 minutes left for in-class discussion is not enough time for 16 students to interact, communicate their opinions and thoughts, and share references for further learning. Additionally, the department will increase the class capacity from 16 to 24 students (due to high demand), which will make this short time discussion even less productive and interactive for a larger group. The discussion duration is also affected by the diversity and the breadth of the topics discussed, since the weekly context switch in applied research material often requires the instructors to repeat concepts or clarify methods and results in more detail. The extra contact hour would allow for longer in-class discussion of the topics (especially since class capacity will increase), would benefit the students academically by allowing a more comprehensive evaluation of the diverse research themes and offering a better appreciation for current trends in the field.

Further, each week students are required to submit a 1-2 page summary of the research talk from the previous week. Over the course of the semester, this amounts to 13 weekly reports that correspond to a significant quantity of student writing and synthesis of diverse topics, which warrants the WI designation.

Note that students may also use the additional in-class time (contact hour) to discuss ideas and draft outlines for their written summaries.

Due to high demand, we now offer the course during both the fall and spring semesters. Thus, the verbiage about the course being taught only in the fall needs to be removed. Finally, MED 4229 needs to be removed as a prerequisite as the department has no plans to continue offering this course.

The department also proposes changes to the prerequisites of other courses, including BIO 4250 and BIO 4910. These changes will help address some of the limitations imposed by the prerequisites currently in place. Finally, other minor changes include fixing the course title for BIO 3450 and removing good-standing GPA requirements and verbiage about the number of times students can repeat a course.

CHANCELLOR’S REPORT FORM

Section AIII: Changes in Degree Programs

All.1. The following revisions are proposed for the Biological Sciences Department
Program: Bachelor of Science in Biomedical Informatics
Program Code: BIB
Effective: Fall 2022

FROM:	TO:												
<p>ADMISSION INTO THE PROGRAM</p> <p>Students applying for admission must meet the College standards for admission into a baccalaureate program, must have one year of high school biology or chemistry and must have completed the following requirements:</p> <ul style="list-style-type: none"> • One semester of college-level English with a grade of C or higher • Be eligible to enroll in MAT 1375 or higher (or have completed MAT 1275 or the equivalent with a grade of C or higher) • BIO 1101 or the equivalent with a grade of C or higher • CST 1101 or the equivalent with a grade of C or higher <p>In addition, transfer students must have a minimum GPA of 2.5</p> <ul style="list-style-type: none"> • Exceptions can be made with the permission of the department chairperson <p>PROGRESSION AND GRADUATION REQUIREMENTS</p> <ul style="list-style-type: none"> • Students must maintain a cumulative GPA of 2.5 • Students must achieve a C or higher in all required courses in the major • Students can only repeat a required course once <table border="0" data-bbox="126 1258 1045 1461"> <thead> <tr> <th>REQUIRED COURSES IN THE MAJOR</th> <th>Credits</th> </tr> </thead> <tbody> <tr> <td>General Education Common Core: I – Required Core ¹ (4 courses, 12 credits)</td> <td>42 credits</td> </tr> <tr> <td>English Composition (2 courses, 6 credits) ENG 1101 English Composition I</td> <td>3</td> </tr> </tbody> </table>	REQUIRED COURSES IN THE MAJOR	Credits	General Education Common Core: I – Required Core ¹ (4 courses, 12 credits)	42 credits	English Composition (2 courses, 6 credits) ENG 1101 English Composition I	3	<p>ADMISSION INTO THE PROGRAM</p> <p>Students applying for admission must meet the College standards for admission into a baccalaureate program, must have one year of high school biology or chemistry and must have completed the following requirements:</p> <ul style="list-style-type: none"> • One semester of college-level English with a grade of C or higher • Be eligible to enroll in MAT 1375 or higher (or have completed MAT 1275 or the equivalent with a grade of C or higher) • BIO 1101 or the equivalent with a grade of C or higher • CST 1101 or the equivalent with a grade of C or higher <p>In addition, transfer students must have a minimum GPA of 2.5</p> <ul style="list-style-type: none"> • <u>Exceptions can be made with the permission of the department chairperson or program director.</u> <p>PROGRESSION AND GRADUATION REQUIREMENTS</p> <ul style="list-style-type: none"> • <u>Students must achieve a C or higher in all required courses in the major. This includes courses offered by other departments, but not courses taken to satisfy Pathways requirements.</u> <table border="0" data-bbox="1045 1258 1969 1461"> <thead> <tr> <th>REQUIRED COURSES IN THE MAJOR</th> <th>Credits</th> </tr> </thead> <tbody> <tr> <td>General Education Common Core: I – Required Core ¹ (4 courses, 12 credits)</td> <td>42 credits</td> </tr> <tr> <td>English Composition (2 courses, 6 credits) ENG 1101 English Composition I</td> <td>3</td> </tr> </tbody> </table>	REQUIRED COURSES IN THE MAJOR	Credits	General Education Common Core: I – Required Core ¹ (4 courses, 12 credits)	42 credits	English Composition (2 courses, 6 credits) ENG 1101 English Composition I	3
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<p>ENG 1121 English Composition II 3</p> <p>Mathematical and Quantitative Reasoning^{1,2} 3</p> <p>Life and Physical Sciences ^{1,2} 3</p> <p>II – Flexible Core (6 courses, 18 credits) From the list of approved courses, select one course from each of the following areas; no more than two courses may be selected from any discipline.</p> <p>World Cultures and Global Issues 3</p> <p>US Experience in its Diversity 3</p> <p>Creative Expression 3</p> <p>Individual and Society 3</p> <p>Scientific World¹ 3</p> <p>One additional course from any Flexible Core area¹. 3</p> <p>III - College Option requirement 12-13 credits</p> <p>One course in speech/ oral communication 3</p> <p>One interdisciplinary liberal arts and sciences course¹. 3</p> <p>Two additional liberal arts courses^{1,3} to reach a minimum total of 42 credits in general education. In meeting their general education requirements overall, students must take at least one advanced liberal arts course^{1,3} or two sequential courses in a foreign language.</p> <p>6</p> <p>Writing Intensive Requirement</p> <p>Students at New York City College of Technology must complete two courses designated WI for the associate level, one from GenEd and one from the major; and two additional courses designated WI for the baccalaureate level, one from GenEd and one from the major.</p> <p>Students must complete a minimum of 60 credits in General Education. Many of these credits can be accomplished by taking program required courses.</p>	<p>ENG 1121 English Composition II 3</p> <p>Mathematical and Quantitative Reasoning^{1,2} 3</p> <p>Life and Physical Sciences ^{1,2} 3</p> <p>II – Flexible Core (6 courses, 18 credits) From the list of approved courses, select one course from each of the following areas; no more than two courses may be selected from any discipline.</p> <p>World Cultures and Global Issues 3</p> <p>US Experience in its Diversity 3</p> <p>Creative Expression 3</p> <p>Individual and Society 3</p> <p>Scientific World¹ 3</p> <p>One additional course from any Flexible Core area¹. 3</p> <p>III - College Option requirement 12-13 credits</p> <p>One course in speech/ oral communication 3</p> <p>One interdisciplinary liberal arts and sciences course¹. 3</p> <p>Two additional liberal arts courses^{1,3} to reach a minimum total of 42 credits in general education. In meeting their general education requirements overall, students must take at least one advanced liberal arts course^{1,3} or two sequential courses in a foreign language.</p> <p>6</p> <p>Writing Intensive Requirement</p> <p>Students at New York City College of Technology must complete two courses designated WI for the associate level, one from GenEd and one from the major; and two additional courses designated WI for the baccalaureate level, one from GenEd and one from the major.</p> <p>Students must complete a minimum of 60 credits in General Education. Many of these credits can be accomplished by taking program required courses.</p>
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PROGRAM-SPECIFIC DEGREE REQUIREMENTS 73-75 CREDITS**Biomolecular Science Courses 24 credits**

BIO 1101	Biology I	4
BIO 1201	Biology II	4
BIO 2450	Genetics	4
BIO 3620	Molecular and Cell Biology	4
CHEM1110	General Chemistry I	4
CHEM1210	General Chemistry II	4

Math and Computer Science 16-17 credits

MAT 1475	Calculus I	4
MAT 1372	Statistics with Probability	3
or		
MAT 2572	Probability and Mathematical Statistics	4
CST 1101	Problem Solving with Computer Programming	3
CST 1201	Programming Fundamentals	3
or		
CST 2403	C++ Programming I	3
CST 1204	Database System Fundamentals	3

Biomedical Informatics Core Courses 17 credits

BIO2110	Programming for Biologists	4
BIO 3350	Bioinformatics I	4
BIO 3352	Bioinformatics II	4
BIO 3450	Biomedical Data Analysis I	4
BIO 4050	Biomedical Informatics Colloquium	1

Research Experience 5 credits

BIO 4900	Internship/Research in Biomedical Informatics	5
or		
BIO 4910	Independent Research Study: Information Literacy and	2

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BIO 1101	Biology I	4
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Biomedical Informatics Core Courses 17 credits

BIO2110	Programming for Biologists	4
BIO 3350	Bioinformatics I	4
BIO 3352	Bioinformatics II	4
<u>BIO 3450</u>	<u>Biomedical Data Analytics I</u>	<u>4</u>
<u>BIO 4550</u>	<u>Biomedical Informatics Colloquium</u>	<u>1</u>

Research Experience 5 credits

BIO 4900	Internship/Research in Biomedical Informatics	5
or		
BIO 4910	Independent Research Study: Information Literacy and	2

<p>BIO 4920 Independent Research Study: Guided Research 3</p> <p>Biomedical Informatics Specialization Courses Choose 3 courses from the following list 11-12 credits</p> <p>BIO 4150 Computational Genomics 4 BIO 4350 Molecular Modeling of Biological Molecules 4 BIO 4450 Biomedical Data Analytics II 4 BIO 3601 Biochemistry 4 BIO 4250 Molecular Evolution and Phylogenetics 3</p> <p>Total General Education Common Core credits: 42 Total program-specific required and elective credits: 78 Total Credits for Degree: 120</p> <p>¹ Students are strongly urged to consult degree requirements for “double-duty” courses: degree requirements that also meet CUNY Pathways general education requirements in that category.</p> <p>² Biomedical Informatics is a STEM degree program, requiring 4- or 5-credit courses in mathematics and science. Students may elect to use their required 4- or 5-credit math or science courses to meet Common Core requirements in Mathematical and Quantitative Reasoning, Life/ Physical Sciences, or Scientific World.</p> <p>³ Complete lists of liberal arts and sciences courses and advanced liberal arts courses, as well as semester-specific lists of interdisciplinary courses and writing intensive courses, are available online at the City Tech Pathways website.</p> <p>⁴ The number of free elective credits will vary depending upon the program-specific courses students use to meet Common Core requirements.</p>	<p>BIO 4920 Independent Research Study: Guided Research 3</p> <p>Biomedical Informatics Specialization Courses Choose 3 courses from the following list 11-12 credits</p> <p>BIO 4150 Computational Genomics 4 BIO 4350 Molecular Modeling of Biological Molecules 4 BIO 4450 Biomedical Data Analytics II 4 BIO 3601 Biochemistry 4 BIO 4250 Molecular Evolution and Phylogenetics 3</p> <p>Total General Education Common Core credits: 42 Total program-specific required and elective credits: 78 Total Credits for Degree: 120</p> <p>¹ Students are strongly urged to consult degree requirements for “double-duty” courses: degree requirements that also meet CUNY Pathways general education requirements in that category.</p> <p>² Biomedical Informatics is a STEM degree program, requiring 4- or 5-credit courses in mathematics and science. Students may elect to use their required 4- or 5-credit math or science courses to meet Common Core requirements in Mathematical and Quantitative Reasoning, Life/ Physical Sciences, or Scientific World.</p> <p>³ Complete lists of liberal arts and sciences courses and advanced liberal arts courses, as well as semester-specific lists of interdisciplinary courses and writing intensive courses, are available online at the City Tech Pathways website.</p> <p>⁴ The number of free elective credits will vary depending upon the program-specific courses students use to meet Common Core requirements.</p>
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Rationale: Exceptions to entry requirements may be made by either the Chair or Program Director. We are removing the good-standing GPA requirement of 2.5, as we are no longer able to enforce this policy. Similarly, we are also removing the verbiage about students being able to repeat a course only once. We also add text stating that a grade of C or better is required for major-specific courses. This requirement includes courses offered by other departments (e.g. CHEM, CST), but excludes courses taken to fulfill Pathways requirements. Next, we are renaming BIO 3450 to better match the course title with the subsequent course in the series. Third, we are changing the course number for BIO 4050 because of a change in contact hours (see below).

Section AIV: Change to an Existing Course Number and/or Credits**Changes to be offered in the Biological Sciences department****BIO 4050 – Biomedical Informatics Colloquium**

Department(s)	Biological Sciences		
Academic Level	<input checked="" type="checkbox"/> Regular <input type="checkbox"/> Compensatory <input type="checkbox"/> Developmental <input type="checkbox"/> Remedial		
Subject Area	Biomedical Informatics		
Course Prefix	BIO		
Course Number	4550		
Course Title	Biomedical Informatics Colloquium		
Catalog Description	A seminar-based course that exposes students to current research topics in the field of biomedical informatics (broadly defined). Course structure can include presentations by invited speakers and/or student-led discussions of recent peer-reviewed research papers (<5 years old).		
Prerequisite	BIO 3352		
Corequisite			
Pre- or corequisite			
Credits	1		
Contact Hours	1 lecture hour, 2 conference hours		
Liberal Arts	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Course Attribute (e.g. Writing Intensive, etc)	WI		
Course Applicability	<input checked="" type="checkbox"/> Major <input type="checkbox"/> Gen Ed Required <input type="checkbox"/> Gen Ed - Flexible <input type="checkbox"/> Gen Ed - College Option <input type="checkbox"/> English Composition <input type="checkbox"/> World Cultures <input type="checkbox"/> Speech <input type="checkbox"/> Mathematics <input type="checkbox"/> US Experience in its Diversity <input type="checkbox"/> Interdisciplinary <input type="checkbox"/> Science <input type="checkbox"/> Creative Expression <input type="checkbox"/> Advanced Liberal Arts <input type="checkbox"/> Individual and Society <input type="checkbox"/> Scientific World		

Degree Requirement Equivalent	BIO 4050
Effective Term	Fall 2022

Rationale: We are proposing to increase the number of contact hours from 2 to 3. Because of the format of the course, the additional hour will substantially improve student learning outcomes by enabling more student-student interaction and discussion about original research in the field of biomedical informatics. In addition to changing the number of contact hours, we will add the writing intensive designation (WI) to the course. Each week, students are required to submit a 1-2 page written summary of the research presented during the previous week. Thus, the course is also used to substantially improve student writing skills. Third, we wish to remove the phrase “This course is only offered once per year” from the course description. The department is currently offering the course in both the spring and fall semesters. See below for current course outline.

		NEW YORK CITY COLLEGE OF TECHNOLOGY The City University Of New York		School of Arts and Sciences Department of Biological Sciences	
Course Information					
Course title:	Biomedical Informatics Colloquium				
Course code:	BIO4050				
Credit Hours:	1 credit hour	1 lecture hour and 2 conference hours (proposed) (virtual or in-person)			
Prerequisites:	BIO3352 or MED4229				
Text:	None. The instructor may give reading material, in the form of articles and papers, periodically.				
Course Description:	A seminar-based course that exposes students to current research topics in the fields of Bioinformatics and Medical Informatics. Weekly presentations by invited speakers and/or faculty introduce students to the broad diversity of research areas in both fields, and engages them in critical thinking and writing. Online lectures and reading activities may also be given periodically.				
Grading Procedure (see Grading Policy for details)					
Attendance and participation are required. Weekly structured reports/summaries written about each lecture/presentation given either in-person or online; each due approximately one week after their respective visit. Reports will be graded based on the Grading Rubric for Seminar Reports (see last page). Grades are also based on student-led discussions of seminars.					
Course Coordinators					
Dr. Christopher Blair			Dr. Evgenia Giannopoulou		
(718) 260-5342	CBlair@citytech.cuny.edu		(718) 260-4971	EGiannopoulou@citytech.cuny.edu	
Instructor					
Dr. Evgenia Giannopoulou					
Office:	A-502B				
E-mail:	egianopoulou@citytech.cuny.edu				
Phone:	718-254-4971				

Extended Course Description

BIO4050 is a one-credit seminar course that is intended to introduce students to current research themes in Bioinformatics and Medical Informatics. Students will attend a seminar each week given by either an external or internal researcher in the field of Biomedical Informatics. Biomedical Informatics in the course is broadly defined, and can encompass diverse research disciplines such as: genomics (broadly defined), systematics and phylogenetics, population genetics, biodiversity informatics, transcriptomics, metagenomics, epigenomics, molecular modeling and drug design, EHR algorithm development and usage, knowledge discovery and data mining from big data in biology, knowledge representation standards, medical information extraction and natural language processing, big data tools and methods for computational medicine, and more. Approximately half of the seminars will be Bioinformatics-based and half will be Medical Informatics-based, in order to provide an unbiased and comprehensive overview of Biomedical Informatics. Some seminars may be pre-recorded by speakers or given online, in which case students are required to view the lecture on their own time and write-up a summary report. Blackboard will be used heavily in this course.

Grading Policy

The grade for this course will be based on weekly attendance and participation, as well as on written reports of the weekly seminars. The instructor will provide a structured format for the summaries. Reports/summaries should be 1-2 pages long (double-spaced) and demonstrate a firm understanding of the primary objectives, hypotheses, methods, and results of the research presented. Students are also encouraged to elaborate on potential future research directions in their summary report (i.e., how the presented research can be expanded upon). When writing the reports, students should try to connect the research presented to topics and analytical tools learned in their classes. Grades will be assigned based on the Grading Rubric for Seminar Reports (see table below). Students are NOT allowed to work in groups for the reports, although they are encouraged to discuss the research findings with peers to enhance learning outcomes. One report will be dropped from the calculation of the final course grade to accommodate students who may miss a seminar due to unforeseen circumstances. All reports are due to the instructor prior to the following week. Reports are to be submitted through Blackboard.

In addition to reports and participation, grades will be based on student-led presentations about the seminars. Each week, the first ~30 minutes of class will be devoted to discussing the seminar from the previous week. One randomly chosen student (volunteers are highly encouraged) will be selected to lead the discussion each week. Thus, it will be necessary to pay close attention to speakers and take good notes to be prepared to lead the discussion. Discussion should follow a similar format to the written reports and include background information about the topic, what the researchers wanted to test, the major findings of the project, and potential future directions.

Student performance on this course will be evaluated as follows:

CRITERIA	DESCRIPTION	POINTS
In-class participation	Weekly attendance and participation in discussion	<u>20%</u>
Student-lead discussions	Performance on student-lead discussions of weekly seminars	<u>20%</u>
Seminar reports	Weekly submission of reports for each seminar/presentation.	<u>60%</u>
TOTAL		<u>100%</u>

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

Netiquette

This syllabus contains the policies and expectations that have been established for this course. These policies and expectations are intended to create a productive learning atmosphere for all students. Please bring any concerns you may have to my attention. To create and preserve a course atmosphere that optimizes teaching and learning, all students share the responsibility of creating a positive learning environment. Students are expected to conduct themselves in a manner that does not disrupt teaching or learning, and they are expected to follow these standards: Course discussions should be civilized and respectful to everyone and relevant to the topic we are discussing. Discussion forums are meant to allow for a variety of viewpoints. This can only happen if we respect one another and our differences. I will begin online live sessions promptly at the designated time and students are expected to be on time to these sessions. Please refrain from engaging in other tasks during the online session as it is disruptive to the instructors and to others around you.

Attendance Policy

Although City Tech and CUNY do not have a formal attendance policy, attendance and participation in this course is necessary to obtain a passing grade. Missing class means missing the seminar, which means that students will not be able to discuss the research or submit the written report.

Academic Integrity

City Tech and CUNY have strict policies regarding academic integrity, cheating and plagiarism. Cheating can be defined as giving, receiving, using, or attempting to use unauthorized study materials for exams or other assignments. Punishment for cheating/plagiarism is at the discretion of the instructor, and can range anywhere from receiving a zero for the assignment or exam to receiving a zero for the entire course and possibly expulsion from the college. Disciplinary actions are usually undertaken with consultation from the Department Chair and Dean. Violations should also be reported to the City Tech Academic Integrity Committee.

Plagiarism can be defined as portraying someone else's ideas as your own without proper acknowledgement. An example of plagiarism would be copying or paraphrasing text from a published research article for your own report without the appropriate citations. Students can also plagiarize other student's work and even their own previous reports (e.g., reports submitted for credit in other classes or at other institutions)! Plagiarism is a serious offense that is not taken lightly by CUNY or New York State. Be careful!

College Statement on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion.

So what is the proper way to cite? Suppose you read a published research paper that provided evidence linking UV radiation to skin cancer. You are then tasked with writing your own report on potential factors that cause skin cancer. Below are two potential examples of an appropriate citation:

- a. Blair et al. (2018) find evidence that UV radiation damages the DNA in skin cells, which may lead to the formation of cancer.
- b. UV radiation likely damages the DNA in skin cells, which may lead to the formation of cancer (Blair et al. 2018).

A citation is needed because this statement is not common knowledge and portrays the results of original research. Note that the phrases are **NOT** direct quotes from the imaginary article. Thus, you must (1) put statements into your own words, and (2) place a citation before or after the statement.

Weekly Schedule Spring 2021

All classes are synchronous (i.e., meeting on Tuesdays 12-1.40am), except when “Asynchronous” is noted. If any changes occur, the instructor will notify you on Blackboard.

Week	Contents	Date
1	Introduction to the course	Feb 2
2 <i>Asynchronous</i>	Online talk by Yaniv Elrich, PhD CEO of Eleven Therapeutics and the Chief Science Officer of MyHeritage, a global consumer genomics company. Topic: “Genetic privacy” (link will be provided on Blackboard)	Feb 9
3	Zeynep Gumus, PhD Assistant Professor at Icahn School of Medicine at Mount Sinai Topic: “Interactive, visual exploration of massive -omics datasets”	Feb 16
4	Mohammad Faysel, PhD Associate Professor at SUNY Downstate Health Sciences University Topic: “Applications of mHealth in Healthcare”	Feb 23
5 <i>Asynchronous</i>	Online talk by Chris Mason, PhD Associate Professor at Weill Cornell Medicine Topic: “Precision Medicine for Astronauts and COVID Patients” (link will be provided on Blackboard)	Mar 2
6 <i>Asynchronous</i>	Online talk by Olivier Elemento, PhD Professor at Weill Cornell medicine, Director of the Englander Institute for Precision Medicine Topic: “Introduction to Big Data at the Englander Institute for Precision Medicine” (link will be provided on Blackboard)	Mar 9
7	Mark Weiner, MD Deputy CIO for Health System and Research Analytics, Professor of Clinical Healthcare Policy and Research, Department of Healthcare Policy & Research, Weill Cornell Medicine Topic: “Truth versus Truthiness in Clinical Data”	Mar 16
8	Thomas Champion, PhD Director, Research Informatics, Weill Cornell Medicine Associate Professor of Research in Healthcare Policy & Research Topic: “Supporting Researchers with Electronic Patient Data”	Mar 23
9	Anna Yeaton PhD Candidate at NYU School of Medicine, Sackler Institute of Graduate Biomedical Sciences Topic: “Prognostic patterns from histopathology slides using deep learning”	Apr 6
10 <i>Asynchronous</i>	Online talk by Manolis Kellis, PhD Professor at MIT and Broad Institute Topic: “Integrative analysis of epigenomic maps” (link will be provided on Blackboard)	Apr 13

11 <i>Asynchronous</i>	Online talk by Olga Troyanskaya Professor of Computer Science and the Lewis-Sigler Institute for Integrative Genomics at Princeton University Topic: “Decoding the human genome with deep learning models” (link will be provided on Blackboard)	Apr 20
12	Armando Solis, PhD Associate Professor, Biological Sciences, CityTech, CUNY Topic: “How did life begin? The continuing search for the first functional proteins”	Apr 27
13 <i>Asynchronous</i>	Online talk by Saba Akbar PhD Researcher at Macquarie University Topic: “Automation in nursing decision support systems” (link will be provided on Blackboard)	May 4
14	Chunhua Weng, PhD Professor of Biomedical Informatics, Department of Biomedical Informatics, Columbia University Topic: “Text knowledge engineering and health data analytics”	May 11
15	In class discussion/summary of the course	May 25

Grading Rubric for Discussion Lead

Criteria	Excellent	Very Good	Poor	Unacceptable
DISCUSSION Preparedness and clarity 1. Presentation 2. Structure 3. Content 30 points max. Discussions will count for 20% of final grade	1. Shows an excellent understanding of topic. Presentation of material is clear and encourages participation from peers. (9 pts)	1. Shows a good understanding of research and is able to clearly articulate ideas to peers. Instructor may rarely clarify ideas or guide students. (6-8 points)	1. Demonstrates basic understanding of material and is able to initiate some discussion. Instructor may have to lead periodically. (3-5 points)	1. Clear lack of preparation and understanding of the research seminar. Unable to present the material and initiate discussion. (1-2 points)
	2. The discussion is well structured. Clearly provides background information, states methods, results and conclusions (9 pts)	2. Minor issues with structure and style may be present. Flow of discussion generally concise and understandable (6-8 points)	2. Issues with structure and style are present. Flow of discussion difficult to follow, although purpose may be intelligible (3-5 points)	2. Major issues with structure and style that impede meaning. Difficult to understand purpose of research. (1-2 points)
	3. Content is relevant to the seminar presented, original, clear and shows the student(s) strong engagement and contribution. Student is able to formulate a cohesive story. (12 pts)	3. Content is relevant to the seminar presented, relatively clear and shows the student(s) engagement and contribution. (7-11 pts)	3. Content unclear and only slightly relevant to the seminar presented. The student(s) engagement is unclear. (3-6 pts)	3. Content and discussion unclear and not relevant to the seminar presented (1-2 points)

Grading Rubric for Seminar Reports

Criteria	Excellent	Very Good	Poor	Unacceptable
REPORT Writing quality and clarity 1. Writing 2. Structure 3. Content 30 points max for each report. 13 reviews total (one report will be dropped from the calculation of the final course grade to accommodate students who may miss a seminar due to unforeseen circumstances) All reviews will count for 60% of final grade	1. Writing is clear, comprehensible, engaging and appropriate. None or few (1-4) minor grammar, punctuation or spelling errors may be present that do not impede understanding. (9 pts)	1. Writing is generally clear. Some (4-8) minor grammar, punctuation or spelling errors may be present that do not impede understanding. (6-8 points)	1. Writing is unclear and at times confusing to the reader. More than 8 grammar, punctuation or spelling errors are present and impede understanding. (3-5 points)	1. Issues with writing make the report difficult to understand. Frequent grammar, punctuation or spelling errors are present. (1-2 points)
	2. The report is well structured. Clearly provides background information, states methods, results and conclusions (9 pts)	2. Minor issues with structure and style may be present. Flow of report generally concise and readable (6-8 points)	2. Issues with structure and style are present. Flow of report difficult to follow, although purpose may be intelligible (3-5 points)	2. Major issues with structure and style that impede meaning. Missing sections. Difficult to understand purpose of research. (1-2 points)
	3. Content is relevant to the seminar presented, original, clear and shows the student(s) strong engagement and contribution. Sections are well connected with each other and make a cohesive story. (12 pts)	3. Content is relevant to the seminar presented, relatively clear and shows the student(s) engagement and contribution. Sections are relatively well connected but could be improved. (7-11 pts)	3. Content unclear and only slightly relevant to the seminar presented. The student(s) engagement is unclear. Sections very loosely connected. (3-6 pts)	3. Content unclear and not relevant to the seminar presented (1-2 points)

Section AV: Changes in Existing Courses**Changes to be offered in the Biological Sciences department****BIO 4250 – Molecular Evolution and Phylogenetics**

CUNYFirst Course ID	Can be found in the CUNYfirst course catalog		
Course Number and Title	BIO 4250 – Molecular Evolution and Phylogenetics		
FROM:		TO:	
Department(s)		Department(s)	
Course Number		Course Number	
Course Title		Course Title	
Prerequisite	BIO 2250	Prerequisite	<u>BIO 3352</u>
Corequisite		Corequisite	
Pre- or corequisite		Pre- or corequisite	
Hours		Hours	
Credits		Credits	
Description		Description	
Requirement Designation		Requirement Designation	
Liberal Arts	[] Yes [] No	Liberal Arts	[] Yes [] No
Course Attribute (e.g. Writing Intensive, Honors, etc)		Course Attribute (e.g. Writing Intensive, Honors, etc)	

Course Applicability	<input type="checkbox"/> Major <input type="checkbox"/> Gen Ed Required <input type="checkbox"/> English Composition <input type="checkbox"/> Mathematics <input type="checkbox"/> Science <input type="checkbox"/> Gen Ed - Flexible <input type="checkbox"/> World Cultures <input type="checkbox"/> US Experience in its Diversity <input type="checkbox"/> Creative Expression <input type="checkbox"/> Individual and Society <input type="checkbox"/> Scientific World <input type="checkbox"/> Gen Ed - College Option <input type="checkbox"/> Speech <input type="checkbox"/> Interdisciplinary <input type="checkbox"/> Advanced Liberal Arts	Course Applicability	<input type="checkbox"/> Major <input type="checkbox"/> Gen Ed Required <input type="checkbox"/> English Composition <input type="checkbox"/> Mathematics <input type="checkbox"/> Science <input type="checkbox"/> Gen Ed - Flexible <input type="checkbox"/> World Cultures <input type="checkbox"/> US Experience in its Diversity <input type="checkbox"/> Creative Expression <input type="checkbox"/> Individual and Society <input type="checkbox"/> Scientific World <input type="checkbox"/> Gen Ed - College Option <input type="checkbox"/> Speech <input type="checkbox"/> Interdisciplinary <input type="checkbox"/> Advanced Liberal Arts
Effective Term	To be implemented in Fall 2022		

Rationale: The current prerequisite for BIO 4250 is BIO 2250 (Evolution), which is an elective for BIB majors. Thus, as it currently stands, very few students would be eligible for BIO 4250. We are proposing to replace BIO 2250 with BIO 3352 (Bioinformatics II), which is a required course for all BIB majors. This change would align BIO 4250 with other upper level BIB electives that also require BIO 3352 as a prerequisite. Below you will find the current course outline for BIO 4250.

		NEW YORK CITY COLLEGE OF TECHNOLOGY The City University Of New York		School of Arts and Sciences Department of Biological Sciences	
Course Information					
Course title:		Molecular Evolution and Phylogenetics			
Course code:		BIO4250			
Credit Hours:		3 credit hours	Lecture and in-class discussions		
Prerequisites:		BIO 3352 (proposed)			
Text:		An Introduction to Molecular Evolution and Phylogenetics (2 nd edition). By: Bromham, Lindell			
Course Description:		This course provides students with a broad introduction to the field of molecular evolution and phylogenetics. The first portion of the course focuses on foundational genetic and evolutionary principles, whereas the latter half of the course discusses how molecular phylogenies are created from molecular sequences and can be used to test specific evolutionary hypotheses. Discussions of specific case studies complement lectures.			
Grading Procedure (see Grading Policy for details)					
Attendance and participation are required. Grades will be based on four exams, case studies, participation in discussions, and a short presentation on a recent (<5 years) article related to molecular evolution and phylogenetics.					
Course Coordinators					
Dr. Christopher Blair					
(718) 260-5342		CBlair@citytech.cuny.edu			
Instructor					
Dr. Christopher Blair					
(718) 260-5342; CBlair@citytech.cuny.edu; A-501A					

Extended Course Description

BIO3475 is a 3-credit course intended to introduce students to how molecular phylogenies can be used to test a variety of evolutionary hypotheses. The course begins with a review of foundational genetic and evolutionary principles. These topics are followed by several chapters on molecular phylogenetics, hypothesis testing, and methods of statistical analysis. One major goal of the course is to provide students with an understanding of the field of molecular evolution without the use of complex equations and calculations. Blackboard will be used heavily in this course.

Grading Policy

The grade for this course will be based on weekly attendance and participation, four exams, individual case studies, and a short presentation on recent research in molecular evolution and phylogenetics. Exams will be a combination of multiple choice, short answer, true/false, and fill-in-the-blank. Following each chapter in the textbook there will be two case studies. Students are expected to carefully read through the case studies at home or in class (time permitting) and submit carefully written answers **to one of the two** questions presented. Answers to case study questions are to be submitted through Turnitin on Blackboard. If time permits, there will be periodic class discussions of the material each week.

Each student will be required to find and present a recent article (<5 years old) related to the field of molecular evolution and phylogenetics. The City Tech library is an excellent resource to help you search for a relevant article. Some specific journals to search include the following: *Molecular Ecology*, *Molecular Ecology Resources*, *Molecular Phylogenetics and Evolution*, *Molecular Biology and Evolution*, *Systematic Biology*, *Biological Journal of the Linnean Society*, *Journal of Heredity*, *Proceedings of the Royal Society of London B*. Each student is required to email the potential paper to the instructor for approval prior to beginning the assignment. Presentations should be ~15 min in length and include an overview of the primary question(s) of interest, a brief overview of the methods the researchers used to address their questions/hypotheses, the major findings of the study, and conclusions, limitations, and future directions.

Student performance on this course will be evaluated as follows:

CRITERIA	POINTS
Exams	<u>60%</u>
Case studies	<u>20%</u>
Presentation	<u>10%</u>
Participation	<u>10%</u>
Total	<u>100%</u>

Attendance Policy

Although City Tech and CUNY do not have a formal attendance policy, attendance and participation in this course is necessary to obtain a passing grade. Missing class means missing the lecture, which means that students will not be able to discuss topics in class and will likely not perform as well on exams.

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

Academic Integrity

City Tech and CUNY have strict policies regarding academic integrity, cheating and plagiarism. Cheating can be defined as giving, receiving, using, or attempting to use unauthorized study materials for exams or other assignments. Punishment for cheating/plagiarism is at the discretion of the instructor, and can range anywhere from receiving a zero for the assignment or exam to receiving a zero for the entire course and possibly expulsion from the college. Disciplinary actions are usually undertaken with consultation from the Department Chair and Dean. Violations should also be reported to the City Tech Academic Integrity Committee.

Plagiarism can be defined as portraying someone else's ideas as your own without proper acknowledgement. An example of plagiarism would be copying or paraphrasing text from a published research article for your own report without the appropriate citations. Students can also plagiarize other student's work and even their own previous reports (e.g., reports submitted for credit in other classes or at other institutions)! Plagiarism is a serious offense that is not taken lightly by CUNY or New York State. Be careful!

College Statement on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion.

Course Need and Justification

This course will serve as an upper level elective within the Biomedical Informatics program. Although the department currently offers several related courses (e.g. Genetics, Evolution, Bioinformatics I and II), the proposed course differs in several important ways. First, the course will be an upper level elective for students after they have taken Bioinformatics II (BIO 3352). A large portion of the course will focus on basic molecular evolutionary principles and concepts, significantly expanding on the topics covered in previous courses. The course will also fill a much-needed gap for training students in basic molecular phylogenetics research. Phylogenetic trees inferred from molecular sequences are now used in some capacity for almost all fields of biology. Unfortunately, these topics are covered at a very basic/rudimentary level in the current course offerings. This shortcoming has progressed through to student internships, many of which use evolutionary trees. This course will remedy the situation by providing students with a comprehensive introduction to both the theory behind evolutionary trees and also expose them to some of the common computational methods used to infer them. The course will most likely be offered once per year with an initial cap of 16 students.

Sample Weekly Schedule

All readings are from “An Introduction to Molecular Evolution and Phylogenetics” by Bromham, L.

Week	Contents	Reading	Date
1	Introduction and DNA -Reading the story in DNA -Overview of textbook -Review of genetics and heredity -DNA extraction - <i>Case studies</i>	Ch. 1: 2-30 Ch. 2: 31-60	
2	Mutation -Overview of mutation -SNPs -Estimating mutation rates - <i>Case studies</i>	Ch. 3: 61-94	
3	DNA Replication -Overview of DNA replication -DNA amplification and PCR -DNA sequence evolution - <i>Case studies</i>	Ch. 4: 95-130	
4	Exam 1: Background, mutation, DNA replication and PCR		
	Genome -Evolution of genome size -Repeat sequences -Transposable elements - <i>Case studies</i>	Ch. 5: 131-166	
5	Gene -Molecular properties of genes -Review of transcription and translation -Regulation of gene expression -Gene sequence evolution - <i>Case studies</i>	Ch. 6: 167-196	
6	Natural Selection -Variation in natural populations -Fitness, linkage, and human evolution - <i>Case studies</i>	Ch. 7: 197-228	
7	Genetic Drift -The neutral theory of evolution -Drift and effective population size -Inbreeding and homozygosity -Substitution patterns - <i>Case studies</i>	Ch. 8: 229-261	
8	Exam 2: Genes, genomes, natural selection and genetic drift		

	Species -Taxonomy and classification -Divergence, speciation and hybrid incompatibility -Defining species through DNA-based methods - <i>Case studies</i>	Ch. 9: 262-294	
9	Alignment -Homology vs. analogy/homoplasy -DNA homology vs. morphological homology -Indels and gaps -Manual and automated multiple sequence alignment	Ch. 10: 295-328	
10	Phylogeny -Tree-based thinking in evolutionary biology -Principles and characteristics of phylogenetic trees -Methods of phylogenetic inference -Phylogenetic networks - <i>Case studies</i>	Ch. 11: 329-368	
11	Hypotheses -Evaluating and comparing phylogenetic trees -Models of molecular evolution -Maximum likelihood and Bayesian inference of trees -Statistical methods of tree support - <i>Case studies</i>	Ch. 12: 369-402	
12	Exam 3: Species, sequence alignment, statistical methods of phylogeny reconstruction		
	Substitution Rates -Rate variation across sites and branches of trees -Potential causes of evolutionary rate variation -Testing for rate variation - <i>Case studies</i>	Ch. 13: 403-437	
13	Dates/Divergence Time Estimation -The importance of the fossil record -Estimation of divergence times -Gene divergence vs. population/species divergence -Strict vs. relaxed molecular clocks - <i>Case studies</i>	Ch. 14: 438-483	
14	Student Presentations	None	
15	Student Presentations/Review for Final	None	
	Final Exam (Cumulative)		

Grading Rubric for Student Presentations

Criteria	Excellent	Very Good	Good	Unacceptable
Presentation Preparedness and clarity 4. Preparation 5. Structure/Style 6. Content 30 points max. Presentation will count for 10% of final grade	1. Shows an excellent understanding of research paper. Presentation of material is clear and encourages discussion from peers. (9 pts)	1. Shows a good understanding of research and is able to clearly articulate ideas to peers. Instructor may rarely clarify ideas or concepts. (6-8 points)	1. Demonstrates basic understanding of material and is able to initiate some discussion. Instructor may have to lead periodically. (3-5 points)	1. Clear lack of preparation and understanding of the research paper. Unable to present the material and initiate discussion. (1-2 points)
	2. The presentation is well structured. Clearly provides background information, states methods, results and conclusions (9 pts)	2. Minor issues with structure and style may be present. Flow of presentation generally concise and understandable (6-8 points)	2. Issues with structure and style are present. Flow of presentation difficult to follow, although purpose may be intelligible (3-5 points)	2. Major issues with structure and style that impede meaning. Difficult to understand purpose of research. (1-2 points)
	3. Content is relevant to the course objectives. Article <5 years old. (12 pts)	3. Content and presentation is moderately relevant to course, and shows the student's engagement and contribution. Article <5 years old. (7-11 pts)	3. Content and presentation weakly relevant to course. Article >5 years old. (3-6 pts)	3. Content and presentation distantly related to course objectives/topics. Article >5 years old. (1-2 points)

Discipline Specific

LEARNING OUTCOMES	ASSESSMENT
<ul style="list-style-type: none"> Recognize the ethical and socioeconomic implications of biological research. 	<ul style="list-style-type: none"> Weekly discussions of current research themes in molecular evolution & phylogenetics.
<ul style="list-style-type: none"> Continue to develop both qualitative and quantitative analytical skills in the life sciences. 	<ul style="list-style-type: none"> Analysis of case studies; critical evaluation of peer-reviewed research papers; in-class discussions of statistical methods for phylogenetic inference.
<ul style="list-style-type: none"> Become proficient with the scientific method and how biologists and bioinformaticians communicate their results. 	<ul style="list-style-type: none"> Synthesis and presentation of a current (<5 years old) research paper in the field of molecular evolution & phylogenetics; in-class discussions and written answers to case studies.
<ul style="list-style-type: none"> Understand how molecular phylogenies are being used in diverse disciplines within the life sciences. 	<ul style="list-style-type: none"> Weekly discussions; performance on exams; presentation of a current research paper in the field.

General Education

LEARNING OUTCOMES	ASSESSMENT
<ul style="list-style-type: none">• Develop an appreciation and excitement for knowledge and continual learning.	<ul style="list-style-type: none">• Analysis of student performance on lecture exams and discussions.
<ul style="list-style-type: none">• Effectively integrate complex information and communicate ideas and results to peers in an efficient and collaborative manner.	<ul style="list-style-type: none">• Performance in class discussions and presentation of research paper.
<ul style="list-style-type: none">• Further develop reading, writing, oral communication and analytical skills.	<ul style="list-style-type: none">• Analysis of student performance on lecture exams, discussions, presentation, and written responses to case studies.

Section AV: Changes in Existing Courses**Changes to be offered in the Biological Sciences department****BIO 4910 – Independent Research Study in Biomedical Informatics: Information Literacy**

CUNYFirst Course ID	Can be found in the CUNYfirst course catalog		
Course Number and Title	BIO 4910 – Independent Research Study in Biomedical Informatics: Information Literacy		
FROM:		TO:	
Department(s)		Department(s)	
Course Number		Course Number	
Course Title		Course Title	
Prerequisite	BIO 3352, BIO 3450	Prerequisite	<u>BIO 3350</u>
Corequisite		Corequisite	
Pre- or corequisite		Pre- or corequisite	
Hours		Hours	
Credits		Credits	
Description		Description	
Requirement Designation		Requirement Designation	
Liberal Arts	<input type="checkbox"/> Yes <input type="checkbox"/> No	Liberal Arts	<input type="checkbox"/> Yes <input type="checkbox"/> No
Course Attribute (e.g. Writing Intensive, Honors, etc)		Course Attribute (e.g. Writing Intensive, Honors, etc)	

Course Applicability	<input type="checkbox"/> Major <input type="checkbox"/> Gen Ed Required <input type="checkbox"/> English Composition <input type="checkbox"/> Mathematics <input type="checkbox"/> Science <input type="checkbox"/> Gen Ed - Flexible <input type="checkbox"/> World Cultures <input type="checkbox"/> US Experience in its Diversity <input type="checkbox"/> Creative Expression <input type="checkbox"/> Individual and Society <input type="checkbox"/> Scientific World <input type="checkbox"/> Gen Ed - College Option <input type="checkbox"/> Speech <input type="checkbox"/> Interdisciplinary <input type="checkbox"/> Advanced Liberal Arts	Course Applicability	<input type="checkbox"/> Major <input type="checkbox"/> Gen Ed Required <input type="checkbox"/> English Composition <input type="checkbox"/> Mathematics <input type="checkbox"/> Science <input type="checkbox"/> Gen Ed - Flexible <input type="checkbox"/> World Cultures <input type="checkbox"/> US Experience in its Diversity <input type="checkbox"/> Creative Expression <input type="checkbox"/> Individual and Society <input type="checkbox"/> Scientific World <input type="checkbox"/> Gen Ed - College Option <input type="checkbox"/> Speech <input type="checkbox"/> Interdisciplinary <input type="checkbox"/> Advanced Liberal Arts
Effective Term	To be implemented in Fall 2022		

Rationale: The department proposes to change the prerequisites from BIO 3352 + BIO 3450 to BIO 3350. The justification for the change is to expose students to information literacy earlier in their studies. BIO 4910 focuses on instructing students on how to conduct a literature review, critically read and interpret scientific papers, and synthesize the information to draft an original research proposal. Enabling the students to enroll in the course after BIO 3350 will introduce them to the scientific process at a more appropriate time in their studies, and lead to better exposure to the process of science.

Section AV: Changes in Existing Courses**Changes to be offered in the Biological Sciences department****BIO 3450 – Biomedical Data Analysis I**

CUNYFirst Course ID	Can be found in the CUNYfirst course catalog		
Course Number and Title	BIO 3450 – Biomedical Data Analysis I		
FROM:		TO:	
Department(s)		Department(s)	
Course Number		Course Number	
Course Title	Biomedical Data Analysis I	Course Title	<u>Biomedical Data Analytics I</u>
Prerequisite		Prerequisite	
Corequisite		Corequisite	
Pre- or corequisite		Pre- or corequisite	
Hours		Hours	
Credits		Credits	
Description		Description	
Requirement Designation		Requirement Designation	
Liberal Arts	<input type="checkbox"/> Yes <input type="checkbox"/> No	Liberal Arts	<input type="checkbox"/> Yes <input type="checkbox"/> No
Course Attribute (e.g. Writing Intensive, Honors, etc)		Course Attribute (e.g. Writing Intensive, Honors, etc)	

Course Applicability	<input type="checkbox"/> Major <input type="checkbox"/> Gen Ed Required <input type="checkbox"/> English Composition <input type="checkbox"/> Mathematics <input type="checkbox"/> Science <input type="checkbox"/> Gen Ed - Flexible <input type="checkbox"/> World Cultures <input type="checkbox"/> US Experience in its Diversity <input type="checkbox"/> Creative Expression <input type="checkbox"/> Individual and Society <input type="checkbox"/> Scientific World <input type="checkbox"/> Gen Ed - College Option <input type="checkbox"/> Speech <input type="checkbox"/> Interdisciplinary <input type="checkbox"/> Advanced Liberal Arts	Course Applicability	<input type="checkbox"/> Major <input type="checkbox"/> Gen Ed Required <input type="checkbox"/> English Composition <input type="checkbox"/> Mathematics <input type="checkbox"/> Science <input type="checkbox"/> Gen Ed - Flexible <input type="checkbox"/> World Cultures <input type="checkbox"/> US Experience in its Diversity <input type="checkbox"/> Creative Expression <input type="checkbox"/> Individual and Society <input type="checkbox"/> Scientific World <input type="checkbox"/> Gen Ed - College Option <input type="checkbox"/> Speech <input type="checkbox"/> Interdisciplinary <input type="checkbox"/> Advanced Liberal Arts
Effective Term	To be implemented in Fall 2022		

Rationale: We propose to change the course title from Biomedical Data Analysis I to Biomedical Data Analytics I. This change will maintain consistency in naming, as the subsequent course name is Biomedical Data Analytics II.