IBMS 6300 Computational Biology and Bioinformatics Credit Hours: 3

Semester: Fall **Year:** 2025
Class Day/Time: Wednesdays 2-5pm **Class Location:** BMR 12.1

Instructor of Record: Dr. Lianghao Ding
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Course Description: A graduate-level course designed to provide students with the knowledge and skills to perform computer program-based analyses on biomedical sciences questions including bioinformatics, genomics, transcriptomics, proteomics, and systems biomedical science.

Prerequisite: None **Co-requisite:** None

Goals of Course:

1. Provide foundational knowledge in bioinformatics, including data processing, analysis techniques, and computational tools.
2. Develop programming skills in R, Python, and Linux to handle biological datasets effectively.
3. Introduce high-throughput sequencing technologies and their applications in genomics, epigenomics, transcriptomics and integration with proteomics.
4. Equip students with the ability to conduct advanced data analyses, such as pathway analysis, variant calling, and machine learning applications.
5. Foster practical problem-solving skills through hands-on projects involving real-world datasets.

Student Learning Outcomes (SLO or "course objectives"):

1. Understand the principles and applications of functional genomics data analysis using genomic, transcriptomic, and proteomic data.
2. Understand the principles and applications of comparative genomics analysis for microbiological research.
3. Understand the principles and applications of machine learning techniques biomedical research.

Course Assessment/Methods of Evaluation:

Assignments an Quizzes 25%; Participation 25%; Projects 50%.

Assignment/Exam/Quiz Submission Policy:

Students are expected to turn in all class assignments, exams and quizzes on time.

Late assignments will be handled as follows:

1 day late	5% deduction from the assignment grade
2 days late	10% deduction from the assignment grade
3 days late	20% deduction from the assignment grade
4+ days late	No credit will be given for the assignment.

Late Exams or Quizzes will be handled as follows:

1 day late	5% deduction from the exam/quiz grade
2-3 days late	10% deduction from the exam/quiz grade
4-7 days late	20% deduction from the exam/quiz grade
7+ days late	30% deduction from the exam/quiz grade

Attendance:

Students are expected to attend all classes. Students will be allowed to miss 1 class without penalty. Additional absences will be handled as follows:

2 absences	Lose 20% of class participation grade
3 absences	Lose 30% of class participation grade
4 absences	Lose 40% of class participation grade
5+ absences	Student will have to remediate in class participation

Students will be considered absent if they arrive more than 15 minutes after the start of class.

Emergencies
In the event of an emergency or sickness, the student **MUST** contact the Instructor and/or the Program Manager (Dr. Chris Holmquist) by email no later than the day of the expected absence. Failure to do so will result in the absence being counted as 2 absences, resulting in a 10% decrease in this category of the class grade.

Linked Program Learning Outcomes:
The student learning outcomes listed above address the following Integrated Biomedical Sciences Program PLO domains:
PLO1 - Core Knowledge domain
PLO2 - Research Methods and Analysis domain
PLO3 - Scholarly domain

Course Schedule:
Week 1 (8/27): Introduction to Computer Programming for Bioinformatics (Ding)
Week 2 (9/3): High-throughput Sequencing Data Processing (Ding)
Week 3 (9/10): Quantitative Omics Analysis – Part 1 (Ding)
Week 4 (9/17): Quantitative Omics Analysis – Part 2 (Ding)
Week 5 (9/24): Gene Regulation and Systems Biology (Ding)
Week 6 (10/1): Variant/Mutation calling and annotation from DNA-seq data (Ding)
Week 7 (10/8): Genomics in Microbiology (Raulerson)
Week 8 (10/15): Introduction to Pipelines (Raulerson)
Week 9 (10/22): Machine learning in Biomedical Research (Ding)
Week 10 (10/29): Molecular Docking (Neuenschwander)
Week 11 (**11/6**): Statistics I (Singh and Le) - **THURSDAY at 9am**
Week 12 (**11/13**): Statistics II (Singh and Le) - **THURSDAY at 9am**
Week 13 (**11/20**): Statistics III (Singh and Le) - **THURSDAY at 9am**
Week 14 (11/26): Molecular Dynamics I (Neuenschwander)
Week 15 (12/3): Molecular Dynamics II (Neuenschwander)
Week 16 (FINALS WEEK) – Final project

Other Class Policies:
Attendance:
Regular or punctual attendance is expected. If a student misses a class or lab, the student is responsible for obtaining any information distributed during those times. Make-ups are possible only under certain instances (labs cannot be made up). Arrangements for any make-ups and/or missed labs should be discussed directly with the instructor for that day's class.

Academic Honesty:
Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

Cheating
Dishonesty of any kind involving examinations, assignments, alteration of records, wrongful possession of examinations, and unpermitted submission of duplicate papers for multiple classes or unauthorized use of keys to examinations is considered cheating. Cheating includes but is not limited to:

- Using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class.
- Falsifying or inventing any information, including citations, on an assigned exercise.
- Helping or attempting to help another in an act of cheating or plagiarism.

Plagiarism
Plagiarism is presenting the words or ideas of another person as if they were your own. Materials, even ideas, borrowed from others necessitate full and complete acknowledgment of the original authors. Offering the work of another as one's own is plagiarism and is unacceptable in the academic community. A lack of adequate recognition constitutes plagiarism, whether it utilizes a few sentences, whole paragraphs, articles, books, audio-visual materials, or even the writing of a fellow student. In addition, the presentation of material gathered, assembled or formatted by others as one's own is also plagiarism. Because the university takes such misconduct very seriously, the student is urged to carefully read university policy Sec. 8-802. Academic Dishonesty. Examples of plagiarism are:

- Submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another.
- Submitting a work that has been purchased or otherwise obtained from an Internet source or another source.
- Incorporating the words or ideas of an author into one's paper without giving the author due credit.

AI (Artificial Intelligence) Policy:
UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.
Use of AI is not permitted in this course at all.
To best support your learning, you must complete all graded assignments by yourself to assist in your learning. Doing your own work, without human or artificial intelligence assistance, is best for your efforts in mastering course learning objectives. This exclusion of other resources to help complete assignments includes artificial intelligence (AI). Refrain from using AI tools to generate any course context (e.g., text, video, audio, images, code, etc.) for any assignment or classroom assignment.

Adding/Dropping:
The official deadline for adding and dropping courses is as published in the academic calendar (Registrar Withdrawal webpage). However, students are strongly encouraged to meet with their graduate advisor or the Program Coordinator prior to adding/dropping courses. Movement into and out of classes after the 4th class day requires approval of the Program Director. Each student is responsible for their own enrollment status with the university.

Disability Accommodations:
UT Tyler HSC abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, which mandate reasonable accommodations be provided for students with documented disabilities. If you have a disability and may require some type of instructional and/or examination accommodations, please contact me early in the semester so that I can provide or facilitate the provision of accommodations you may need. If you have not already done so, you will need to register with the Student Services Office (located on the main campus). You may call 903-566-7079 for more information.
A listing and description of all student policies can be found here: Manual of Policies and Procedures for Student Affairs.