BMES484/544: Genome Information Engineering

Instructor: Ahmet Saçan <ahmetmsacan@gmail.com>

Course Description:
This course is designed to provide students with hands-on experience in the application of genomic, proteomic, and other large-scale information to biomedical engineering. The underlying goal is to develop an understanding of high-through technologies, biological challenges, and key mathematical and computational methods relevant to biomedical engineering.

Course Objectives:

- Gain an understanding of how the molecular machinery in a cell is encoded, maintained, and regulated, at various levels, from its genome to genes to proteins.
- Develop ability to analyze genomics, microarray, and proteomics data in statistically valid ways.
- Understand and apply methods that link and enrich results from analysis of individual experiments to biological activity through the use of databases of gene annotations, pathways, and transcription factors.
- Gain experience with biological data exchange formats and data storage and communication.

Course Materials

- **Required Textbooks:**
  - M. Zvelebil, J.O. Baum. Understanding Bioinformatics. Garland Science. 2007.

- **Recommended Resources:**
  - www.google.com
  - P. A. Pevzner, Computational Molecular Biology: An Algorithmic Approach. MIT press.
  - Lecture Notes, Recorded Lectures, and other material available from Blackboard Learn

Tentative Course Schedule:

Week 1	Background in Cellular & Molecular Biology, Bioinformatics	
Week 2-3	Sequence Alignments, Database Search	
Week 4	Alignment Statistics, Multiple alignment, Motifs	
Week 5	Genome-Sequencing & Assembly	Midterm
Week 6	Next-Generation sequencing	
Week 7	Phylogenetic trees	
Week 8	Protein Structures & Structure Alignment	
Week 9	Sequence-based Prediction, Secondary Structure Prediction	
Week 10	Homology modeling, molecular dynamics simulations	

Grading Matrix:
Assignments: 60%
Midterm: 20%
Final: 20%

Graded assignments, assessments, and evaluations

Task/activity	Type	Graded	Purpose	Value
Assignments	Written & Programming	Yes	Reinforce weekly content	High

Midterm	Written & Programming	Yes	Evaluate understanding of course concepts and ability to apply the methods	Moderate
Final	Written & Programming	Yes	Evaluate understanding of course concepts and ability to apply the methods	High

- **Assignments:** Online tests will be used to reinforce weekly material. Students will work on solving small bioinformatics problems that may require writing Matlab and/or Python programs or the use online bioinformatics services.

Late Policy:

Late submissions after due date are not accepted for Blackboard Quizzes/Tests.
Late submissions of programming assignments are penalized at a rate of 10% per day (not prorated).
Late submissions not accepted for an assignment if its solution is already provided or presented in class or in web-conference (regardless of whether the student viewed the solution).
Late submissions of assignments not accepted after the last day of classes.
Individual assignments may have a different late policy than stated here; any such differences in per-assignment late policy will be provided on Blackboard.
Exceptions to the late policy subject to medical excuse or other emergencies.

Grading Scale:

Score %	**<63**	**63**	**67**	**69**	**73**	**77**	**79**	**83**	**87**	**89**	**93**	**97**
Letter Grade	**F**	**D**	**D+**	**C-**	**C**	**C+**	**B-**	**B**	**B+**	**A-**	**A**	**A+**

The grading scale is subject to alterations depending on student performance in the class.

Course policies:

- I will communicate with you via email and Blackboard Discussion Board. You are responsible for reading your Drexel email account and check the discussion board on a daily basis to receive these announcements.
- All items in this syllabus are subject to change as the course progresses. You will be notified in class or via email of any changes in policies or content.

All students are expected to abide by Drexel University's policies. If an act of academic dishonesty is determined to have occurred, for a first offense, one of the following sanctions will be imposed, depending on the severity of the offense:

- Reduction of a course grade
- An "F" for the assignment or exam
- Failure for the entire course with the inability to withdraw.
- Other action deemed appropriate by the faculty member. Examples include, but are not limited to, requiring the student to re-take the exam, re-complete an assignment, or complete an assigned exercise. The decision of the faculty member and the department head shall be reported to the Office of Judicial Affairs, which is responsible for maintaining student conduct records. The incident will result in an official disciplinary record for the student(s).
- Any academic honesty infraction beyond a first offense is subject to the sanctions described above, as well as to disciplinary sanctions that may be imposed through the University judicial process, administered through the Division for Student Life and Administrative Services/Office of Judicial Affairs. These sanctions may include suspension or expulsion from the University.

Course and University Policies

Course / Syllabus Changes: While the syllabus is intended to be as accurate as possible, the instructor retains the right to make changes to the content or schedule. Students will be notified in advance of any changes via announcements on the course website, e-mail, and in class.

Please refer to the following links regarding important University policies.

Academic Integrity:
Drexel University is committed to a learning environment that embraces academic honesty. In order to protect members of our community from results of dishonest conduct, the University has adopted policies to deal with cases of academic dishonesty. Please read, understand, and follow the "Academic Integrity Policy."
https://drexel.edu/provost/policies/academic-integrity/

Disability Accommodation:
If you have a disability for which you may be requesting an academic accommodation, you are encouraged to contact both your instructor and the access coordinator for your school to establish eligibility for academic accommodations.
http://drexel.edu/oed/disabilityResources/students/

Course Add/Drop and Withdrawal Policies:
https://drexel.edu/provost/policies/course-add-drop/
https://drexel.edu/provost/policies/course-withdrawal/

Appropriate Use and Intellectual Property of Course Materials:
It is important to recognize that some or all of the course materials provided to you may be the intellectual property of Drexel University, the course instructor, or others. Use of this intellectual property is governed by Drexel University policies, including the IT-1 policy found here:
https://drexel.edu/it/about/policies/policies/01-Acceptable-Use/

Briefly, this policy states that course materials, including recordings, provided by the course instructor may not be copied, reproduced, distributed or re-posted. Doing so may be considered a breach of this policy and will be investigated and addressed as possible academic dishonesty, among other potential violations. Improper use of such materials may also constitute a violation of the University's Code of Conduct found here: https://drexel.edu/cpo/policies/cpo-1/ and will be investigated as such.