COURSE DESCRIPTION: BIO/CIS 6000 – COMPUTER APPLICATIONS IN BIOINFORMATICS

Introduction to biochemistry topics, genomics, and computer-related applications in Bioinformatics. Analyses of genetic sequences and their corresponding three dimensional structures, computer-aided sequence searches and comparisons (homologies). The algorithms used to perform searches and comparisons are provided. Computers are used to implement gene analyses in the area of DNA, protein, and RNA prediction of sequences and structures. The course includes a computer laboratory and biological, wet laboratory in genomics.

3 credits and 4 hours – 2 hours lecture 2 hours lab

Prerequisites: MAT 1400 and BIO 1300

STUDENT ATTENDANCE POLICY
A student who has been absent 15% of the total number of instructional hours that a class meets during a term or session may be considered excessively absent by the instructor. The instructor may consider excessive absences as a factor in the assignment of a student’s grade.

STUDENT LEARNING OUTCOMES
Upon completion of the course students should be able to:

• Determine protein coding regions and putative protein sequence(s) within a DNA sequence using bioinformatic programs.
• Perform searches of nucleotide and protein databases using a query sequence and retrieve sequences that are related to the query sequence.
• Align and compare multiple DNA or multiple protein sequences to predict functional domains.
• Apply bioinformatic methodology to test a scientific hypothesis.
• Demonstrate basic knowledge of algorithms and their applications to bioinformatics.

TEXTBOOK
The required textbook for this course is:


GRADES
The Computer Applications in Bioinformatics course will be graded as follows:

50% Lecture, 20% of which will be the final examination, and
50% Laboratory
ACCESSIBILITY
Access-Ability Services (AAS) serves as a liaison and resource to the KCC community regarding disability issues, promotes equal access to all KCC programs and activities, and makes every reasonable effort to provide appropriate accommodations and assistance to students with disabilities. Please contact this office if you require such accommodations and assistance. Your instructor will be glad to make the accommodations you need, but you must have documentation from the Access-Ability office for any accommodations.

ACADEMIC INTEGRITY

Academic Dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion, as provided herein. Additional information can be found in the College catalog (http://www.kingsborough.edu/sub-registration/Pages/catalog.aspx)

Plagiarism as a violation of academic integrity
Students will be asked to write papers and laboratory assignments. During this endeavor, they should be careful to avoid plagiarism. Plagiarism is the intentional theft(s) of someone else’s intellectual property without attribution (proper credit). Determination and penalty – ranging from grade reduction to course failure – will be decided by the instructor.

Internet plagiarism includes submitting downloaded term papers or parts of term papers, paraphrasing or copying information from the internet without citing the source, and “cutting & pasting” from various sources without proper attribution.
COURSE OUTLINE

Week 1  Lecture: General Introduction to Computer Technology-Algorithms
         Lab: Euclid’s Algorithm to find Greatest Common Divisor

Week 2  Lecture: Introduction to Genomics
         Lab: Finding a gene in a DNA sequence

Week 3:  Lecture: Searching Data Bases
         Lab: Comparing a given sequence across species

Week 4  Lecture: Working with Nucleotide Sequence Databases-I
         Lab: Restriction enzyme analysis of DNA sequence

Week 5  Lecture: Working with Nucleotide Sequence Databases-II
         Lab: FOXP2 gene is used to illustrate gene prediction

Week 6  Lecture: Working with RNA
         Lab: Prediction of secondary structure and sequence alignment for two sequences

Week 7  Lecture: Working with a Single Protein Sequence-I
         Lab: (Wet Lab) Protein purification of green florescent protein from bacteria

Week 8  Lecture: Working with a Single Protein Sequence-II
         Lab: Gene Analysis of the protein Rhodopsin

Week 9  Lecture: Comparing Two Sequences
         Lab: Identifying human genes within a given sequence.

Week 10 Lecture: Working with Protein 3-D Structure
              Lab: Finding different structures of the protein calmodulin

Week 11 Lecture: Intermolecular Interactions & Biological Pathways
               Lab: Using the given sequence of the yeast tryptophan biosynthesis enzyme

Week 12 Lecture: Applications
               Lab: (Web Lab) Forensic Analysis