

## Biological Sequence and Genome Analysis

Course Time: **Online. Discussion are Mondays 1:30 - 3:10 pm**

Course Location: Online discussion session during above time using Zoom link provided on the Blackboard.

Instructor: Aman Ullah, 703-993-7182, Aullah3@gmu.edu

Office Hours: By appointment

Course Material: Will be available on the Blackboard

Prerequisites: Knowledge of a programming language (C, C++, R, R-studio, Java, Orange, Python, Basic, or FORTRAN).

Required Textbooks: None

Reference Textbooks: *Understand Bioinformatics* by Zvelebil and Baum. 2007. Garland.

*Biological Sequence Analysis: probabilistic models of proteins and nucleic acids* by Durbin, Eddy, Krogh, and Mitchison. 1998. Cambridge.

*Computational Molecular Biology: An Introduction* by Peter Clote and Rolf Backofen. 2000. Wiley. - electronic copy available

*Bioinformatics: Sequence and Genome Analysis* by David Mount. 2001. Cold Spring Harbor Press. - electronic copy available

*Molecular Phylogenetics* by Page and Holmes - electronic copy available

### Course Description:

In recent years, there has been an explosion in the amount of biological information available due to technology developed by efforts such as the Human Genome Project. Bioinformatics is the field that includes the development and implementation of mathematical and computer techniques to analyze this data. In this course, the fundamental mathematical and algorithmic theory behind current bioinformatics techniques will be taught. The student will implement these methods. They include hidden Markov models, the dynamic programming algorithm, genetic algorithms, simulated annealing, neural networks, and information theory. The biological background will be provided in the course.

### Grading Policy:

The course grade will be determined as follows-

Mid-Term Exam - 25%	90-100 A
Final Exam - 25%	80-89.9 B
Problem Sets - 25%	70-79.9 C
Final Projects - 25%	0-69.9 F

Problem sets will be assigned as homework several times during the semester. They will be due two weeks after they are assigned. The assignments will be posted on the course web page. Late HomeWorks will not be accepted.

All students are expected to complete the final project and make a presentation at the announced time.

Academic Honesty Policy :

Academic dishonesty will not be tolerated. This includes cheating, plagiarism, and falsification of academic records. That being said, you can help each other out on the homework (this does not mean that you can copy each other's homework).

Important Dates:

Monday, August 26, 1:30 - 2:30 pm - First Day of Class

Monday, September 2 - No class due to Labor Day

Tuesday, October 7<sup>th</sup> , 1:30 - 4:10 pm – Midterm Distributed.

Monday, October 14 - Fall Break (Classes do not meet this week) - Midterm Exam due by midnight.

Monday, October 30, 1:30 pm - Final Project Proposals Due

Monday, November 25<sup>th</sup> , 1:30 pm - Final Project Presentations Due

Monday, December 2<sup>nd</sup>, 1:30 - 4:10 pm - Last Day of Class - Final Exam Distributed

Monday, December 16, 1:30 pm - Final Exam Due

Sage Advice: If you want to do well in course: 1) Do all the problem sets. 2) Read the text book and any other assigned reading. 3) Ask questions in class and office hours. 3) If you are having difficulty doing the problem sets, be sure to get help. I encourage the students discussing the course material and problems, but require everyone to do the work - NO COPYING.