

Syllabus
CHEM 434 Bioinformatics
Spring 2008

- Instructor:** Dr. Jamil Momand, Ph.D.
Dr. Nancy Warter-Perez, Ph.D.
- Class location and time:** Engineering and Technology, Room C256
T,R 1:30-3:10 AM
- J.M. Office Hours:** Physical Sciences Building, Room 803
M 10 am, W 10 am, Th 9-11 am
Office Phone: (323) 343-2361
Email: jmomand@calstatela.edu
Department Phone: (323) 343-2300
Website: <http://www.calstatela.edu/faculty/jmomand/>
- N.W-P. Office Hours:** Engineering and Technology, Room A305
T: 6:30 – 8:30 PM, W: 11 – 12:30 PM, or by appointment
Office Phone: (323) 343-5927
Email: nwarter@calstatela.edu
Department Phone: (323) 343-4470
- Course Prerequisite:** See the following Website
<http://www.calstatela.edu/faculty/jmomand/PrerequisitesBioinformaticscourse.html>
- Required Text:** Magnus Lie Hetland. (2005) Beginning Python: From Novice to Professional (Beginning: From Novice to Professional), Apress ISBN 159059519X
- On-line bioinformatics manual
- References:** Cristianini, N. and Hahn, M.W. (2007) Introduction to Computational Genomics: A Case Studies Approach. Cambridge University Press ISBN-13: 978-0521856034
- Claverie, J.M. and Notredame, C. (2006) Bioinformatics For Dummies, For Dummies Publisher, ISBN-13: 978-0470089859
- Pevsner, J. (2003) Bioinformatics and Functional Genomics, John Wiley & Sons, ISBN 0-471-21004-8
- Jones J. & Pevzner P. (2004), An Introduction to Bioinformatics Algorithms (Computational Molecular Biology), The MIT Press, ISBN 0262101068
- Dawson, M., (2003) Python Programming for the Absolute Beginner, Muska & Lipman/Premier-Trade; ISBN 1592000738

Lutz, M. & Ascher, D. (2004) Learning Python, O'Reilly Media Inc., ISBN 0-596-00281-5

Baxevanis & Ouellette (2001) Bioinformatics, Methods of Biochemical Analysis Series Vol. 43, John Wiley & Sons, ISBN 0-471-38391-0

Pevzner, P.A. (2000) Computational Molecular Biology, MIT Press, ISBN: 0262161974

Campbell & Heyer (2003) Discovering Genomics, Proteomics, & Bioinformatics, Pearson Education, ISBN: 0-8053-4722-4

Misener & Krawetz (2000) Bioinformatics Methods and Protocols, Methods in Molecular Biology Series Vol. 132, Humana Press, ISBN 089603-732-0

Final Projects: Tuesday, 3 June, 1:30-4:00 PM

Grading:	Quizzes (3)	120 points
	Homework	80 points
	Final Project	200 points
	<u>Writing assignment</u>	<u>100 points</u>
	Total	500 points

Writing Assignment: The student will have the option completing one of two writing assignments. Option #1: write a 3-page minimum summary on any **primary research** article covering any topic in bioinformatics published within the last three months. In one's own words, the student will include a restatement of the hypothesis being tested, a summary of the results, and a conclusion of the work. Option #2: the student will write a four-page paper (minimum) that analyzes a company that proposes to use bioinformatics to provide a service. **The company must offer a software program or a database service.** For either option, the student must get approval to write on the article/company from the instructor by April 22.

The writing projects are due 20 May, 1:30 PM.

Programming assignment: The student will have a programming assignment that will be performed within a small group. The algorithm will be handed in as part of the final project. The group will introduce and demonstrate the algorithm to the entire class during finals week.

Make-up Quizzes and Homework Assignments: There are no make-up quizzes. There are no make-up homework assignments but the lowest homework score will be dropped.

Learning Objectives: To assist students gain the following skills:

- Retrieve gene sequence information from Genbank
- Use BLAST program to conduct gene similarity searches
- Align multiple sequences with Clustal W program
- Predict protein functional motifs secondary structures with PSIPRED
- Display and compare three-dimensional structures of proteins
- Write algorithms that will perform a simple search of gene sequences stored in a database
- Understand the theory that led to the development of the scoring methods commonly used to measure sequence similarities

LECTURE SCHEDULE
CHEM 434
Bioinformatics
Spring 2008

Lecture/ Instructor	Date	Topic	Reading	In Class Assignment	Homework
1/jm, nw-p	25 Mar	Introduction to course; a primer on molecular life science	Introduction and Ch. 1-online manual	Email to professors to introduce yourself, previous bioinformatics experience; indicate what you want out of this class.	Online manual (Ch. 1 problems). Sign up to receive the "NCBI News"—a free newsletter
2/jm	27/Mar	How to get information on bioinformatics topics from CSULA, Medline, OMIMs		See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
3/jm	1/Apr	Sliding window, dot plots.	Ch. 5-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
4/jm	3/ Apr	Needleman-Wunsch algorithm, Smith-Waterman algorithm	Ch. 5-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
5/jm	8 Apr	Quiz 1 , Scoring matrices	Ch. 4-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
6/nw-p	10 Apr	Python Programming – Types and operations	Ch 1-4 BP	Write a Python script to compute the hydrophobicity of an amino acid.	
7/nw-p	15 Apr	Python Programming –if tests, while and for loops	Ch 5 BP	Write a sliding window program to compute %GC.	Write a sliding window program to compute hydrophobicity.
8/nm-p	17 Apr	Python Programming (cont.)		Given a globally aligned sequence, compute the score using fixed match/mismatch score and affine gap penalties.	
9/jm	22 Apr	Information organization and sequence databases	Ch. 2-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
10/jm	24 Apr	Quiz 2 , Sequence comparison	Ch. 3-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
11/jm	29 Apr	BLAST	Ch. 6-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
12/nw-p	1 May	Python	Ch 6, 10-11	Write a program to read in a	Write a program to compute the

		Programming - Functions and Modules	BP	PAM matrix into a 2-dimensional array.	PAM/BLOSUM score of two amino acids.
13/nw-p	6 May	Longest Common Substring Algorithm (LCS) - Dynamic Programming	LCS and Global Alignment Handouts	Implement LCS algorithm – scoring.	Final Project assignment
14/ nw-p	8 May	Global Alignment – Extensions to LCS		Implement LCS algorithm – traceback.	
15/nw-p	13 May	Extensions to Global Alignment – Local Alignment, affine gap penalties	Local Alignment Handouts	Project help	
16/jm	15 May	ClustalW- Multiple Sequence Alignment	Ch. 6-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
17/jm	20 May	Written Reports Due PSIPRED- prediction of protein structure, Protein data bank	Ch. 7-online manual	See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
18/jm	22 May	Quiz 3 Predicting tertiary structure		See calstatela.edu/faculty/jmomand/Bioinformaticscourse	See calstatela.edu/faculty/jmomand/Bioinformaticscourse
19/ nw-p	27 May	Programming project help			
20/jm, nw-p	29 May	Course summary, instructor evaluations, project help			
	3 Jun	Final Exam Project presentations			