



Lahore University of Management Sciences
BIO 231 – Computational Biology 1
Spring 2014

Instructor	Dr.Safee Ullah Chaudhary
Room No.	
Office Hours	
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Course URL (if any)	

Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	50 mins
Recitation (per week)	Nbr of Rec (s) Per Week	1	Duration	50 mins
Lab (if any) per week	Nbr of Session(s) Per Week	1	Duration	90 mins
Tutorial (per week)	Nbr of Tut(s) Per Week		Duration	

Course Distribution	
Core	Yes
Elective	
Open for Student Category	Any
Closed for Student Category	

COURSE DESCRIPTION
This course provides introduction to computational biology and the tools and techniques used in the analyses of genomic and proteomics data. The emphasis is on the fundamentals of nucleic acid and protein sequence analysis, structural analysis, and phylogenetic analysis. A significant amount of time is spent for hands-on training and programming of topics covered in the lectures.

COURSE PREREQUISITE(S)	
<ul style="list-style-type: none">••	BIO 101 CS 100

COURSE OBJECTIVES	
<ul style="list-style-type: none">•••	To provide introduction to computational biology and bioinformatics To introduce tools and techniques useful for DNA and protein sequence analysis To enable students to program in R to solve problems in bioinformatics

Learning Outcomes	
<ul style="list-style-type: none">•••	After the course, the student should: Have knowledge of key computational biology/bioinformatics concepts and techniques. Understand the inner workings of some of the most widely-used bioinformatics methods, such as sequence analysis and comparison, and protein structure and function analysis. Be able to solve moderate complexity computational problems related to bioinformatics



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Grading Breakup and Policy
Assignment(s): 30% Home Work: Quiz(s): 10% Class Participation: 30% Attendance: Midterm Examination: Project: Final Examination:40%

Examination Detail	
Midterm Exam	Yes/No:Yes Combine Separate:Combine Duration:2 hrs Preferred Date: Exam Specifications:
Final Exam	Yes/No: Yes Combine Separate: Combine Duration: 2 hrs Exam Specifications:

COURSE OVERVIEW			
Week/Lecture/ Module	Topics	Recommended Readings	Objectives/ Application
1	Introduction - Molecular Biology Primer		
2	Probability and Statistics Primer		
3	Biological Resources on the Web I (Hands-on)		
4	Biological Resources on the Web II (Hands-on)		
5	Biological Resources on the Web III (Hands-on)		
6	Genome Sequences and Analysis I		
7	Genome Sequences and Analysis II		
8	Finding Signals in DNA		
9	Hands-on Genome Sequence Analysis		
10	Sequence Comparison and introduction to Dynamic Programming		
11	Multiple Sequence Alignment I - Scoring Matrices		
12	Multiple Sequence Alignment II - Heuristic Methods / BLAST		
13	Multiple Sequence Alignment III - Local / Global Alignments		
14	Hands-on MSA		
15	Phylogenetics I		
16	Phylogenetics II		
17	Hands-on Phylogenetics		
18	RNA Secondary Structure Prediction		
19	Protein Structure Visualization		
20	Protein Structure Classification		
21	Protein Structure Comparison		
22	Hands-on Protein Structures		
23	Biological Networks I		
24	Biological Networks II		
25	Hands-on-Biological Networks (Network resources on the Web)		
26	From Biological Data to Biological Insights		



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Textbook(s)/Supplementary Readings

- Bioinformatics, Sequence and Genome Analysis, Second Edition, David W Mount, Cold Spring Harbor Laboratory Press, 2004.
- Developing Bioinformatics Computer Skills, Cynthia Gibas and Per Jambeck, O'Reilly, 2001
- An Introduction to R, R Manual, <http://cran.r-project.org/doc/manuals/R-intro.html>