

SOUTHEAST MISSOURI STATE UNIVERSITY

Department of Biology

BI458/658
BT458/658

Analytical Bioinformatics for Biology and Medicine

Revision Fall 2012

I. Catalog Description and Credit Hours:

Analysis of large-scale molecular biology data. Databases and queries. Gene annotation. Sequence similarities and alignments. Protein structure/function prediction. Genomics, transcriptomics, proteomics. (3 credit hour)

II. Prerequisite(s): BI381 or permission of instructor

III. Purposes or Objectives of the Course:

- A. Students will demonstrate a familiarity with fundamental issues associated with handling, organizing, and searching large-scale databases of genome-based information.
- B. Students will demonstrate the ability to access and query various public genome databases and demonstrate an understanding of data gathered from those queries.
- C. Students will demonstrate the ability to use web-based software to analyze collections of genomic, transcriptomic, and proteomic data.
- D. Students will demonstrate the ability to analyze protein sequences for primary, secondary, and tertiary structure predictions, cellular localization, and functional motifs.
- E. Students will demonstrate the ability to assemble and analyze subsets of experimentally-derived molecular data.

IV. Student Learning Outcomes:

- A. Students will be able to access and query public genome databases.
- B. Students will be able to utilize web-based applications to analyze complex collections of genomic and gene expression data.
- C. Students will be able to analyze protein sequence data for structure and function.

V. Expectations of Students:

- A. Students are expected to attend all class activities and complete all assignments on time.
- B. Students are expected to maintain an online research notebook detailing all analyses and results from those analyses.
- C. Students are expected to perform satisfactorily on all course assignments, exams, and other activities.
- D. Graduate Students will have extended individual projects which will include additional analyses, and greater depth of analysis.

VI. Course Content or Outline (include number of periods on each topic):

Topic	Class Periods
Application of large scale molecular data for solving biological and biomedical problems	2
Experimental methods for obtaining and processing original DNA, RNA, or protein sequences	3
Data formats, data structure	2
Databases, web interfaces, navigation, data retrieval	4
Sequence similarity searching	3
Alignments, comparisons, trees of similarity	5
Genomes and genome assembly	3
Genome annotation	3
Transcriptomes -- high through-put expression analysis, microarrays	3
Transcriptomes, -- Real Time PCR, RNA-seq	3
Proteomes – predicting gene products	2
Proteomes – predicting protein structures and locations	3
Proteomes – analyzing proteomic data	3
Metabolomes, interactomes, and similar datasets	3
Bioinformatics, genes, and disease	3

VII. Textbook and/or Supplemental Materials:

In addition to standard word processing software, students must have routine access to high-speed internet and Microsoft Excel or equivalent spreadsheet software. In addition, students must have the ability to download and run certain locally resident software, including JAVA-based programs. No textbook required.

VIII. Basis of Student Evaluation:

<u>Undergraduates</u>		<u>Graduate Students</u>	
Daily assignments	55 %	Daily assignments	50 %
Online Notebook	15 %	Online Notebook	15 %
Individual Projects	20 %	Individual Projects	25%
Final Exam	10 %	Final Exam	10 %

Grading Scale

<u>Undergraduates</u>	<u>Graduate Students</u>
90% - 100% = A	90% - 100% = A
80% - 89% = B	80% - 89% = B
70% - 79% = C	70% - 79% = C
60% - 69% = D	below 70% = F

The weight of the evaluation criteria may vary according to each instructor and will be communicated at the beginning of the course.

There is no "D" grade in the graduate school. Graduate students scoring below 70% will earn a failing grade.

IX. Academic Policy Statement:

Students will be expected to abide by the University Policy for Academic Honesty regarding plagiarism and academic honesty. Refer to:

<http://www6.semo.edu/stuconduct>

X. Student with Disabilities Statement:

If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course. Reasonable efforts will be made to accommodate special needs.