

BIOC 3008 (0.5 credit): Course Syllabus

Introduction to Bioinformatics, Fall 2008

Calendar Description: Practical exploration of the broad scope of bioinformatics; theory, implementation, applications and limitations of computational approaches. Topics may include introductory programming, data modeling, biological databases, sequence alignment, phylogeny, pathways and biological networks.

Prerequisites: BIOC2200 (Cell Physiology and Biochemistry) or permission of the Institute. Background in computer programming and/or evolutionary concepts is recommended.

Lecture: Thursday 11:35AM-12:55PM; 234 Tory

Workshop: Friday 8:35AM-11:25AM; 3393 Herzberg

Instructor: Dr. Michel Dumontier

Office: 4610 Carleton Technology and Training Center (CTTC)

Telephone: 520-2600 x4194

E-mail: Use email through WebCT

Office hours: Thursdays 1:00-3:00PM, or by appointment throughout week.

Course Goals

There are several objectives associated with this course. There are also more specific objectives associated with each module. Course objectives are listed below:

- To gain knowledge of basic algorithms and approaches in bioinformatics.
- To gain experience with popular bioinformatics tools and databases.
- To read and interpret a bioinformatics application paper.
- To design and develop a web-based bioinformatics resource.
- To gain an understanding of experimental approaches and techniques used to generate bioinformatics data
- Acquire, integrate and use concepts, information and knowledge required to understand and solve bioinformatics problems.

Grading:

Assignments, 60% (submitted on WebCT)

Final Exam, 40% (date TBA)

The final exams will consist of short and long answer questions. Questions on exams will be derived from material given in lectures and the assigned readings.

Recommended Text:

Understanding Bioinformatics (2008), by Marketa Zvelebil & Jeremy O. Baum. New York : Garland Science/Taylor & Francis Group. [QH324.2 .Z84 2008](#)

Bioinformatics : a practical guide to the analysis of genes and proteins, Andreas D. Baxevanis, B.F. Francis Ouellette., Wiley, 3rd Edition, 2005, QH324.2 .B547

Other Reference Texts on Reserve in Library:

Protein bioinformatics : an algorithmic approach to sequence and structure analysis, Ingvar Eidhammer and Inge Jonassen, William R. Taylor, Wiley & Sons, 2004. QD431.25.S85 E53

Structural bioinformatics, Philip E. Bourne, Wiley, 2003. QP517.M3 S776

WebCT: Announcements, information on the course, lecture slides, assigned readings, supplemental readings, quizzes, and other assigned practice questions will be made available on WebCT. Also, use the email component of WebCT to contact me.

Assignments

Workshops are the time assigned to complete assignments for this course only. A workshop may comprise of a tutorial. Assignments may span multiple workshops. Assignments will be due the day prior to the next scheduled workshop. This is to ensure no overlap between assignments and timely completion of assignments. All assignments will be submitted via WebCT. Only ONE extension of 3 days will be given (no reason required) during the course. If you opt for this, you must submit your assignment on WebCT noting that you are using your ONE free extension, and this MUST be done by the 3rd day following the assignment deadline. If no assignment is handed in before the extended deadline, or this is not the first late assignment, the mark is automatically assigned 0. There can be absolutely no discussion on this matter.

Incentive: Students will gain a bonus for handing the assignment in early - 2% for each day prior to the deadline (up to 5 days or 10% bonus), in which the total assignment mark will not exceed 100%. Additional marks may be obtained by completing special bonus questions or for particularly innovative work (at the discretion of the TA / Instructor), up to a final assignment mark that does not exceed 100%.

Workshop attendance is typically necessary to complete the assignments, although in some cases you may choose to complete the assignments elsewhere. If you choose to work elsewhere, you are solely responsible for setting up the necessary tools to complete the assignment. We may make some materials available as to how to do this, but these are not supported, and you are on your own. Unless otherwise noted, all assignments must be prepared independently and submitted free of plagiarism. *Plagiarized assignments result in an automatic zero.* To avoid this, become familiar with what constitutes plagiarism. Some workshops will require students to collaborate in a group setting to complete the assignment. In these cases, students must prepare a group report, and clearly indicate their contributions.

Missed Exams: A student who misses an exam because of illness or other circumstances beyond their control must notify me (for mid-terms) or their registrar (for the final exam) within 5 working days of the missed exam. The student's petition to be excused from a midterm or to write a deferred final exam must be accompanied by: 1) a medical certificate clearly stating that the student was seen by a doctor on, or prior to, the date of the exam and was medically incapable of writing the exam at the appointed time, or 2) other official documents indicating that the student's absence was due to circumstances beyond their control.

There will be no make-up exam for students who miss a midterm. The marks for missing the midterm will be shifted to the final exam. The final exam will be scheduled during the regular examination period at the end of the term. It is the responsibility of the student to be present during this period; in particular, holiday travel arrangements must not be made before the examination schedule is known.

Academic Accommodations: Students with disabilities who need accommodation should contact the Paul Menton Centre (500 Unicentre, 520-6608) to complete the necessary letters of accommodation. Please discuss your needs with me at least two weeks in advance of the first midterm, so that I can arrange for the accommodations.

BIOC 3008, Introduction to Bioinformatics, Fall 2008

Tentative Schedule:

	Date	Subject	Understanding Bioinformatics	Bioinformatics
		<i>Before Lecture 1 you must be familiar with (i.e. can solve textbook problems):</i>	Ch1-3	
L1	Thurs Sept 4	Introduction Bioinformatics Resources		Ch 1-4
L2	Thurs Sept 11	Sequence Alignment I Dotplots & Dynamic programming	Ch4	Ch 11
L3	Thurs Sept 18	Sequence Alignment II Pairwise sequence alignment	Ch5	Ch 11
L4	Thurs Sept 25	Sequence Alignment III MSA & phylogeny	Ch6, Ch7-8	Ch 12-13
L5	Thurs Oct 2	Function Prediction I 1' Sequence Analysis		Ch 8
L6	Thurs Oct 9	Function Prediction II Motifs and Domains	Ch14	
L7	Thurs Oct 16	Function Prediction III Protein Structure Prediction	Ch11,12 Ch13,	Ch 9
L8	Thurs Oct 23	Function Prediction IV Networks and Interactions		Ch 10
L9	Thurs Oct 30	Function Prediction V Functional interactions	Ch15	
L10	Thurs Nov 6	Data Integration I Knowledge Representation		
L11	Thurs Nov 13	Data Integration II Schemas, Ontologies & Databases		
L12	Thurs Nov 20	Data Integration III Semantic Web and Workflows		
L13	Thurs Nov 27	Review		
W1	Fri Sept 5	Programming I: Basics		
W2	Fri Sept 12	Dynamic Programming		
W3	Fri Sept 19	BLAST, PSIBLAST		
W4	Fri Sept 26	ClustalX & Phylip		
W5	Fri Oct 3	Programming II: Sequence Analysis		
W6	Fri Oct 10	COGS & RPSBLAST		
W7	Fri Oct 17	SwissModeler & Pymol		
W8	Fri Oct 24	Cytoscape + BIND/KEGG		

W9	Fri Oct 31	STRING		
W10	Fri Nov 7	Programming III: Flat Files, XML, RDF		
W11	Fri Nov 14	Ontologies		
W12	Fri Nov 21	Taverna		
Exam		Exam covers Lectures 1-13		