

# **BIOC 3008 (0.5 credit): Course Syllabus**

## **Introduction to Bioinformatics, Fall 2009**

**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:** Monday 10:05AM-11:35PM; 313 Southam Hall

**Workshop:** Monday 2:35PM-5:25PM; 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.

### **Teaching Assistants:**

- Jose Cruz-Toledo  
E-mail: [jctoledo@connect.carleton.ca](mailto:jctoledo@connect.carleton.ca)
- Alison Callahan  
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**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.

### **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 bioinformatics application papers.
- 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% (12x5%)

Final Exam, 40%

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:**

- (UB) Understanding Bioinformatics (2008), by Marketa Zvelebil & Jeremy O. Baum. New York : Garland Science/Taylor & Francis Group. ISBN: 978-0-8153-4024-9. [QH324.2 .Z84 2008](#)
- (B) 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

### **Workshops and Assignments**

*Workshops are the time assigned to complete assignments for this course only.*

**ATTENDANCE IS MANDATORY, AND FAILURE TO SHOW MEANS THAT THE CORRESPONDING ASSIGNMENT WILL NOT BE MARKED.**

A workshop may comprise of a tutorial. Assignments will be due the day prior to the next scheduled workshop by 11:59 pm. 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 within 3 days 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 – 10% by 11:59pm of the day of the workshop, 5% by 11:59pm of the following day. Additional marks may be obtained by completing special bonus questions or for particularly innovative work (at the discretion of the TA / Instructor). The total assignment mark will not exceed 100%.

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 (Read part E of the Academic Regulations of the University, found in pages 59-61 of the current Undergraduate Calendar). 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.

**Academic Accommodations:** Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities for a formal evaluation of disability-related needs. Registered PMC students are required to contact the Centre, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you require accommodation for your formally scheduled exam(s) in this course, please submit your request for accommodation to PMC by November 8, 2009 for December examinations.

## BIOC 3008, Introduction to Bioinformatics, Fall 2009

### *Tentative Schedule:*

	Date	Subject	A	UB	B
L1	Mon Sept 14	<b>Introduction I</b> Resources & Data Modeling			1-4
W1	Mon Sept 14	<i>Scientific report writing</i> <i>Programming: basics</i>	A1		
L2	Mon Sept 21	<b>Sequence Alignment I</b> Dotplots & Dynamic Programming		4	11
W2	Mon Sept 21	<i>Programming: parsers</i>	A2		
L3	Mon Sept 28	<b>Sequence Alignment II</b> Pairwise/Profile alignment		5	11
W3	Mon Sept 28	<i>DP &amp; BLAST</i>	A3		
L4	Mon Oct 5	<b>Sequence Alignment III</b> MSA & phylogeny		6-8	12-13
W4	Mon Oct 5	<i>Adv. Sequence Alignment</i>	A4		
	Mon Oct 12	<i>Statutory holiday</i>			
L5	Mon Oct 19	<b>Sequence Alignment IV</b> Comparative Genomics			
W5	Mon Oct 19	<i>Phylogenetics</i>	A5		
L6	Mon Oct 26	<b>Function Prediction I</b> Sequence Analysis			8
W6	Mon Oct 26	<i>Programming: analysis</i>	A6		
L7	Mon Nov 2	<b>Function Prediction II</b> Structure Prediction		11-13	9
W7	Mon Nov 2	<i>RNA</i>	A7		
L8	Mon Nov 9	<b>Function Prediction III</b> Networks and Interactions			10
W8	Mon Nov 9	<i>Structure Modeling</i>	A8		
L9	Mon Nov 16	<b>Function Prediction IV</b> Functional interactions		15	
W9	Mon Nov 16	<i>Interaction Analysis</i>	A9		
L10	Mon Nov 23	<b>Data Integration I</b> Semantic Web			
W10	Mon Nov 23	<i>Programming: XML / RDF</i>	A10		
L11	Mon Nov 30	<b>Data Integration II</b> RDFS Reasoning			
W11	Mon Nov 30	<i>Programming: RDFS &amp; SPARQL</i>	A11		
L12	Mon Dec 7	<b>Data Integration III</b> Web services & Workflows			
W12	Mon Dec 7	<i>Workflows: Taverna</i>	A12		
Exam		Exam covers Lectures 1-12			