

**PROGRAM PROPOSAL**  
**AD-HOC HONOURS IN BIOLOGY AND COMPUTER SCIENCE**

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(The courses that I shall have completed as of the end of Winter 2012 are underlined.  
This is based on my schedule as of Aug 17<sup>th</sup> 2011)

**JOINT HONOURS IN BIOLOGY AND COMPUTER SCIENCE**  
78 Credits

COURSE	CREDITS	TITLE
<b>REQUIRED MATH COURSES</b>		
<u>MATH 222</u>	3	Calculus 3
<u>MATH 223</u>	3	Linear Algebra
<u>MATH 240</u>	3	Discrete Structures I
<u>MATH 323</u>	3	Probability
<u>MATH 324</u>	3	Statistics
<u>MATH 325</u>	3	Honours ODEs
<b>REQUIRED BIOLOGY COURSES</b>		
<u>CHEM 212</u>	4	Introductory Organic Chemistry I
<u>BIOL 200</u> <sup>1</sup>	3	Molecular Biology
<u>BIOL 201</u>	3	Cell Biology and Metabolism
<u>BIOL 202</u>	3	Basic Genetics
<u>BIOL 215</u>	3	Introduction to Ecology and Evolution
<u>BIOL 301</u>	4	Cell and Molecular Laboratory
<b>REQUIRED COMPUTER SCIENCE COURSES</b>		
<u>COMP 206</u>	3	Introduction to Software Systems
<u>COMP 250</u>	3	Introduction to Computer Science
<u>COMP 251</u> <sup>4</sup>	3	Data Structures and Algorithms
<u>COMP 362</u>	3	Honours Algorithm Design
<u>COMP 561</u>	4	Computational Biology Methods and Research
<b>REQUIRED JOINT HONOURS COURSES<sup>6</sup></b>		
<u>BIOL 479</u>	9	Honours Research Project 1

COURSE	CREDITS	TITLE
<b><math>\Sigma = 63</math> Credits</b> (4 Uncompleted as of the end of Winter 2012)		
<b>ADDITIONAL COURSES<sup>7</sup></b> Choose 15 Credits from the following. At total of 9 Credits (excluding COMP 561) must be at the 500-level <sup>8</sup>		
MATH 437	3	Mathematical Methods in Biology
MATH 447	3	Introduction to Stochastic Processes
COMP 273	3	Introduction to Software Systems
COMP 302	3	Programming Languages and Paradigms
COMP 303	3	Software Development
COMP 310	3	Operating Systems
COMP 330	3	Theoretical Aspects: Computer Science
COMP 335	3	Software Engineering
<u>COMP 350</u>	3	Numerical Computing
COMP 417	3	Introduction to Robotics and Intelligent Systems
COMP 421	3	Database Systems
COMP 423	3	Data Compression
COMP 424	3	Artificial Intelligence
COMP 490	3	Introduction to Probabilistic Analysis of Algorithms
All COMP courses at the 500-level		
<u>(COMP 558)</u>	3	Fundamentals of Computer Vision
<u>BIOL 300</u>	3	Molecular Biology of the Gene
<u>BIOL 303</u>	3	Developmental Biology
BIOL 309	3	Mathematical Models in Biology
BIOL 313	3	Eukaryotic Cell Biology
BIOL 314	3	Molecular Biology of Oncogenes
BIOL 319	3	Introduction to Biophysics
BIOL 370	3	Human Genetics Applied
BIOL 395	1	Quantitative Biology Seminar I

COURSE	CREDITS	TITLE
BIOL 495	1	Quantitative Biology Seminar II
<u>BIOL 518</u>	3	Advanced Topics in Cell Biology
<u>BIOL 551</u>	3	Molecular Biology: Cell Cycle
BIOL 568	3	Topics on the Human Genome
BIOL 575	3	Human Biochemical Genetics
<b><math>\Sigma = 78</math> Credits</b> (4 Uncompleted as of the end of Winter 2012)		

### PROGRAM CONTRIBUTORS

#### COMPUTER SCIENCE DEPARTMENT

- **Bettina Kemme:** Head of the Academic Committee, Primary Computer Science Collaborator
- **Liette Chin:** Undergraduate Program Coordinator

Suggestions were also contributed by:

- **Jérôme Waldispühl:** Advisor for joint-CS-Biology students
- **Doina Precup**

#### BIOLOGY DEPARTMENT

- **Jackie Vogel:** Primary Biology Collaborator
- **Nancy Nelson:** Biology Undergraduate Advisor
- **Gary Brouhard:** Primary Research Supervisor for Honours Project
- **Neil Price:** Honours Advisor, conferred Departmental Permission for the ad-hoc honours program

## **Joint Major in Computer Science & Biology (69-73 Credits)**



Life Sciences are becoming increasingly quantitative and analytical, and integrative.

This program will train students to the fundamentals of Biology – with a focus on molecular biology – and will give them the computational and mathematical skills needed to handle and analyze large biological datasets.

The program fills an important gap in the undergraduate programs at McGill, as no existing program allows students to get a solid training in these two increasingly interconnected fields.

**Advising notes for UO students:** It is highly recommended that freshman BIOL, CHEM, MATH and PHYS courses be selected with an advisor to ensure they meet the core requirements of the COMP-BIO program.

### **Required MATH Courses (6 Credits):**

<b>Credits</b>	<b>Department</b>	<b>Courses</b>	<b>Course Title</b>
3	Mathematics	MATH 222	Calculus 3
3		MATH 223	Linear Algebra

### **Required COMP Courses (12, 15 OR 16 CREDITS):**

<b>Credits</b>	<b>Department</b>	<b>Courses</b>	<b>Course Title</b>
3	Computer Science	COMP 202	Introduction to Computing 1*
		COMP 206	Introduction to Software Systems
		COMP 250	Introduction to Computer Science
		COMP 251	Data Structure and Algorithms
		COMP 462	Computational Biology Methods
		<i>or</i> COMP 561	Computational Biology Methods and Research

\*Students who have sufficient knowledge in a programming language are not required to take COMP 202

**Required BIOL/CHEM Courses (20 CREDITS):**

<b>Credits</b>	<b>Department</b>	<b>Courses</b>	<b>Course Title</b>
3	Biology	BIOL 200	Molecular Biology
3		BIOL 201	Cell Biology and Metabolism
3		BIOL 202	Basic Genetics
3		BIOL 215	Introduction to Ecology and Evolution
4		BIOL 301	Cell and Molecular Laboratory
4	Chemistry	CHEM 212	Introductory Organic Chemistry 1

**Required JOINT Courses (4 CREDITS):**

<b>Credits</b>	<b>Department</b>	<b>Courses</b>	<b>Course Title</b>
3	Computer Science	COMP 401	Project in Biology & Computer Science
1		COMP 499	Undergraduate Bioinformatics Seminar

**Complementary Courses (27 CREDITS)**

6 credits from the following:

<b>Credits</b>	<b>Department</b>	<b>Courses</b>	<b>Course Title</b>
3	Biology	BIOL 309	Mathematical Models in Biology
3		<b>and</b> BIOL 373	Biometry
<b>OR</b>			
3	Mathematics	MATH 323	Probability
3		<b>and</b> MATH 324	Statistics
<b>OR</b>			
3		MATH 203	Principles of Statistics 1
3		<b>and</b> MATH 204	Principles of Statistics 2

At least 21 credits from the following lists with the following two requirements:

- (1) At least 9 credits from each of the two blocks
- (2) At least 9 credits at the 400 level or above
- (2) At least 3 credits at the 400 level or above from each block

Computer Science Block

<b>Credits</b>	<b>Department</b>	<b>Courses</b>	<b>Course Title</b>
3		MATH 240	Discrete Structures 1

## EXISTING JOINT MAJOR PROGRAM

3	COMP 273	Introduction to Computer Systems
3	COMP 302	Programming Languages and Paradigm
3	COMP 303	Software Development
3	COMP 304	Object Oriented Software Design
3	COMP 310	Operating Systems
3	COMP 330	Theoretical aspects: Computer Science
3	COMP 335	Software Engineering Methods
3	COMP 350	Numerical Computing
3	COMP 360	Algorithm Design Techniques

All COMP courses at the 400-level (except 401, 499 and 462) and all courses at the 500-level (except 561)

### Biology Block

<b>Credits</b>	<b>Department</b>	<b>Courses</b>	<b>Course Title</b>
3		BIOL 300	Molecular Biology of the Gene
3		BIOL 309	Mathematical Models in Biology
3		BIOL 310	Large Scale Ecology
3		BIOL 313	Eukaryotic Cell Biology
1		BIOL 395	Quantitative Biology Seminar 1
3		BIOL 435	Natural Selection
1		BIOL 495	Quantitative Biology Seminar 2
3		BIOL 518	Advanced Topics in Cell Biology
3		BIOL 551	Molecular Biology: Cell Cycle
3		BIOL 568	Topics of the Human Genome
3		BIOL 569	Developmental Evolution
3		BIOL 572	Molecular Evolution
3		BIOL 583	Advanced Biometry