1.0 Degree Title
Specify the two degrees for concurrent degree programs

Bachelor of Science

1.1 Major (Legacy = Subject) (30-char. max.)
Computer Science and Biology

1.2 Concentration (Legacy = Concentration/Option)
If applicable (30 char. max.)

1.3 Minor (with Concentration, if applicable)
(30 char. max.)

1.4 Category

Faculty Program (FP) Honours (HON)
Major Joint Honours
X Joint Major Component (HC)
Major Concentration (CON) Internship/Co-op
Minor Thesis (T)
Minor Concentration (CON) Non-Thesis (N)
Other
Please specify

1.5 Complete Program Title
B.Sc.; Joint Major in Computer Science and Biology

2.0 Administering Faculty/Unit
Science

2.0 Administration Faculty/Unit

3.0 Effective Term of revision or retirement
Please give reasons in 5.0 "Rationale" in the case of retirement
(Ex. Sept. 2004 = 200409)
Retirement

Term: 201609

4.0 Existing Credit Weight
Proposed Credit Weight

73
69 to 73

5.0 Rationale for revised program

1) Addition of complementary courses in Biology and Computer Science to afford more flexibility to students.
2) Removal of courses that are no longer offered
3) Removal of two of the three alternative pairs of courses on probability and statistics, keeping only MATH 323 and 324, which are the only courses providing a sufficiently deep mathematical treatment of these critical fields.
4) Creation of three (optional) streams (Computational Molecular Biology and Genetics; Computational Evolution and Ecology; Computational Neurobiology) to guide students through the large set of possible complementary courses.

6.0 Revised Program Description (Maximum 150 words)

This program will train students in the fundamentals of biology and will give them computational and mathematical skills needed to manage, analyze, and model large biological datasets. It is structured along three optional streams: (1) Computational Molecular Biology and Genetics; (2) Computational Evolution and Ecology; (3) Computational Neurobiology. Two integrative features of the program are a three-credit joint independent studies course (COMP 401), and a one-credit seminar (COMP 499).

Students may complete this program with a maximum of 73 credits or a minimum of 69 credits. This depends upon the student's choice of required courses and whether or not the student is exempt from taking COMP 202.

Program prerequisites: To ensure they meet the core requirements of the program it is highly recommended that the following courses be selected by U0 students: BIOL 111-112, CHEM 110-120, MATH 133, MATH 140-141 or MATH 150-151, PHYS 101-102 or PHYS 131-142. Note that MATH 150-151 provides equivalence for required course MATH 222. It is also advisable to take COMP 202 during U0 if possible.
7.0 List of existing program and proposed program

Existing program (list courses as follows: Subj Code/Crse Num, Title, Credit weight, under the headings of: Required Courses, Complementary Courses, Elective Courses)

Required Courses (49 credits)

Required Mathematics and Statistics Courses
MATH 222 Calculus 3 (3 credits)
MATH 223 Linear Algebra (3 credits)

Required Computer Science Courses
12-16 credits from:
* Students who have sufficient knowledge in a programming language are not required to take COMP 202.
** Students take either COMP 462 or COMP 561.
COMP 202 Foundations of Programming (3 credits)*
COMP 206 Introduction to Software Systems (3 credits)
COMP 250 Introduction to Computer Science (3 credits)
COMP 251 Algorithms and Data Structures (3 credits)
COMP 462 Computational Biology Methods (3 credits)**
COMP 561 Computational Biology Methods and Research (4 credits)**

Required Biology Courses
20 credits from:
BIOL 200 Molecular Biology (3 credits)
BIOL 201 Cell Biology and Metabolism (3 credits)
BIOL 202 Basic Genetics (3 credits)
BIOL 215 Introduction to Ecology and Evolution (3 credits)
BIOL 301 Cell and Molecular Laboratory (4 credits)
CHEM 212 Introductory Organic Chemistry 1 (4 credits)

Required Joint Courses
4 credits from:
COMP 401 Project in Biology and Computer Science (3 credits)
COMP 499 Undergraduate Bioinformatics Seminar (1 credit)

Complementary Courses (27 credits)
6 credits, ONE of the following pairs of courses as follows:
MATH 203 and MATH 204 or MATH 323 and MATH 324 or BIOL 309 and BIOL 373.
BIOL 352 Mathematical Models in Biology (3 credits)
BIOL 373 Biometry (3 credits)
MATH 203 Principles of Statistics 1 (3 credits)
MATH 304 Principles of Statistics 2 (3 credits)
MATH 323 Probability (3 credits)
MATH 324 Statistics (3 credits)

At least 21 credits selected from the following blocks, with the following requirements:
- at least 9 credits from each of the following two blocks
- at least 9 credits at the 400 level or above
- at least 3 credits at the 400 level or above from each block

Computer Science Block
Note: All COMP courses at the 400 level or above (except COMP 400).
COMP 273 Introduction to Computer Systems (3 credits)
COMP 302 Programming Languages and Paradigms (3 credits)
COMP 303 Software Development (3 credits)
COMP 310 Operating Systems (3 credits)
COMP 350 Numerical Computing (3 credits)
COMP 360 Algorithm Design (3 credits)
COMP 361D1 Software Engineering Project (3 credits)*
COMP 361D2 Software Engineering Project (3 credits)*
MATH 240 Discrete Structures 1 (3 credits)
* Students must take both COMP 361D1 and COMP 361D2.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight, under the headings of: Required Courses, Complementary Courses, Elective Courses)

Required Courses (48-52 credits)
* Note: Students with CEGEP-level credit for the equivalents of MATH 222 and/or CHEM 212 (see http://www.mcgill.ca/students/courses/plan/transfer/ for accepted equivalents) may not take these courses at McGill and should replace them with elective courses to satisfy the total credit requirement for their degree.

Required Mathematics and Statistics Courses
12 credits from:
MATH 222 Calculus 3 (3 credits)*
MATH 223 Linear Algebra (3 credits)
MATH 323 Probability (3 credits)
MATH 324 Statistics (3 credits)

Required Computer Science Courses
12-16 credits from:
COMP 202 Foundations of Programming (3 credits)**
COMP 206 Introduction to Software Systems (3 credits)
COMP 250 Introduction to Computer Science (3 credits)
COMP 251 Algorithms and Data Structures (3 credits)**
COMP 462 Computational Biology Methods (3 credits)**
COMP 561 Computational Biology Methods and Research (4 credits)**
** Students who have sufficient knowledge in a programming language are not required to take COMP 202
*** Students are advised to take MATH 240 before COMP 251
**** Students take either COMP 462 or COMP 561.

Required Biology Courses
20 credits from:
BIOL 200 Molecular Biology (3 credits)
BIOL 201 Cell Biology and Metabolism (3 credits)
BIOL 202 Basic Genetics (3 credits)
BIOL 215 Introduction to Ecology and Evolution (3 credits)
BIOL 301 Cell and Molecular Laboratory (4 credits)
CHEM 212 Introductory Organic Chemistry 1 (4 credits)*

Required Joint Courses
4 credits from:
COMP 401 Project in Biology and Computer Science (3 credits)
COMP 499 Undergraduate Bioinformatics Seminar (1 credit)

Complementary Courses (21 credits)
At least 21 credits selected from the following blocks, with the following requirements:
- at least 9 credits from each of the following two blocks
- at least 9 credits at the 400 level or above
- at least 3 credits at the 400 level or above from each block

Computer Science Block
All COMP courses at the 400 level or above (except COMP 400, 401, 499, 462, 561).
COMP 273 Introduction to Computer Systems (3 credits)
COMP 302 Programming Languages and Paradigms (3 credits)
COMP 303 Software Development (3 credits)
COMP 307 Principles of Web Development (3 credits)
COMP 310 Operating Systems (3 credits)
COMP 322 Introduction to C++ (1 credit)
COMP 330 Theory of Computation (3 credits)
COMP 350 Numerical Computing (3 credits)
COMP 360 Algorithm Design Techniques (3 credits)
COMP 361D1 Software Engineering Project (3 credits)*
COMP 361D2 Software Engineering Project (3 credits)*
MATH 240 Discrete Structures 1 (3 credits)
* Students must take both COMP 361D1 and COMP 361D2.

(continuation on the next page)
Biology Block

BIOL 300 Molecular Biology of the Gene (3 credits)
BIOL 303 Developmental Biology (3 credits)
BIOL 304 Evolution (3 credits)
BIOL 306 Neural Basis of Behavior (3 credits)
BIOL 308 Ecological dynamics (3 credits)
BIOL 309 Mathematical Models in Biology (3 credits)
BIOL 310 Biodiversity and Ecosystems (3 credits)
BIOL 313 Eukaryotic Cell Biology (3 credits)
BIOL 314 Molecular Biology of Oncogenes (3 credits)
BIOL 316 Eukaryotic Cell Biology 2 (3 credits)
BIOL 319 Introduction to Biophysics (3 credits)
BIOL 320 Evolution of Brain and Behavior (3 credits)
BIOL 370 Human Genetics Applied (3 credits)
BIOL 389 Laboratory in Neurobiology (3 credits)
BIOL 395 Quantitative Biology Seminar 1 (3 credits)
BIOL 416 Genetics of Mammalian Development (3 credits)
BIOL 434 Theoretical Ecology (3 credits)
BIOL 435 Natural Selection (3 credits)
BIOL 495 Quantitative Biology Seminar 2 (3 credits)
BIOL 509 Methods in Molecular Ecology (3 credits)
BIOL 514 Neurobiology of Learning and Biology (3 credits)
BIOL 520 Gene Activity in Development (3 credits)
BIOL 524 Topics in Molecular Biology (3 credits)
BIOL 530 Advances in Neuroethology (3 credits)
BIOL 532 Developmental Neurobiology Seminar (3 credits)
BIOL 546 Genetics of Model Systems (3 credits)
BIOL 551 Principles of Cellular Control (3 credits)
BIOL 568 Topics of the Human Genome (3 credits)
BIOL 569 Developmental Evolution (3 credits)
BIOL 575 Human Biochemical Genetics (3 credits)
BIOL 580 Genetics Approaches to Neural Systems (3 credits)
BIOL 588 Advances in Molecular/Cellular Neurobiology (3 credits)
NEUR 310 Cellular Neurobiology (3 credits)

Suggested streams
Note: These streams are for students’ guidance only; it is not mandatory to follow any stream.

1) Computational Molecular Biology and Genetics Stream

Biology complementary block: BIOL 300, BIOL 314, BIOL 370, BIOL 416, BIOL 434, BIOL 546, BIOL 551, BIOL 568, BIOL 575, BIOL 572

2) Computational Evolution and Ecology Stream

Biology complementary block: BIOL 303, BIOL 304, BIOL 308, BIOL 309, BIOL 310, BIOL 435, BIOL 509, BIOL 520, BIOL 569, BIOL 572

3) Computational Neurobiology Stream

Biology complementary block: BIOL 306, BIOL 320, BIOL 389, BIOL 530, BIOL 532, BIOL 580, BIOL 588, NEUR 310.
### 9. Approvals

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Submitted by

- **Name**: 
- **Phone**: 
- **Email**: 
- **Submission Date**: 

To be completed by ARR:

- **CIP Code**: 

**8.0 Consultation with Related Units**
- Yes
- No

**Financial Consult**
- Yes
- No

Attach list of consultations
Hi Josie,
Here is the consultation from Neurology - Neurosurgery, needed for the CS-Bio proposed/revised programs.
Cheers,
ML

-------- Forwarded Message --------
Subject: FW: PLEASE RESPOND RE: consultation report for NEUR 310
Date: Tue, 24 Nov 2015 13:36:42 +0000
From: Neurology - Neurosurgery <n-ns@mcgill.ca>
To: Michael Langer <langer@cim.mcgill.ca>
Hello Michael,

Sorry for the delay. Please see the approval from Neurology and Neurosurgery Chair, Dr. Guy Rouleau.

I am away from the office unexpectedly today, but if there is anything else, I will be checking my emails throughout the day.

Kind regards,
Sandra
Sandra Kadowaki
Administrative Affairs Assistant
Neurology & Neurosurgery
McGill University
Montreal Neurological Hospital

From: Guy Rouleau, Dr
Sent: Monday, November 23, 2015 4:24 PM
To: Neurology - Neurosurgery
Subject: RE: PLEASE RESPOND RE: consultation report for NEUR 310

Yes, OK

Guy Rouleau MD PhD FRCP(C) OQ
Director, Montreal Neurological Institute and Hospital and
Department of Neurology and Neurosurgery
McGill University

From: Neurology - Neurosurgery
Sent: November 23, 2015 3:59 PM
To: Guy Rouleau, Dr <guy.rouleau@mcgill.ca>
Subject: PLEASE RESPOND RE: consultation report for NEUR 310

Hi Dr. Rouleau,

The School of Computer Science and Dept of Biology are proposing a new Honours Program in Computer Science and Biology (Undergrad), and would also like to modify the existing Joint Majors Program in Computer Science and Biology; they would like to include NEUR 310 Cellular Neurobiology as a Complementary Course in these programs.
As you can see below, JF Cloutier, who is charge of this course, has given his ok to include it in their program. Michael Langer, Chair of the Academic Committee for the School of Computer Science, however, needs departmental approval as well. I asked David Ragsdale about this since he is involved in Undergrad teaching, and he suggested that I simply ask you for your “OK” on this. Are you alright with this course being included?

Thanks,

Sandra

Sandra Kadowaki  
Administrative Affairs Assistant  
Neurology & Neurosurgery  
McGill University  
Montreal Neurological Hospital

From: David Ragsdale, Dr.  
Sent: November-18-15 5:05 PM  
To: Neurology - Neurosurgery <n-ns@mcgill.ca>  
Subject: RE: consultation report for NEUR 310

Sandra:

This is (I think) the only undergraduate course offered by Neurology and Neurosurgery and is probably way Dr. Rouleau’s radar. I would guess that he has no idea about the content of the course and would not be in a position to judge its suitability for other programs.

Monroe Cohen coordinates the undergraduate neuroscience program, but that’s not a department, so if they insist on department approval that won’t do. Can we ask Dr. Rouleau to sign off on the course?

Dave

From: Neurology - Neurosurgery  
Sent: Wednesday, November 18, 2015 2:06 PM  
To: David Ragsdale, Dr. <david.ragsdale@mcgill.ca>  
Subject: FW: consultation report for NEUR 310  
Importance: High

Hello Dr Ragsdale,

I received the request below regarding the School of Computer Science and Dept of Biology who are proposing new Honours Programs, and also modifying the existing Joint Majors Program in Computer Science and Biology. They’d like to include NEUR 310 Cellular Neurobiology as a Complementary Course in these programs. JF Cloutier is responsible for these courses and has given his ok, but Michael Langer, the Chair for the Academic Committee in the School of Computer Science is requesting Departmental approval.
I asked Fraser Moore (involved in Neurology UGME) about this, and he suggested I ask you about this since you are very much involved in Undergraduate teaching in neuroscience. What would the protocol be in this kind of situation, in order to obtain departmental approval for what is being requested?

Many thanks,

Sandra

Sandra Kadowaki
Administrative Affairs Assistant
Neurology & Neurosurgery
McGill University
Montreal Neurological Hospital

From: Jean-Francois Cloutier, Dr.
Sent: November-18-15 10:42 AM
To: Michael Langer <langer@cim.mcgill.ca>
Cc: n-ns@mcgill.ca; Neurology - Neurosurgery <n-ns@mcgill.ca>
Subject: Re: consultation report for NEUR 310

Dear Michael,

As the coordinator of the Neur310 course, I do not have any objections to including this course as a complementary course in your program, as long as the Department approves it.

Sincerely,

JF

*****************************************************************************
Jean-Francois Cloutier, Ph.D.
Associate Professor Dept. Neurology & Neurosurgery
Chercheur Boursier Sénior - FRQ-S
Montreal Neurological Institute
3801 University; Room MP105
Montréal, Quèbec H3A2B4
email: jf.cloutier@mcgill.ca
tel: 514-398-6351
fax: 514-398-1319
*****************************************************************************

On Nov 13, 2015, at 5:58 PM, Michael Langer <langer@cim.mcgill.ca> wrote:

Hello Sandra Kadowsky and Professor Cloutier,

The School of Computer Science and Dept of Biology are proposing a new Honours Program in Computer Science and Biology, and also modifying the existing Joint Majors Program in Computer Science and Biology.

As you can see from the attachments, we would like to include
NEUR 310 Cellular Neurobiology as a Complementary Course in these programs.

Could you please reply to this email and let us know if the Dept of Neurology and Neurosurgery has any Objections?

PS the email link on the mcgill website is n-ns@mcgill.ca which is probably not correct.

Thank you very much.

Michael Langer
Chair, Academic Committee
School of Computer Science
Faculty of Science, McGill U