FACULTY OF SCIENCE
MEETING OF FACULTY
Tuesday, 10 January 2017
3:00 p.m.
Leacock Council Room - L232

A G E N D A

1. Adoption of Agenda

2. Minutes of 6 December, 2016 S-16-18 On Web

3. Business Arising from the Minutes

4. Report of Committee
   - Academic Committee - Associate Dean Tamara Western S-16-19 On Web

5. Dean's Business
   a) Announcements

6. Reports of Director & Associate Deans
   a) Director (Advising Services) Nicole Allard
   b) Associate Dean (Graduate Education) Laura Nilson
   c) Associate Dean (Research) Doina Precup
   d) Associate Dean (Academic) Tamara Western

7. Report on Actions of Senate
   Prof. David Harpp: Senate Meeting of 7 December, 2016

8. Members' Question Period

9. Other Business

Next Meeting 14 February 2017
Before the start of the meeting, Prof. Peter M.J. Douglas from the Department of Earth & Planetary Sciences gave a short research presentation.

ATTENDANCE: As recorded in the Faculty Appendix Book

DOCUMENTS: S-16-15 - S-16-17

Dean Lennox called the meeting to order at 3:00 p.m., and welcomed both members and the Deputy Provost (Student Life & Learning) Prof. Ollivier Dyens to the meeting.

1) DEPUTY PROVOST (STUDENT LIFE & LEARNING) PROF. OLLIVIER DYENS

Dean Lennox welcomed Deputy Provost (Student Life & Learning) Prof. Ollivier Dyens to the Faculty of Science meeting. Deputy Provost Dyens introduced his colleagues Dr. Maria Orjuela-Laverde, Academic Associate at Teaching and Learning Services; Kathleen Massey, University Registrar and Executive Director of Enrolment Services; and Richard Courtois, Senior HR Advisor for Student Life & Learning (SLL).

Deputy Provost Dyens said the role of SLL is both to support students and to support the academic mission of McGill. He said that SLL encompassed Athletics and Recreation, Enrolment Services, the Office of the Dean of Students, Student Housing and Hospitality Services, Student Services as well as Teaching and Learning Services. Deputy Provost Dyens said the vision of SLL is to unify life and learning to nurture, inspire and guide our community throughout the 21st century journey. Deputy Provost Dyens said that the mission of SLL is to strive for innovative ways to ensure the best, most rewarding, and healthiest McGill experience creates an environment where students can explore their world, discover their purpose and reach their goals. Deputy Provost Dyens then enumerated the principles of SLL. He said these are to support the academic mission of the university, to build bridges between life and learning and to advocate for student rights and responsibilities.

Deputy Provost Dyens said SLL has two types of units – those that are self-funding and those that are university funded. The self-funded units are Student Services, Athletics and Recreation as well as Student Housing and Hospitality Services. The university-funded units are Enrolment Services, the Office of the Dean of Students, Teaching and Learning Services and finally The Office of Student Life and Learning.

Deputy Provost Dyens said the objectives of SLL are to (1) offer the best, most innovative and healthiest educational experience in North America, (2) use the campus to extend the learning experience and (3) to develop intellectual partnerships with Faculties, students, and the entire McGill community. Deputy Provost Dyens then highlighted some recent SLL initiatives including the rethinking of Frosh wherein the SLL office worked with Director Allard, the Dean of Students and Student Services to improve the experience of Frosh for both students and those within the Milton-Parc community and the First Year Residence Cafeteria Study Group (FRezCa) which is a free tutorial service by TAs and professors for students in the Faculty of Science.

Regarding the current situation SLL is facing, Deputy Provost Dyens highlighted the changing nature of higher education (new technology; new skills needed; new competitors; increasing demands on services),
the changing nature of students (more responsible, intelligent and compassionate but also in need of better resilience) and the need to define further reasonable accommodations.

Regarding some of the current challenges, Deputy Provost Dyens highlighted managing the business and legal relationships with student groups, communicating with students and the university community, policy development (for example regarding sexual violence; student assessment; medical notes; plagiarism) as well as broader questions like “how can we create a healthy, but demanding, learning environment?” and “How can we support, help, and develop autonomy?”.

Finally, Deputy Provost Dyens touched on some ways SLL could help Faculty Council members. The first of these was to note that the Deputy Provost is available for any questions, issues or problems of any kind that members may have. Deputy Provost Dyens also said the Dean of Students Chris Buddle is available to help with academic problems and students exhibiting worrisome behaviour and that Cara Piperni, Interim Senior Director of Student Services, is available to assist students with non-academic problems of any kind.

Deputy Provost Dyens then introduced Kathleen Massey who said that Enrolment Services works closely with the Science Office for Undergraduate Student Advising (SOUSSA) to support students and develop new practices and policies. She said members should not hesitate to contact her directly. Dr. Maria Orjuela-Laverde spoke next. She said that Teaching & Learning Services supports professors in developing classroom strategies, working with Teaching Assistants and is also starting to work with undergrads. She gave the example of classroom observation which is currently being offered to professors who request it in the Faculty of Engineering. Here, Dr. Orjuela-Laverde talks to students about their experience in the classroom without the professor in the room. She said this can be a helpful form of course evaluation. Richard Courtois spoke next and he said his role was to make sure all sub-units of SLL follow the same HR policies and guidelines. He also said as Senior HR Advisor he deals with re-organization, training and more.

Lastly, Deputy Provost Dyens insisted that Faculty members should call of SLL at any time with any question regarding students. He said that professors are often the first line of defense to ensure students are safe and protected because they see students regularly. He said that the SLL office exists to take care of anything that falls outside of Faculty members’ responsibilities as professors and researchers.

Deputy Provost Dyens then took questions from members.

Regarding FRezCa, Deput Provose Dyens explained that the study group mostly covers large first-year courses where it might be easy for students to fall behind. He said Anita Parmar, Research Advisor for Student Life and Learning, is the person to contact for more information.

Regarding students’ resiliency, Dean Lennox said students often become risk-averse due to the academic implications. He said this was largely a function of students’ increasing focus on grades and that students’ desire to be successful academically can often impede their ability to explore and take risks. Deputy Provost Dyens said one option may be to extend the time students’ have to decide whether or not to take courses as Pass/Fail. Kathleen Massey said students are at McGill to learn and that learning inherently involves risk-taking. She said all policy changes, including delaying a commitment to Pass/Fail, need to be considered carefully. She also suggested that perhaps delaying the course withdrawal deadline would allow for more exploration by reducing the risk. Dean Lennox said sometimes good ideas are stopped before they are fully explored because there are so few good forums for these conversations. Deputy Provost Dyens said there was a need to create time and space for students to work on their own projects or to experiment outside of the context of a graded classroom. He said that more room is needed to allow students to explore within their electives while keeping the core curriculum rigorous.

Regarding course evaluation, Dean Lennox said he would like to explore the alternative methods being employed within the Faculty of Engineering – that is, having a TLS representative talk to students about their experience in the classroom without the professor in the room. He said course evaluations are very
valuable but sometimes not ideal for pulling out students’ often very good insights about how a course could be improved.

2) **ADOPTION OF AGENDA**

Prof. Damha moved, seconded by Prof. Stephens, that the Agenda be adopted.

The motion carried.

3) **MINUTES OF 15 NOVEMBER, 2016**

Prof. Zuroff moved, seconded by Prof. Fussmann, that the Minutes be approved.

The motion carried.

4) **BUSINESS ARISING FROM THE MINUTES**

There was no business arising from the minutes.

5) **REPORTS OF COMMITTEES**

- Academic Committee

The Academic Committee approved the following on Tuesday, 22 November 2016:

**SECTION A: NEW COURSES & PROGRAMS**

(1) **Atmospheric & Oceanic Sciences**

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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>PRN</th>
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<tr>
<td>ATOC 404</td>
<td>Climate Physics</td>
<td>3</td>
<td>PRN 11846</td>
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Associate Dean Western said this department has long been considering a course on 1D climate to fill a gap between the 200-level sequence and the more math/physics-intensive 500-level courses that primarily serve M.Sc. students. She said that this course would also serve to increase the visibility of Atmospheric & Oceanic Sciences in the university at large, which resonates with McGill's new emphasis on sustainability and could very well be an optional course for students in the Earth System Science program. Additionally, she said this course fits the Faculty’s goal of more interdisciplinary courses, including courses co-listed in two departments. Finally, she said this course will be required for the ATOC Climate Science stream of the undergraduate Major and Honours programs.

Associate Dean Western moved, seconded by Prof. Kemme, that the new course be approved.

The motion carried.

(2) **Physics**

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<tr>
<td>PHYS 404</td>
<td>Climate Physics</td>
<td>3</td>
<td>PRN 11844</td>
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Associate Dean Western said the Physics Department strongly supports this double prefix course. She said this course would introduce Physics undergrads to climate and atmospheric science, which would serve as valuable background to those interested in pursuing planetary science or exoplanet graduate degrees after completing their undergraduate Physics degree.

Associate Dean Western **moved**, seconded by Prof. Merlis, that the new course be approved.

**The motion carried.**

(3) **Chemistry**

CHEM 505 Computer Modeling of Molecules & Materials AC-16-19 PRN 11834

3 credits

Associate Dean Western said computer modeling of molecular systems and materials is now routinely used in all branches of fundamental science – chemistry, physics, and materials science – but that there is currently no course offered at McGill that covers this material. She said this course was being proposed to give students a greater understanding of the structure of programming.

Associate Dean Western **moved**, seconded by Prof. Damha, that the new course be approved.

**The motion carried.**

(4) **Computer Science**

COMP 550 Natural Language Processing AC-16-20 PRN 11423

3 credits

Associate Dean Western said that natural language processing is one of the main subareas of artificial intelligence, but there is currently no course in the Faculty of Science on this topic. While acknowledging that the Department of Linguistics offers a course on computational linguistics (LING 550) which focuses on linguistic analysis using computational techniques, she said that COMP 550 assumes significantly more computational background, and is aimed towards technological applications. She said this course will prepare students for graduate-level research in natural language processing, and give them the background to qualify for internship and job opportunities in this field in industry. Finally, she said this course has previously been offered as a topics course (COMP 599) with enrollment numbers of 39 in Fall 2015 and 44 in Fall 2016.

Associate Dean Western **moved**, seconded by Prof. Kemme, that the new course be approved.

**The motion carried.**

**SECTION B: COURSE REVISIONS**

(1) **Anatomy & Cell Biology**

ANAT 323 Clinical Neuroanatomy AC-16-10 PRN 11729

Course Title, Corequisites 3 credits
Associate Dean Western explained that ANAT 323 is primarily offered to PT/OT students, therefore the material focuses on clinical cases making the title change to Clinical Neuroanatomy necessary. She said this clinical approach is specific to this course and the students required to take it. Regarding the new ANAT 315 corequisite, Associate Dean Western said ANAT 315 is an existing prerequisite for PT/OT students and that there is thus a gap in knowledge among the Anatomy Honours students who have not taken or are taking ANAT 315.

Associate Dean Western moved, seconded by Prof. Fussmann, that the course revision be approved.

**The motion carried.**

<table>
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<tr>
<th>Course</th>
<th>Description</th>
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<tr>
<td>ANAT 365</td>
<td>Cellular Trafficking</td>
<td>AC-16-11</td>
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<tr>
<td></td>
<td>Course Description</td>
<td>PRN 11730</td>
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<tr>
<td></td>
<td>3 credits</td>
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</table>

Associate Dean Western said that this course has evolved in its focus and format based on student feedback over the years and that, as such, a change in the course description is needed.

Associate Dean Western moved, seconded by Prof. Fussmann, that the course revision be approved.

**The motion carried.**

**SECTION C: PROGRAM CHANGES**

(1) **Anatomy & Cell Biology**

Major in Anatomy and Cell Biology AC-16-12

Associate Dean Western said that BIOL 301 is a core required course in the program and as such should not also be listed as a complementary course.

Associate Dean Western moved, seconded by Prof. Kemme, that the program revision be approved.

**The motion carried.**

Honours in Anatomy and Cell Biology AC-16-13

Associate Dean Western said BIOL 301 and ANAT 432 are core required courses in the program and as such should not also be listed as complementary courses. She also said that since ANAT 315 is now a corequisite for complementary course ANAT 323, ANAT 315 should be added to the list of complementary courses.

Associate Dean Western moved, seconded by Prof. Zuroff, that the program revision be approved.

**The motion carried.**

(2) **Atmospheric & Oceanic Sciences**

Major in Atmospheric Science AC-16-15

Associate Dean Western said the revision to the Major adds a new proposed course and adds to the list of complementary courses. The new proposed course is ATOC/PHYS 404 Climate Physics and will be added...
to the complementary course list for three of the Streams of the Major and will be added as a required course for the Climate Science Stream, where it replaces MATH 203. In the proposed Major, MATH 203 is a complementary course across all streams. In addition, two ESYS courses (ESYS 300 and ESYS 301) have been added to the complementary course lists for three streams (Weather Analysis and Forecasting, Climate Science, and General), as these are appropriate for the Atmospheric Science major and distinct from other complementary courses.

Associate Dean Western moved, seconded by Prof. Merlis, that the program revision be approved.

The motion carried.

Honours in Atmospheric Science

Associate Dean Western said the revision to the Honours program adds a new proposed course and adds to the list of complementary courses. The new proposed course is ATOC/PHYS 404 Climate Physics and will be added to the complementary course list for three of the Streams of the Major and will be added as a required course for the Climate Science Stream. In addition, two ESYS courses (ESYS 300 and ESYS 301) have been added to the complementary course lists for three streams, as these are appropriate for the Atmospheric Science major and distinct from other complementary courses.

Associate Dean Western moved, seconded by Prof. Merlis, that the program revision be approved.

The motion carried.

Minor in Atmospheric Science

Associate Dean Western said that the current Atmospheric Science Minor has limited flexibility with five required courses and only one complementary course. She said the proposed revision is intended to increase the flexibility of the Minor, so that students have a broader range of options that reflects the full range of course offerings by the Atmospheric & Oceanic Sciences department. The proposed Minor has one required course and the remaining five courses (15 credits) are complementary courses. The list of complementary courses has been expanded list by 10 additional courses. Finally, Associate Dean Western said the current Minor has certain required courses that are Complementary for the Major, while the proposed Minor program does not and that this has been corrected in the proposed Minor.

Associate Dean Western moved, seconded by Prof. Merlis, that the program revision be approved.

The motion carried.

(3) Neuroscience

Major in Neuroscience

Associate Dean Western said that this program revision included the addition of relevant courses, the deletion of courses no longer offered and changes to ensure that different streams have access to relevant courses available in other streams.

Associate Dean Western moved, seconded by Mr. Ware, that the program revision be approved.

The motion carried.

Honours in Neuroscience

AC-16-22
Associate Dean Western said that this program revision included both the addition of relevant courses and the deletion of courses no longer offered.

Associate Dean Western **moved**, seconded by Mr. Ware, that the program revision be approved.

The motion carried.

(4) **Bachelor of Arts & Science**

Minor Concentration History and Philosophy of Science AC-16-23

Associate Dean Western said this revision instituted some housekeeping changes to update the program.

Associate Dean Western **moved**, seconded by Prof. Fussmann, that the program revision be approved.

The motion carried.

Major Concentration Political Science AC-16-24
Joint Honours Component Political Science AC-16-25
Minor Concentration Political Science AC-16-26

Associate Dean Western said these revisions served to clarify program requirements and formalize many of the permissions and explanations that advisors have been giving to students on an ad-hoc basis.

Associate Dean Western **moved**, seconded by Prof. Zuroff, that these three program revisions be approved.

The motion carried.

**SECTION D: OTHER (For Information)**

(1) **Bio-Physical Sciences Umbrella & Alignment** AC-16-27

- For information (Program changes to follow)

Associate Dean Western informed the committee of that she has been working in conjunction with the Departments of Biology, Chemistry, Mathematics & Statistics, Physics, Physiology and the School of Computer Science to create an “umbrella framework” for undergraduate bio-physical sciences programs. She said the goal of this umbrella structure is to bring together all integrative bio-physical science programs and that this includes the four current joint programs (i.e. Math-Biology, Biology-Computer Science, Physiology-Physics, and Physiology-Math) as well as the interdisciplinary departmental options (i.e. Biology-Quantitative Biology and the proposed Physics-Biophysics and Chemistry-Biophysical Chemistry). She said the proposal is to make explicit the courses these programs already share in order to streamline timetabling as well as to develop integrative courses to contribute to these programs to make them truly interdisciplinary. Finally, she said the programs would each continue to exist as streams (or pillars) within the umbrella structure, but with their shared portions identified and aligned so that students would more easily be able to choose and move between them. She said that students taking interdisciplinary biosciences have already begun identifying with one another by forming a grass-roots society known as the McGill Integrated Bioscience Society (MIBS).
Associate Dean Western said that she wanted to give the Faculty Council time to reflect before bringing the new courses, new programs and program revisions associated with this umbrella framework to the Faculty Meeting meeting of January 10, 2017. She listed the items as follows:

- **Two new courses:**
  - BIOL 219 - Physical Biology of the Cell (4 credits)
  - PHYS 329 - Statistical Physics with Biophysical Application (3 credits)

- **Five revised programs:**
  - Biology – Quantitative Biology (Major & Honours)
  - Biology & Mathematics (Major)
  - Computer Science & Biology (Major & Honours)
  - Physiology & Mathematics (Major)
  - Physiology & Physics (Major)

- **Two new programs:**
  - Chemistry – Biophysical Chemistry (Major & Honours)
  - Physics – Biological Physics (Major & Honours)

### (2) Minor in Nanotechnology AC-16-5

Associate Dean Western said this Minor is offered by the Faculty of Engineering and that the Academic Committee twice discussed whether this Minor should be made available to Faculty of Science undergraduate students. She said that ultimately the Academic Committee did not feel comfortable offering this Minor to B.Sc. students due to concerns that this Minor is almost entirely composed of 400- and 500-level courses that have a number of prerequisite courses, thus making many of these courses inaccessible to students, considering the stipulation that 18 credits must be used exclusively for the Minor. She said that the Minor will again come back to the Academic Committee once roadmaps are drawn up representing several scenarios in which students electing to pursue this Minor were able to complete it.

### (3) Quantitative Life Sciences PhD Program AC-16-9

Associate Dean Western explained that a novel inter-department and inter-faculty Ph.D. training program in Quantitative Life Sciences had been proposed to Dean Lennox for approval. She said that, although this program did not follow the typical approval process, it was important to have the feedback of the Faculty Council. She said that, as such, this program would be discussed further under Dean’s Business.

Dean Lennox thanked Associate Dean Western for presenting the report of the Academic Committee.

- **Committee on Student Standing** S-16-17

Director Allard explained that the committee on Student Standing is a Faculty of Science committee to whom students can appeal decisions made by her regarding their requests for special accommodations due to special circumstances. She said on request came to the committee which was ultimately rejected.

### 6) DEAN’S BUSINESS

#### a) Announcements

Dean Lennox said he had a few updates on major projects with which the Faculty of Science is involved.

First, he spoke about the Royal Victoria Hospital project. Dean Lennox said that a report has been presented to the Principal which has been discussed by the P-7 group. He said some questions have come
back to the Steering Committee (primarily points of clarification and requests for explanations of some of the data). He said he expects a university-wide announcement of the academic plan to be forthcoming soon.

Second, Dean Lennox discussed the Stewart Biology redevelopment. He said, at the present time, this only affects Stewart-West because of the way the funding comes in. He said this project is well on-track for an April closure of Stewart-West and a complete relocation of everyone there. He said that demolition of the interior of the building would begin shortly thereafter. Dean Lennox said this project is proceeding very well and he publically acknowledged again the work of the Departments of Biology and Psychology as excellent partners to this project. He said he will continue to update the Faculty Council on this project.

Third, Dean Lennox noted that one of the members of the Faculty Advisory Board, which convenes to advise the Dean on new possibilities for philanthropy, had donated $500K over 5 years to the Faculty of Science to fund a Communications & Outreach Officer, which the Faculty of Science does not currently have. Dean Lennox said philanthropy is very important to what we do in the Faculty of Science and said that it is our incredible donors who make things happen by seeing where we have gaps and filling them. Dean Lennox said he will invite members of the Faculty Advisory Board to a future Faculty Meeting.

b) Quantitative Life Sciences PhD Program

Dean Lennox explained that a novel inter-department and inter-faculty Ph.D. training program in Quantitative Life Sciences had been proposed to him for approval. He said that, although this program did not follow the typical approval process, it was important him to have the feedback of the Faculty Council. He said the members’ thoughts, concerns and recommendations would inform his vote regarding this program.

Dean Lennox said one potential concern is that this program is monitored by the Dean of Graduate and Postdoctoral Studies and thus not under the purview of a Faculty of Science department. Prof. Fussmann asked about access to departmental awards and TA allocations for students in the program. Dean Lennox said this would be at the discretion of the department and that a Faculty policy would need to be developed if this program was approved. Associate Dean (Graduate Education) Laura Nilson said a policy would also need to be developed to ensure continued support of students in the program in the (hopefully rare) case that a student has a problem with their supervisor. Associate Dean Nilson also mentioned that departments should be aware that students in this program may have different academic requirements, demands and opportunities than students in the regular departmental program and should consider whether this is an issue – for example in the case of two students with the same supervisor.

Associate Dean Nilson said the prediction is that the QLS will bring in all new students to the university but that it will be hard to know if a student that would have normally done, say, a PhD in Mathematics will instead go into QLS because of different academic or financial incentives. She said this could impact Graduate Funding allocations that would go to QLS rather than to particular departments and therefore that one potential concern is whether this might compromise funding to existing programs in the Faculty, if, for example, instead of new students, the QLS enrolment is comprised of students who would have otherwise enrolled in a Faculty of Science PhD program.

Dean Lennox said he will proceed by granting his approval to the Dean of Graduate & Postdoctoral Studies but will set conditions for 1-, 2- and 3-year reviews with at least one Faculty of Science representative on any review committee. He said that we in the Faculty of Science pride ourselves on setting high standards and that he is concerned about the potential of large graduate programs within the Faculty that are not under departmental discretion.
Finally, Dean Lennox said he welcomed written comments from Faculty members and set a deadline of December 12, 2016 to receive such comments. Associate Dean Nilson said she would further review this PhD program at an upcoming meeting with Faculty of Science Graduate Program Directors.

7) REPORTS OF ASSOCIATE DEANS

a) Associate Dean (Graduate Education) Laura Nilson

Associate Dean Nilson said the first round of Graduate Mobility Awards had been granted to fund graduate students’ research. She said Graduate and Postdoctoral Studies (GPS) has launched the Graduate Mobility Award to encourage graduate students to study and conduct research abroad as part of their McGill degree program. She said award values varied depending on where the mobility activity takes place, its duration, the availability of funding at the time of application, etc. She said that in order to be eligible, students must be participating in one or more of the following mobility activities related to their thesis work: a research stay at a lab abroad, specialized training abroad, field work abroad or participation in a formal bilateral exchange/research partnership abroad. She noted conference-related travel was not eligible. She said applications are reviewed by the Faculty of Science. Keeping in mind that the goal of these funds is to allow students to take advantage of novel research-related mobility opportunities, rather than to pay for travel that was already planned as part of the student’s thesis, she said funding priority is based on the following: the novelty of the opportunity (learn a new skill, develop new collaborations, etc.), the duration of the trip (trips of less than one month should be well-justified), and the importance and value added by the award to the student’s research and/or training. She said the next rounds of funding will be in February and April 2017 and that all funds must be awarded by the end of the fiscal year.

b) Associate Dean (Research) Doina Precup

Associate Dean Precup noted a number of CFI successes. She explained the John R. Evans Leaders Fund is one of the CFI’s core funds. She said this Fund has a $2M cap and is mainly awarded to people started their careers. She said Prof. Anthony Mittermaier was awarded funding for a new shielded magnet and that Prof. Audrey Moores was awarded funding for a new state-of-the-art electron microscope. She said these items will created tremendous capacity within the Faculty of Science.

c) Director of Advising Nicole Allard

Director Allard said she had two reminders related to the upcoming final examinations.

First she said this is a very anxiety-producing time for students so she asked that if members noticed students they are concerned about, to please contact either her office or the Dean of Students’ office. She also said Instructors may use the Early Alert System widget, accessible by customizing their myCourses homepage, to express concern for a student. This system functions as an early alert mechanism to advise the Dean of Students about any students who may be experiencing difficulty so that appropriate coordinated efforts can be made to assist the student and/or refer them to relevant services, as warranted.

Second, Director Allard reminded instructors administering departmental Finals that some students may be simultaneously writing their exam with the Office for Students with Disabilities (OSD) and that, therefore, if they notice errors on the exam or need to make any other announcement, that they should notify the OSD office. She also said instructors should have their cell phones with them so that students in the OSD office could contact them with questions regarding the exam. Dean Lenox underscored the importance of working with the OSD and asked that Faculty members please pass this information along to their colleagues.

8) REPORTS ON ACTIONS OF SENATE
The meeting started at 14:30 in the Redpath Museum with two memorial tributes read by Dean of Medicine Eidelman for Allan Sherwin and John Richardson. Principal Fortier reviewed the recent university rankings reports. Although she was pleased with the Maclean's ranking of number 1 in Canada, she commented that a stronger indicator was McGill keeping this position for the twelfth year in a row. Although the rankings are not necessarily accurate, they are at least reproducible. The Times Higher Education Supplement also ranked McGill as 18th of 150 universities for highest employability of graduates. Canada ranked fourth as a country of university employability.

The Principal has worked closely with the Quebec government to create a new Conseil des universités that would be a new university and CEGEP body to guide accountability and receive input. McGill is also working with Quebec to facilitate immigration by international students.

She gave an update on external relations and commented on the involvement of McGill with Montreal's Council on Economic growth. This year's Remembrance Day celebrations were not at McGill due to construction constraints, and Principal Fortier commented on the lack of youth in attendance, and would like to return the celebrations to McGill for this reason.

A number of Kudos were listed, included the recent SSHRC Gold Medal to Claudia Mitchel (Fac. Education), two Rhodes Scholarships, two Prix du Quebec, and a list of sports accomplishments, including the McGill men's baseball team capturing the national title again, for the third year in a row.

During the questions and motions period, the topic of university regulations of unpaid internships was discussed. Principally around the issue of better support for students who could not volunteer for free. Questions about construction woes included having better pathways through construction sites, more notice of changes, and better avenues to complain. V-P Yalovsky stated that in spite of him in daily communication with the city on these issues, the city has not yet 'received' any complaints.

The open session focused on a discussion on how to better prepare our PhDs for work. Al Mucci suggested the stats should include PDFs and be distributed to current PhD students. Internships for graduate students, especially during their finishing years, some relaxation of graduate course requirements to allow the students to choose more integrative training, bring in alumni to talk about their experiences, and shifting our culture toward not getting tenure track positions as a failure were discussed.

Academic Policy Report. Some discussion about revisions to the terms of reference of the Joint-Board Senate Committee on Equity were made but the bulk of this session was adopting the Policy against Sexual Violence, which was voted in unanimously for final approval and applause.

Reports from the Committees on Enrolment and Student Affairs were made and we learned from Chris Buddle that McGill had 286 disciplinary cases last year, of which 86% of the academic cases were plagiarism and about 70% of the non-academic cases were harassment and danger. The Report on the Joint Board-Senate meeting on Sustainability commented on the 'good ideas' brought forth.

The meeting culminated with a confidential session on Honorary Degrees that, in spite of some questions on conflicts of interest, were deemed eligible by the vetting process of the Board of Directors.

The meeting ended at 16:25.
There were no members’ questions.

10) OTHER BUSINESS

There being no other business, the meeting adjourned at 4:40 p.m.
The Academic Committee approved the following on Tuesday, 12 December 2016:

**SECTION A: NEW COURSES**

1. **Biology**  
   - BIOL 219 Introduction to Physical Biology of the Cell  
   - 4 credits  
   - AC-16-29 Circulated  
   - PRN 11699

2. **Geography**  
   - GEOG 425 Southeast Asia Urban Field Studies  
   - 3 credits  
   - AC-16-43 Circulated  
   - PRN 11475

3. **Physics**  
   - PHYS 329 Statistical Physics with Biophysical Applications  
   - 3 credits  
   - AC-16-30 Circulated  
   - PRN 11924

**SECTION B: NEW PROGRAMS**

1. **Chemistry**  
   - Major in Chemistry - Biophysical Chemistry Option  
   - Honours in Chemistry - Biophysical Chemistry Option  
   - AC-16-34 Circulated  
   - AC-16-35 Circulated

2. **Physics**  
   - Major in Physics - Biological Physics Option  
   - Honours in Physics - Biological Physics Option  
   - AC-16-38 Circulated  
   - AC-16-39 Circulated

**SECTION C: COURSE REVISIONS**

1. **Geography**  
   - GEOG 504 Advanced Economic Geography  
   - Title, Description  
   - 3 credits  
   - AC-16-44 Circulated  
   - PRN 11767

2. **Chemistry**  
   - CHEM 603 Fundamentals of Spectroscopy  
   - Title, Description, Prerequisites  
   - 5 credits  
   - AC-16-42 Circulated  
   - PRN 11842

**SECTION D: PROGRAM CHANGES**

1. **Biology**  
   - Major in Biology - Quantitative Biology Option  
   - Honours in Biology - Quantitative Biology Option  
   - Joint Major in Biology & Mathematics  
   - AC-16-31 Circulated  
   - AC-16-32 Circulated  
   - AC-16-33 Circulated

2. **Computer Science**  
   - Joint Major in Computer Science & Biology  
   - Joint Honours in Computer Science & Biology  
   - AC-16-36 Circulated  
   - AC-16-37 Circulated

3. **Physiology**  
   - Joint Major in Physiology & Mathematics  
   - Joint Major in Physiology & Physics  
   - AC-16-40 Circulated  
   - AC-16-41 Circulated

4. **Geography**  
   - Major in Geography  
   - AC-16-45 Circulated

5. **Earth and Planetary Sciences**  
   - Major in Earth and Planetary Sciences (Retirement)  
   - AC-16-46 Circulated
- Honours in Earth Sciences (Retirement) AC-16-47 Circulated

(6) McGill School of the Environment
- Major in Environment – Earth Sciences & Economics Domain AC-16-48 Circulated

SECTION E: OTHER (For Information)
(1) McGill School of the Environment
B.A. Program Changes: AC-16-49 Circulated
- Faculty Program in Environment – Economics & the Earth’s Environment Domain
New Course

New Data

Program Affected? Y
Program Change Form Submitted? Y
Subject/Course/Term BIOL 219
- one term
Credit Weight or CEU's 4 credits

Course Activities

<table>
<thead>
<tr>
<th>Schedule Type</th>
<th>Hours per week</th>
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<td>T - Tutorial</td>
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Total Hours per Week : 4
Total Number of Weeks : 13

Course Title

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<th>Official Course Title :</th>
<th>Intro to Physical Biology</th>
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<td>Course Title in Calendar :</td>
<td>Introduction to Physical Biology of the Cell</td>
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</table>

Rationale

Students in the interdisciplinary programs need a basic grounding in cell and molecular biology, but have limited credit space; these students will also be taking fewer higher level courses in Biology than a student following a singular biological or biomedical program.

Responsible Instructor

Jackie Vogel (Co-ordinator)

Course Description

This course is an introduction to molecular and cell biology, using a physical biology perspective. New technologies and methodologies, both experimental and computational, are embedded in the presentation of each topic.

Teaching Dept.

0286 : Biology

Administrating Faculty/Unit

SC : Faculty of Science

Prerequisites

1 year of college calculus, chemistry and physics or equivalents, BIOL 112 or equivalent

Web Registration Blocked? : N

Corequisites

Math 222 and CHEM 212

Web Registration Blocked? : N

Restrictions

- Not open to students who have taken or are taking ANAT 212, BIOC 212, BIOL 200 and BIOL 201
- Restricted to students in Computer Science-Biology, Biology-Mathematics, Physiology-Physics, Physiology-Mathematics, Biology-Quantitative Biology, Chemistry-Biophysical Chemistry and Physics-Biological Physics options

Supplementary Calendar Info

1. This course is meant to prepare students for related 300-level courses in Biology, Chemistry, Physics, etc.
### Additional Course Charges

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<td>Consultation Reports Attached?</td>
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<td>Effective Term of Implementation</td>
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### Approvals Summary

#### Show all comments

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<th>Departmental Meeting</th>
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<th>Other Faculty</th>
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<td>Approved by Departmental Chair Edited by: Nancy Nelson on: Dec 5 2016</td>
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To be completed by the Faculty

For Continuing Studies Use
BIOL 219 “Physical Biology of the Cell”
Fall term, 4 credits (3-1-8)
3 x 50 minute lectures, one compulsory 50 minute tutorial per week

Pre-requisites: 1 year of college calculus, chemistry and physics or equivalents, BIOL 112 or equivalent

Co-requisites: MATH 222 and CHEM 212 or equivalents

Coordinator: J Vogel

BIOL 219 is an introduction to molecular and cell biology using physical biology perspectives, and equally prepares interdisciplinary students for more advanced courses in the biological and physical sciences. Technologies and methodologies, both experimental and computational, are included in the presentation of each thematic module.

Notes:
Not open to students who have taken or are taking ANAT 212, BIOC 212, BIOL 200 and BIOL 201

Method of evaluation
Problem sets (8): 10%
Mid-term exams (3 x 20%): 60%
Final exam: 30%

Textbook: Lodish “Molecular Cell Biology” 8th edition and selected material from Nelson “Biological Physics”
Module 1: Overview of a living cell; prokaryotic and eukaryotic, biophysical perspectives
1.1. Design features of cells
1.2. Major classes of biological molecules; examples
1.3. Length and time scales

Module 2: Proteins, enzymes and reactions
2.1. Protein structure (1, 2, 3 and quaternary)
2.2. Sculpting protein structure (modifications)
2.3. Protein folding and quality control (chaperone example)
2.4. Enzyme characteristics, reaction and energy potential
2.5. Orders of kinetic reactions
2.6. Allostery
2.7. Cooperativity

Module 3: Energy
3.1. Overview of metabolism
3.4. Physical basis of energy in biological systems
3.5. Making ATP with oxygen, part I
3.6. Making ATP with oxygen, part II
3.7. Origins of life, how to make ATP without oxygen
3.8. Photosynthesis (physical perspective)

Module 4: Information storage and flow
4.1. DNA and RNA structure; RNA structure-function
4.2. The physical basis of the genetic code
4.3. 1D (sequence) and 2D linear structure of coding and non-coding sequences
4.4. 3d organization of the genome, human and yeast chromosome examples
4.5. Origins of variation: splice variants, mutations, TNs, paralogs
4.6. Transcription; monocistronic and polycistronic
4.7. Regulation of transcription: Thermodynamics
4.8. Regulation of transcription: Kinetics
4.9. Overview of translation (includes nuclear export)
4.10 Regulation of translation (examples)

Note it is assumed that students will learn details of gene structure, mutations, splicing etc in BIOL 202
Module 5: Biological machines and ensembles
5.1. Physical properties of the cytoplasm
5.2. Molecular self-assembly I: Phase separation (thermodynamic models)
5.3. Molecular self-assembly II: Polymerization (kinetic models) and polymer mechanics
5.4. The cytoskeleton- actin and microtubules (structure of monomer and polymer, etc)
5.5. DNA and RNA replication machineries
5.6. Intracellular transport I: passive mechanisms, diffusion
5.7. Intracellular transport II: active mechanisms, molecular motors

Module 6: Control in cell division
6.1. Oscillators, feedback, noise
6.2. Biological control; oscillators, feedback, thresholds in detail
6.3. Control of cell cycle transitions
6.4. Dynamics in mitosis I; DNA replication, DNA repair
6.5. Dynamics in mitosis II; chromosome segregation machinery
6.6. Checkpoint examples, biophysical perspectives

Mid term 3

Module 7: Cell signaling and polarity
7.1. Overview of symmetry breaking, emergent polarity
7.2. Cell morphology/polarization through intracellular signaling; receptor G-protein signaling (mating pathway example); small GTPases Cdc42, Rho etc.
7.3. Asymmetric cell divisions, stem cells
7.4. Secretory machineries; endo and exocytosis
7.5. Cellular interactions (ECM) through intercellular signaling (delta/notch)
7.6. Enforcing properties among cells in tissues (planar polarity)

Module 8: Neuroscience
8.1. Neurons and electrical potential, transduction
8.2. Neurotransmitters, control
8.3. Example of a simple circuit

Final exam, 30% to 7.1. - 8.34, 70% to midterm 1,2 & 3 material
DATE: October 24 2016

TO: Melissa Vollrath

FROM: Jackie Vogel

The attached proposal has been submitted to the Biology Curriculum Committee, and it has been decided that your department should be consulted.

Course #: BIOL 219 Physical Biology of the Cell

Would you be good enough to review this proposal and let me know no later than November 4, 2016, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

✓ NO OBJECTIONS

SOME OBJECTIONS

COMMENTS:

Signature: [Signature]

Date: 3 November 2016
The attached proposal has been submitted to the Biology Curriculum Committee, and it has been decided that your department should be consulted.

Course #: ___BIOL 219 ___Physical Biology of the Cell

Would you be good enough to review this proposal and let me know no later than ___November 4, 2016 ____, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_______ X____ NO OBJECTIONS

___________ SOME OBJECTIONS

COMMENTS:

After consultation with the UCC and the whole department, the Physics Department strongly supports creation of this course.

__________________________________________________________________________

__________________________________________________________________________

Signature:  

Date: November 4th 2016
Hi Jackie,

I have no objections.

Best,
Axel

From: Jackie Vogel <jackie.vogel@mcgill.ca>
Sent: November 24, 2016 2:28:07 PM
To: Anthony Mittermaier, Dr.; Axel Hundemer; Mathieu Blanchette; Djivede Armel Kelome
Subject: 2nd request for consultation

hello Tony, Mathieu and Axel, this is a friendly reminder that I require a consultation report for the new course BIOL 219 “physical biology of the cell”, which will be part of the core curriculum for CS-BIOL, BIOL-MATH and biophysical chemistry B.Sc. programs. Please return the attached form for your department soon as possible, with approval or objection, and comments you may have. A description of the course is also attached.

If you have already sent the consultation form, I apologize- things are very hectic right now. Please resend it.

cheers
Jackie

Consultation
Form B...th.doc
McGill Biology Department

Guidelines for the Course Proposal/Change Form

CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE: ________________________________

TO: ________________________________

FROM: ________________________________

The attached proposal has been submitted to the Biology Curriculum Committee, and it has been decided that your department should be consulted.

Course #: ________________________________

Would you be good enough to review this proposal and let me know no later than __________, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____ X _____ NO OBJECTIONS  _____ SOME OBJECTIONS

COMMENTS:

Because the School of Computer Science has only two professors currently whose main research area is Bioinformatics (Blanchette and Waldispühl), it could happen in some years that these professors are not available to give the lectures. Our understanding based on discussions with you (Prof. Jackie Vogel) is that Dept. Biology would find a replacement. Moreover, the situation may evolve in future years that Biology would cover all the lectures anyhow.

Signature: ________________________________

Date: ________________________________

2 Nov 2016
McGill Biology Department

Guidelines for the Course Proposal/Change Form

CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE: _October 24 2016________________________________________

TO: _Amy Blum_and _Anthony Mittermaier________________________

FROM: _Jackie Vogel____________________________________________

The attached proposal has been submitted to the Biology Curriculum Committee, and it has been decided that your department should be consulted.

Course #: ___BIOL 219 ___Physical Biology of the Cell_____________________

Would you be good enough to review this proposal and let me know no later than ___November 4, 2016____, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____ NO OBJECTIONS

__________ SOME OBJECTIONS

COMMENTS:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Signature: ____________________________

Date: ______Nov 9, 2016________
New Course

Program Affected?  N

Program Change Form Submitted?  

Subject/Course/Term  GEOG 425
• one term

Credit Weight or CEU's  3 credits

Course Activities

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Total Hours per Week: 25
Total Number of Weeks: 2

Course Title

Official Course Title: SE Asia Urban Field Studies
Course Title in Calendar: Southeast Asia Urban Field Studies

Rationale

A 3-credit field studies course is required to graduate with a major in Geography. To date, all geography field studies courses held overseas or outside of Montreal (e.g. Panama, Barbados, etc) focus on physical geography rather than human, and more specifically, urban geography. Urban Studies is currently the most popular major in the Geography Department and while the department currently offers an urban field studies course (GEOG 494) that fulfills the field studies course requirement, it is based in Montreal. The proposed course seeks to offer the department's first opportunity for students to do an overseas field course with an urban focus. The proposed course would have space for about 12 students, and would last for 2 weeks, one week in Singapore and one week in Malaysia. GEOG 494 is currently offered twice per year (once in the Fall taught by Prof. Kevin Manaugh and once in the summer taught by myself). GEOG 425 Southeast Asia Urban Field Studies would be offered every other May, alternating with my GEOG 494 Urban Field Studies summer course in Montreal. GEOG 425 would fulfill the field course requirement for Geography majors and is open to both Urban Studies majors and minors. Prerequisites include GEOG 217 and GEOG 325. Geography majors who are
not majoring in Urban Studies may take this course if they have completed the prerequisites. *Additional fees will be reviewed by the Fee Advisory Committee (FAC) on Dec. 14, 2016

<table>
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<tr>
<th>Responsible Instructor</th>
<th>Sarah Moser</th>
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<tbody>
<tr>
<td>Course Description</td>
<td>This course allows students to experience some of the urban changes taking place in Southeast Asian cities, a dynamic region, while providing the opportunity to connect recent scholarship with field observations. We will explore various current themes in urban studies and urban geography including globalization, the transnational circulation of urban policies, interpretations of culture and heritage / new built heritage, gentrification, migrant labour, public housing, creative clusters, and new cities as national economic strategies.</td>
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<td>Teaching Dept.</td>
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<td>Administering Faculty/Unit</td>
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<td>Prerequisites</td>
<td>GEOG 217 Cities in the Modern World; GEOG 325 New Master-Planned Cities (preference will be given to Urban Studies Majors and Minors) Web Registration Blocked? : Y Minimum Grade or Test Scores : B+ Prereq course or test taken at the same time? : N</td>
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<td>Corequisites</td>
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<td>Restrictions</td>
<td>preference will be given to Urban Studies Majors and Minors</td>
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<td>Supplementary Calendar Info</td>
<td>1. This course costs an additional $2318 in order to cover transportation and accommodation expenses.</td>
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<td>Additional Course Charges</td>
<td>Description costs of field course</td>
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Supplementary Information:

- **Required Text/Resources Sent To Library?**: N
- **Explain for Required Resources**: Students will need to pay an additional fee to cover the costs of air travel, accommodation, and ground transportation.
- **Supplementary Calendar Info**: This course costs an additional $2318 in order to cover transportation and accommodation expenses.
| Library Consulted About Availability of Resources? |   |
| Consultation Reports Attached? | N |
| Effective Term of Implementation | 201705 |
| File Attachments | • Moser - proposed syllabus for GEOG 425.docx |
| To be completed by the Faculty | Slot Course: N |
| For Continuing Studies Use | Thesis Component: N |

**Approvals Summary**

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Hello,

At the Fee Advisory Committee on Dec 2 2016, the fee of $2318.33 was approved for this course. So now we need a short description that can be part of the notes on the class schedule once the course has been approved or added to the schedule. For example:

“A fee of $2318 covers the cost of a 2 week urban field studies course in Singapore and Malaysia, including round trip flight from Montreal to Singapore, accommodation and ground transportation.” (please approve or edit…)

This fee may be charged to students in two ways:

a) Attach it to the course – if this is the case, then if a student drops the course then it would be refundable within the time frame for dropping.

b) Charge it manually – we could charge it manually based on a list that you would provide of students who have signed up to go. A manual charge is not refundable unless the department requests it.

In both cases, you could decide that a deposit is required for students to confirm their intent. The deposit is usually non-refundable and would be forfeited should they choose not to go. Again exceptional circumstances such as illness, may inform you on whether not to make an exception. The deposits may be paid by the student through internet banking to their student fee account. Students would be asked to send an email to student.accounts@mcgill.ca with “GEOG 425 Southeast Asia Trip” in the subject line so that we may reserve this amount as a deposit for the activity and only release it to pay the charge once the charges are posted on the fee account.

So this is a decision to make so that we can start the set-up once the course has final approval. Could you please let me know where the course is in the approval process?

Thank you.

Mary Jo McCullogh

Tel: (514) 398-2315 | Fax: (514) 398-2656 | http://www.mcgill.ca/student-accounts/
Hello Cindy

I am the Admin Assistant in the Geography Dept and Mary Jo McCullogh has advised me to contact you in order to inform you about a new course GEOG 425 Southeast Asia Urban Field Studies. We have received approval from SUS and AUS as this field course is offered to both Arts and Science students.

I’m not sure exactly what you need but I have attached the course proposal, budget, and Syllabus.

Please let know if you need anything else. I’ve CC’d Prof Sarah Moser in this email as she will be able to answer any further question concerning the actual field course.

Thank you

Nancy Secondo
Administrative Assistant
Department of Geography
805 Sherbrooke St W
Burnside Hall, Room: 705
Montreal, Quebec, H3A 0B9
Tel: 514-398-4114  Fax: 514-398-7437
nancy.secondo@mcgill.ca

---

From: SUS Financial Officer
Sent: Thursday, November 10, 2016 4:05 PM
To: Nancy Secondo
Cc: AUS Academic; SUS Academic Affairs Officer; Sarah Moser, Dr.; Mary Jo McCullogh; Nigel Roulet, Prof.
Subject: Re: GEOG 425 Request related to non-tuition Student Fee & Budget

Hello Ms. Secondo,

The SUS General Council as well as the SUS Finance Committee have reviewed and approved the fee changes.

Thank you,

SIBAT ANAM
Vice President of Finance
Science Undergraduate Society, McGill University
1821, 805 Sherbrooke Street West
Montreal, Quebec, H3A 2K6
Mobile: (514) 651-4499 | Office: (514) 398-6979

---

From: SUS Academic Affairs Officer
Sent: Wednesday, October 26, 2016 6:42 PM
To: Nancy Secondo; AUS Academic; SUS Financial Officer
Cc: Sarah Moser, Dr.; Mary Jo McCullogh; Nigel Roulet, Prof.
Subject: Re: GEOG 425 Request related to non-tuition Student Fee & Budget

Hello Ms. Secondo,

The SUS General Council as well as the SUS Finance Committee have reviewed and approved the fee changes.

Thank you,
Hi Nancy,

I hope this email finds you well. I would like to confirm that the official name of the course I am motioning to approve today is **GEOG 425 Southeast Asia Urban Field Studies** and that the fee is **$2,140 CAD**.

I just wanted to confirm because the word document is entitled Budget and Rational for GEOG 494 Southeast Asia Urban Field Studies, and the budget states **$1112.8 CAD** as the "Total Expenses" under "Cost per Student".

Warm regards,

Jasmine

**Jasmine Leung**

Vice President Academic | Vice-Président Académique
Science Undergraduate Society | L'Association Étudiante de la Faculté des Sciences
McGill University, 805 Sherbrooke Street West,
Montreal, Quebec H3A 2K6
M: 1 (443) 968-0801 O: (514) 398-6979

---

**From:** AUS Academic  
**Sent:** Friday, October 28, 2016 3:21 PM  
**To:** Sarah Moser, Dr.; SUS Academic Affairs Officer; Nancy Secondo; SUS Financial Officer  
**Cc:** Mary Jo McCullogh; Nigel Roulet, Prof.  
**Subject:** Re: Budget and rationale for GEOG 425

Hi all,

From the AUS side to our understanding the AUS does not need to approve it as geography for administrative purposes is in the Faculty of Science. It is furthermore our understanding that if a department was split between the two faculties, approval by only one of the two faculty associations is required. Please don't hesitate to let me know if any of you have information to the contrary.

Best Regards,

Erik

**Erik A. Partridge**  
Vice President Academic | Vice-Président aux Affaires Académiques  
Arts Undergraduate Society | L'Association Étudiante de la Faculté des Arts  
Leacock B-12, McGill University, Montréal QC  
Office: (514) 398-1993 | Website: www.ausmcgill.com  
Office Hours: T 10-12:30, W 2-3:30, F 12:30-1:30

*The Arts Undergraduate Society of McGill University is a student association accredited by the gouvernement du Québec. (R.S.Q. Ch.A-3.01)*

---

**From:** Nancy Secondo
RE: GEOG 425 Request related to non-tuition Student Fee & Budget

Thank you so much

Nancy Secondo
Administrative Assistant
Department of Geography
805 Sherbrooke St W
Burnside Hall, Room: 705
Montreal, Quebec, H3A 0B9
Tel: 514-398-4114   Fax: 514-398-7437
nancy.secondo@mcgill.ca

From: SUS Academic Affairs Officer
Sent: Wednesday, October 26, 2016 4:27 AM
To: Nancy Secondo; AUS Academic; SUS Financial Officer
Cc: Sarah Moser, Dr.; Mary Jo McCullogh; Nigel Roulet, Prof.
Subject: Re: GEOG 425 Request related to non-tuition Student Fee & Budget

Hi Ms. Secondo,

Thank you for your email. My name is Jasmine Leung, and I am the VP Academic of the Science Undergraduate Society (SUS). I will be motioning from the floor at the October 26th SUS General Council Meeting to have the request for a non-tuition student fee for GEOG 425 approved.

Warm regards,
Jasmine

Jasmine Leung
Vice President Academic | Vice-Président Académique
Science Undergraduate Society | L'Association Étudiante de la Faculté des Sciences
McGill University, 805 Sherbrooke Street West,
Montreal, Quebec H3A 2K6
M: 1 (443) 968-0801 O: (514) 398-6979

From: Nancy Secondo
Sent: Monday, October 24, 2016 5:04:06 PM
To: AUS Academic; SUS Academic Affairs Officer; SUS Financial Officer
Cc: Sarah Moser, Dr.; Mary Jo McCullogh; Nigel Roulet, Prof.
Subject: FW: GEOG 425 Request related to non-tuition Student Fee & Budget

Hello

Please find attached a request for a non-tuition Student Fee & Budget for our new course GEOG 425.

I have attached the Budget outline for the course along with a description of the GEOG 425 Southeast Asia Field Studies description.
I have CC'd Prof Sarah Moser, the instructor of the course, she will be able to answer any question you may have.

Thank you

Nancy Secondo
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Burnside Hall, Room: 705
Montreal, Quebec, H3A 0B9
Tel: 514-398-4114  Fax: 514-398-7437
nancy.secondo@mcgill.ca

From: Mary Jo McCullogh
Sent: Monday, October 24, 2016 2:05 PM
To: Nancy Secondo
Cc: Sarah Moser, Dr.; Nigel Roulet, Prof.
Subject: RE: GEOG 425 Request related to non-tuition Student Fee & Budget

Hello,

So I have noted on your proposal the fee change from $2140 to $2318.33 – we might want to round this to $2318…..

Note that as this is a new course, it will now need the blessing of both the faculty society and the SSMU to be approved by the FAC. This can be done concurrently. The fee proposal and the budget should be sent to the AUS or SUS initially. Once you have their confirmation that they agree with the fee, then the SSMU will likely sign off on it.

If you have any questions let me know.

Thanks.

Mary Jo McCullogh | Director | Student Accounts | McGill University | 3415 McTavish St. McLennan Library Bldg.  mary.mccullogh@mcgill.ca
Tel: (514) 398-2315 | Fax: (514) 398-2656 | http://www.mcgill.ca/student-accounts/

**Please be sure to reference your McGill ID when writing Student Accounts as it will help us to respond more accurately.**

From: Nancy Secondo
Sent: Wednesday, October 05, 2016 12:06 PM
To: Mary Jo McCullogh
Cc: Nigel Roulet, Prof.; Sarah Moser, Dr.
Subject: GEOG 425 Request related to non-tuition Student Fee & Budget

Hi Mary Jo,

Prof Sarah Moser has prepared the paper work to request related to non-tuition student fees along with a prepared detailed budget breakdown as to what the fees would be for.

Please let me know if we need to provide with more information.

Thank you
GEOG 425: Southeast Asia Urban Field Studies  
May 2017  
May 11-23, in the field: Singapore and Malaysia

Instructor:  
Dr. Sarah Moser  
E-mail: sarah.moser@mcgill.ca  
514-266-9908  
Office: 413 Burnside Hall (before the course starts)  
Office Hours: by appointment

Course meeting times: we will meet for full and partial days in various field sites in Singapore and Malaysia for the duration of the course (May 11-23, 2017).

Course context and description
Singapore and Malaysia have experienced massive and unprecedented urban change in recent decades, a large portion of which has been state-driven. As a result of both geographical fortune and state policies, Singapore has become a ‘global city’ that functions as a command and control center for global finance and is an important Asian node for global flows of capital, goods, services, and people.

Malaysia has similar global aspirations, and while it has not achieved Singapore’s economic success, it has become a hub for education, Islamic banking, and various service industries. Malaysia is currently trying to leverage its position next to Singapore through a massive Special Economic Zone that is twice Singapore’s size. Since the 1990s, the Malaysian state has dramatically transformed the built environment as part of its national economic strategy, to re-brand the country for foreign investors, and as part of on-going nation-building. Malaysia was also a pioneer in the current wave of new master-planned cities, and other countries in Southeast Asia, Central Asia, the Middle East, and Africa have looked to Malaysia’s new cities, particularly Putrajaya, as a model for a successful, progressive ‘Islamic’ city built from scratch.

Singapore and Malaysia are multi-cultural, multi-religious, and multi-lingual countries, with ethnic Malays, Chinese, Indians, and others from various parts of Asia. Over the years, both states have crafted various policies intended to include or marginalize minority groups, many of which are manifested in the built environment. Singapore is majority Chinese (80%), while Malaysia is majority Malay Muslim (55%). The tensions, collaborations, interplay, and competitiveness between the countries are fascinating to observe and play out in the built environment in various ways.

This course allows students to see some of the urban changes taking place in this dynamic region up close, while providing the opportunity to connect recent scholarship with field observations. We will explore various current themes in urban studies and urban geography including globalization, the transnational circulation of urban policies, interpretations of culture and heritage / new built heritage, gentrification, migrant labour, public housing, creative clusters, and new cities as national economic strategies. Singapore and Malaysia are ideal countries from which to study these topics as they are safe, the pace of urban change is startlingly fast, both states prioritize city-centric economic strategies, and students will have a seasoned guide! I have traveled, worked, and studied in Singapore and Malaysia for around 20 years and have lots of connections in the region who can provide expertise on various topics.
This course introduces students to human geography fieldwork in urban settings in Southeast Asia. Using Singapore and several cities in Malaysia as our laboratory, we will explore current issues in social and cultural geography, urban geography, and planning.

We will focus on understanding the urban environment through field visits, active observation, and field journaling. We will also look at various techniques: interviews, mapping, GIS, and photography. Our class time will be spent in the field, learning about urban change and how it is interwined with politics, economic forces, interpretations of culture and heritage, and learning how to put some qualitative field techniques into practice in the context of urban Southeast Asia.

*GEOG 425 fulfills the field course requirement for Geography majors and is open to both Urban Studies majors and minors. Prerequisites include GEOG 217 and GEOG 325. Geography students who are not majoring in Urban Studies may take this course if they have completed the prerequisites.

**Course Goals**
- To expand students’ general (geographic) knowledge, particularly geographies of urban Southeast Asia.
- To gain skills and confidence in the use of geographic field methods, such as observation, ethnographies, mapping, and interviewing.
- To encourage students to become independent researchers.
- To appreciate the complex economic, social, political, and cultural processes that influence urban change in Singapore and Malaysia.
- To appreciate how knowledge is generated in human geography.
- To understand how to devise a research question, select appropriate methods to answer that question, and to understand the limitations of each method, particularly in the context of Southeast Asia.
- To develop team-working, problem-solving, and critical thinking skills.

**Texts**
You must purchase a notebook for use as your field journal. A spiral-bound, plain paper notebook of A5 or similar size is the most appropriate. You’ll need space to sketch maps as well as write notes. All required readings will be in the course reader.

**Assessment**

1) Participation 5%

2) Ethnography paper 30% Due: June 1, 2017 (by email)

3) Field journal, documenting fieldwork tasks 30% Due: final day of class

4) Reflection essay: Fieldwork challenges and solutions 15% In class exam, final day of class

5) Presentation summary of readings 20% In class
I will get approval for the course as a whole from the Research Ethics Board before departure.

1) Participation
All activities are mandatory, students will be assessed on the quality of participation, level of engagement, decorum, and sensitivity to cultural context.

2) Ethnography and positionality paper
Due: June 1, via email
Word limit: 2,000 words (approx. 7-8 pages)
Students will conduct several hours of ethnographic research in an urban setting in Singapore of their choosing. Students working in pairs must agree on a location, which could include a gathering place for migrant workers, a tourist site, an alternative arts venue, and so on (please confirm location with me first). These observations will be written up in an ethnography. (see separate assignment sheet)

3) Field Journal
Due: Final day of class
The field journal is your record of thoughts, sketches, and questions. You must use it to respond to the specific tasks I assign for each excursion, as well as for additional thoughts and ideas that you come up with during the excursions.

Your field journal must be legible. However, do not attempt to make it a polished piece of work! Notes rather than complete sentences are fine. Half-finished ideas, rough sketches, musings and questions that you pose but do not answer fully are all part of the fieldwork process, and your journal is the place for them.

4) Reflection essay: Fieldwork challenges and solutions
Due: June 1, 2017
This paper (10 pages) is worth 20% of your grade and focuses on the various methods we have learned for conducting urban field studies, the challenges of doing research in urban Southeast Asia, some solutions and workarounds to challenges, and strengths and limitations of each approach.

5) Presentation summary of readings
Due: In class
As this course will keep student busy and engaged in the field, there will not be a lot of time for reading. At the same time, it is critical to have a grasp of some of the key urban studies and Southeast Asian urban geography scholarship in order to carry out fieldwork tasks and deepen the fieldwork experience. Each day, one student will take a turn presenting 1-2 readings to the rest of the class and leading a discussion about them and how they connect to what we will visit. 45 minutes of each day will be allocated to these presentation and discussion sessions. Students will be assessed on how well they have grasped and presented the ideas, their ability to critically engage with the articles, and their ability to facilitate discussion.

Day-to-day info
We will spend all day or a portion of each day in the field. If there is a monsoon, outdoor activities will be postponed until it passes. You must be appropriately dressed, including comfortable footwear. Dress for constant 32C weather – Singapore and Malaysia are close to the equator so it is hot and humid all the time. In Singapore, summer clothing is acceptable (although appropriate clothes for guided tours and interactions with professors is necessary – no beach wear). In Malaysia, wear loose pants or a skirt and cover shoulders. In Singapore you will need
to purchase an MRT (metro) pass at an MRT station to get around the city. The (non-refundable) deposit for the card is around $7 and you will spend around $50 on MRT and bus rides throughout the week in Singapore, including the bus fare to get to Johor Bahru, Malaysia.

**Costs**

The up front cost of the trip is $2,140, which includes a round trip flight from Montreal to Singapore, accommodation, and most ground transportation. Meals are not included. We will eat in hawker centers, food courts, and inexpensive restaurants: breakfasts will cost $2-5, lunches and dinners $4-10.

- Flight (round trip Montreal-Singapore): $1,200 (prices can vary from $1,000 if purchased early to $1,400)
- Accommodation for 1 week in Singapore: $310 (air con dorms at the National University of Singapore)
- Accommodation for 1 week in Malaysia: $280 (hotel room - shared with 2 students)
- Ground transportation costs: $300
- Entrance fees: $50
- Entry visas: $0 (Entry into Singapore and Malaysia are free for Canadian and American citizens and visas are given on arrival – students with other passports need to check the visa requirements)

Total: $2,140

**Team Formation**

You will form groups of 3-4 for the purposes of taking field trips together and mutual support. Teams will be formed during the first class.

**Safety and decorum**

Safety is our priority at all times and it is our shared responsibility to minimize any safety hazards. Since Singapore and Malaysia are two very different cultural contexts, students need to be sensitive to each and respectful of residents, an important component of conducting field research. Students should never be alone in the field and we must stay in communication about schedules and activities.

Singapore and Malaysia are generally safer than any American city. Drugs, drug crimes, and violence are extremely rare and guns are completely forbidden. Do not take any risks to collect data, whether during class time or for your own projects. I will discuss specific safety related to both Singapore and Malaysia in a pre-departure meeting. In particular:

- ALWAYS work with a partner or in your team when in the field.
- If asked to leave by a business owner, do so immediately and without protest.
- The sun, heat, and mosquitoes are the key safety issues in Singapore and Malaysia. We will avoid the sun during peak hours and will take cool down breaks in air-conditioning at various points throughout the day. There is no malaria in Singapore or Malaysia, although there are sporadic outbreaks of dengue (also a mosquito-born illness).
- Someone in each team must carry a mobile phone when in the field (you can buy a SIM card in Singapore). We will communicate through a WhatsApp group so students must download WhatsApp (free). My phone number (emergencies only please) is (514)266-9908.
**Late Submission of Assignments**
Students can make a formal request to the professor for special consideration for an extension to an assignment due date with one of the following documents in hand:

- A Medical Doctor's note which specifically states that you were unable to hand in an assignment by the due date because of a medical emergency, or
- A bereavement notice from a newspaper or other legitimate documentation in the case of a family or close friend’s death.

In the case of a group assignment, the request should be made by the affected student.

**Ten percent** will be deducted for every 24-hour period a piece of assessment is late. The first 24-hour period starts at the time the piece was due (e.g. if you submit something at 5.30pm when it was due at 10am, that equates to a 10% deduction).

**Important Notes**

- As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and/or the Office for Students with Disabilities, 514-398-6009.

- End-of-course evaluations are one of the ways that McGill works towards maintaining and improving the quality of courses and the student’s learning experience. You will be notified by e-mail when the evaluations are available on Mercury, the online course evaluation system. Please note that a minimum number of responses must be received for results to be available to students.

- In accord with McGill University’s Charter of Students’ Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

- McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information).
Class Schedule:

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Topic</th>
<th>Activity</th>
<th>Required Readings</th>
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</thead>
<tbody>
<tr>
<td><em><strong>Wednesday, May 10: check into accommodation at PGP (Prince George’s Park Residences) at NUS (National University of Singapore)</strong></em></td>
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<td>*tour of Biopolis by Dr. Ajay Mathuru (neuroscientist at Yale-NUS College)</td>
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<tr>
<td>Date</td>
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<td></td>
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<td>*free morning</td>
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<td>*45 minute class at Tiong Bahru: discuss readings</td>
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<td>-Tiong Bahru public housing estates (only remaining Art Deco housing estate, new hipster district)</td>
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<td>-Chinatown</td>
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<td>*free morning</td>
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<td>-Orchard Road: visit to Lucky Plaza, a mall that serves as a gathering point for Filipina domestic workers</td>
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<td>-Payah Lebar / Geylang: a district of east Singapore where Indonesian domestic helpers (maids) gather on Sundays</td>
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<td>*45 minute class at Lucky Plaza: discuss readings</td>
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<td><em>evening tour of Little India by Dr. Diganta Das, (Geography professor at Nanyang Technological University)</em></td>
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<td>Date</td>
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<td>Topic</td>
<td>Activity</td>
<td>Required Readings</td>
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<td><strong>Wednesday, May 17</strong></td>
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<td>*free day – work on assignments in chosen district</td>
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<td><strong>Thursday, May 18</strong></td>
<td>Johor Bahru</td>
<td>New master-planned city Special Economic Zone Comparative advantage</td>
<td><strong>Excursion 7:</strong>&lt;br&gt;- Iskandar Malaysia Nusajaya&lt;br&gt;- Breakfast at Kopitiam: discuss readings</td>
<td>Rizzo, A., &amp; Glasson, J. (2012). <em>Iskandar Malaysia</em>. <em>Cities</em>, 29(6), 417-427.  &lt;br&gt;Rizzo, A., &amp; Khan, S. (2013). Johor Bahru’s response to transnational and national...</td>
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<tr>
<td>Date</td>
<td>Location</td>
<td>Topic</td>
<td>Activity</td>
<td>Required Readings</td>
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<td><strong>Friday, May 19</strong></td>
<td>Melaka, Malaysia</td>
<td>UNESCO World Heritage Site</td>
<td><strong>Excursion 8:</strong></td>
<td>Goh, D. P. (2014). Between history and heritage: Post-colonialism, globalisation, and the remaking of Malacca, Penang, and Singapore. TRaNS: Trans-Regional and National Studies of Southeast Asia, 2(01), 79-101.</td>
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<td>Contested heritage</td>
<td>- old Melaka is a UNESCO World Heritage Site (in danger of losing this status) and home to what was once one of the largest ports in the world in pre-colonial times</td>
<td>Cartier, C. (1998). Megadevelopment in Malaysia: From heritage landscapes to “leisurescapes” in Melaka's tourism sector. Singapore Journal of Tropical Geography, 19(2), 151-176.</td>
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<td>*45 minute class at Heritage Society: discuss readings</td>
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<td>- Melaka River revitalization / gentrification</td>
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<td>- Arab City, an Arab-themed megadevelopment</td>
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<td>- evening: Melaka Night Market</td>
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<td>*45 minute class at hotel: discuss readings</td>
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<td>- pasar malam (Malay night market)</td>
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<td>Life outside / at the fringes of a planned city</td>
<td>- breakfast at local hawker's center</td>
<td>Moser, Sarah. (forthcoming) Life beyond the master plan: How residents resist,</td>
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<tr>
<td></td>
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<td>Social life of a planned city</td>
<td>*45 minute class at hotel: discuss readings</td>
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<td>- visit to a migrant worker compound</td>
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<td>- team visits to a different recreational site in Putrajaya</td>
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<td>Date</td>
<td>Location</td>
<td>Topic</td>
<td>Activity</td>
<td>Required Readings</td>
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</tbody>
</table>
| Monday, May 22 | Cyberjaya, Malaysia | High-tech city                | **Excursion 11:**
- Day trip to Cyberjaya, planned in the early 1990s to be the ‘Silicon Valley’ of Asia
| Tuesday, May 23 | Kuala Lumpur City Center (KLCC), Muslim market area, Chinese district, Bangsar, The Colloseum | **Excursion 12:**

***Take commuter train to Kuala Lumpur (30 minutes from Putrajaya)***

| Wednesday, May 24 | Bukit Bintang, Golden Triangle | **Excursion 13:**
- Bukit Bintang
- Golden Triangle | TBA |
# New Course

<table>
<thead>
<tr>
<th>Program Affected?</th>
<th>Y</th>
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<td>Program Change Form Submitted?</td>
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<tr>
<td>Subject/Course/Term</td>
<td>PHYS 329</td>
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<tr>
<td>Credit Weight or CEU's</td>
<td>3 credits</td>
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<td>Course Activities</td>
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<td>Schedule Type</td>
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<td>Total Number of Weeks</td>
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<tr>
<td>Official Course Title</td>
<td>Stat Phys Biophys App</td>
</tr>
<tr>
<td>Course Title in Calendar</td>
<td>Statistical Physics with Biophysical Applications</td>
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<tr>
<td>Rationale</td>
<td>Statistical physics is currently booming in biophysical sciences. We propose the creation of a new statistical physics course introducing classical concepts of statistical physics next to most modern examples of biophysics, where they naturally apply. Compared to a traditional statistical mechanics course, the focus is much more on kinetics rather than thermodynamics, with a much stronger “soft” component. While this is a physics course, it is naturally interdisciplinary, and will become an integral part of most of the current biophysics streams created in many departments (physics, chemistry and biology).</td>
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<tr>
<td>Responsible Instructor</td>
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<td>Course Description</td>
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<td>Teaching Dept.</td>
<td>0293 : Physics</td>
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<tr>
<td>SC : Faculty of Science</td>
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<tr>
<td>Administering Faculty/Unit</td>
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<tr>
<td>Prerequisites</td>
<td>[BIOL 219 AND (PHYS 253 OR PHYS 232 OR CHEM 345)] OR permission of the instructor</td>
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<td>Web Registration Blocked?</td>
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<td>Corequisites</td>
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<tr>
<td>Restrictions</td>
<td>Not opened to students having taken PHYS 333, PHYS 362 or CHEM 365</td>
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<td>Supplementary Calendar Info</td>
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<td>Additional Course Charges</td>
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<td>Campus</td>
<td>Downtown</td>
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<td>Projected Enrollment</td>
<td>50</td>
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<td>Requires Resources Not Currently Available</td>
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<td>Explanation for Required Resources</td>
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<td>Required Text/Resources Sent To Library?</td>
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<td>Library Consulted About Availability of Resources?</td>
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<tr>
<td>Consultation Reports Attached?</td>
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<tr>
<td>File Attachments</td>
<td>WeeklySchedule329.doc</td>
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<tr>
<td>To be completed by the Faculty</td>
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<tr>
<td>For Continuing Studies Use</td>
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**Approvals Summary**

<table>
<thead>
<tr>
<th>Version No.</th>
<th>Departmental Curriculum Committee</th>
<th>Departmental Meeting</th>
<th>Departmental Chair</th>
<th>Other Faculty</th>
<th>Curric/Academic Committee</th>
<th>Faculty</th>
<th>SCTP</th>
<th>Version Status</th>
</tr>
</thead>
</table>
PHYS 329 Syllabus

PHYS 329: Statistical Physics with Biophysical applications

Course Calendar Description (50 words):

This interdisciplinary course introduces Statistical Physics illustrated with modern biophysical applications. Principles covered include partition functions, Boltzmann distribution, bosons, fermions, Bose Einstein condensates, Fermi gases, chemical potential, thermodynamical forces, biochemical kinetics, and an introduction to noise and phase transitions in biology (3 credit, one semester course).

Prerequisites: BIOL 219 and [PHYS 253 or PHYS 232 or CHEM 345] or permission of the instructor. Not opened to students having taken PHYS 333 or PHYS 362 or CHEM 365.

Evaluation: Bi-weekly problem sets (30%), Midterm Exam (20%), Final Exam (50%).

Weekly schedule:

<table>
<thead>
<tr>
<th>Week / Lecture</th>
<th>Lecture (3xx)</th>
<th>Lecture details (3xx)</th>
</tr>
</thead>
</table>
| Week 1 / Lecture 1 | Introduction (Statistical Mechanics)  | • Bridge building: macroscopic \(\rightarrow\) microscopic worlds and the role of statistical mechanics
|                 |                                        | • A first example: ligand-receptor occupancy, used for the next three lectures instead of spin |
| Week 1 / Lecture 2 | Entropy and Multiplicity, Einstein solid I | • Multiplicity
|                 |                                        | • Entropy                                                                               |
| Week 2 / Lecture 3 | Einstein Solid II, Entropy of mixing   |                                                                                       |
| Week 2 / Lecture 4 | Fluctuations and the Boltzmann distribution: | • Boltzmann distribution derivation
|                 |                                        | • Relative probabilities                                                                 |
| Week 3 / Lecture 5 | Partition function | • Partition functions  
• Applications (two state systems, RNA tweezer) |
|-------------------|--------------------|-----------------------------------------------------------------|
| Week 3 / Lecture 6 | Classical stat-mech I: | • Maxwell-Boltzmann distribution  
• Applications to molecular systems |
| Week 4 / Lecture 7 | Classical stat-mech II: | • Equipartition theorem  
• Ideal gas, Diatomic rotations |
| Week 4 / Lecture 8 | Paramagnetism, analogy with biological systems | Paramagnet, DNA zipper |
| Week 5 / Lecture 9 | Bosons and Fermions: | • Bosons and Fermions  
• Fundamental particles  
Density of states  
• (Brief mention that phonons are examples of bosons, in solids) |
| Week 5 / Lecture 10 | Fermi Gases and Blackbody Radiation: | • Fermi Gases  
• Blackbody radiation |
<p>| Week 6 / Lecture 11 | Bose-Einstein condensates: | Bose-Einstein condensation of cold atoms. (Mention cold molecules, and condensation of photon gases). |
| Week 6 / Lecture 12 | Chemical potential in biology | Cell walls, CO poisoning |
| Week 7 / Lecture 13 | Practice Questions | |
| Week 7 / Practice Midterm | | |
| Week 8 / Reading Week | | |
| Week 8 / MIDTERM | | |
| Week 8 / Reading Week | | |
| Week 9 / Lecture 14, 15 | Thermodynamical forces for biology | • Chemical forces, entropic forces |</p>
<table>
<thead>
<tr>
<th>Week 10 / Lecture 16</th>
<th>Quasi equilibrium</th>
<th>Flux, Fick’s law, Stoke Einstein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 11 / Lecture 17</td>
<td>Introduction to biochemical kinetics</td>
<td>Rate equations. Kinetic of Ligand-receptor</td>
</tr>
<tr>
<td>Week 11 / Lecture 18</td>
<td>Classical biochemical kinetics</td>
<td>Michaelis-Menten, channels, transcription</td>
</tr>
<tr>
<td>Week 12 / Lecture 19</td>
<td>Adding dynamics I: Poisson processes for biophysics</td>
<td>Photon counting, Mutations</td>
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<tr>
<td>Week 12 / Lecture 20</td>
<td>Adding molecular dynamics:</td>
<td>Langevin equation</td>
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<tr>
<td>Week 13 / Lecture 21</td>
<td>Phase transition</td>
<td>Ising model</td>
</tr>
<tr>
<td>Week 13 / Lecture 22</td>
<td>Phase transition in biology</td>
<td>Liquid-liquid phase transition in organelles: Flory-Huggins theory (might be 2 lectures)</td>
</tr>
<tr>
<td>Week 14 / Lecture 23</td>
<td>Kinetics vs thermodynamics</td>
<td>Two well potential, Reaction coordinate</td>
</tr>
</tbody>
</table>
DATE: November 4th 2016

TO: Chemistry department

FROM: Paul François

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Course #: PHYS 329 Statistical Physics with Biophysical Applications

Would you be good enough to review this proposal and let me know no later than November 9, 2016, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

X NO OBJECTIONS

COMMENTS:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Signature: 

Date: Nov 9, 2016
### 1.0 Degree Title
Please specify the two degrees for concurrent degree programs

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### 1.1 Major (Legacy= Subject)(30-char. max.)
Chemistry

### 1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

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<tbody>
<tr>
<td>Biophysical Chemistry</td>
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</tbody>
</table>

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

### 2.0 Administering Faculty/Unit
Science

### 3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

<table>
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<tr>
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### 4.0 Rationale and Admission Requirements for New Proposal

In order to fully capitalize on the large and ongoing investments in biophysical research and education made by many of the Departments in the Faculty of Science, the departments of Chemistry, Biology, Physics, Physiology, Math, and Computer Science have developed an integrated Biophysics undergraduate teaching and recruitment strategy. As part of this initiative, the Department of Chemistry is proposing a new Biophysical Chemistry Option for its Majors program. The admissions standards are identical to those of the Regular Chemistry Major program.

/Continued on last page

### 5.0 Program Information
Please check appropriate box(es)

#### 5.1 Program Type
- Bachelor's Program
- Master's
- M.Sc. (Applied) Program
- Dual Degree/Concurrent Program
- Certificate
- Diploma
- Graduate Certificate
- Graduate Diploma
- Ph.D. Program
- Doctorate Program
- (Other than Ph.D.)
- Private Program
- Off-Campus Program
- Distance Education Program
- (By Correspondence)
- Other (Please specify)

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

#### 5.3 Level
- Undergraduate
- Dentistry/Law/Medicine
- Continuing Studies (Non-Credit)
- Collegial
- Masters & Grad Dips & Certs
- Doctorate
- Post-Graduate Medicine/Dentistry
- Graduate Qualifying
- Postdoctoral Fellows

#### 5.4 FQRSC (Research) Indicator
(for GPS)

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### 6.0 Total Credits

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### 7.0 Consultation with Related Units
- Yes
- No

### Financial Consult
- Yes
- No

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Attach list of consultations.
**8.0 Program Description (Maximum 150 words)**

This program will train students in the fundamentals of chemistry and will give them physical, computational, and mathematical skills needed for advanced biophysical chemistry research and the biomedical and biotechnology industries. The program features integrative, interdisciplinary courses in bio-physical sciences.

**9.0 List of proposed program for the New Program/Major or Minor/Concentration.**

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

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

**Program Prerequisites**

**PRE-PROGRAM REQUIREMENTS:** Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

**Required Courses** (59 credits)

The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level. Students completing this program will not be eligible for admission to the Ordre des chimistes du Québec without additional chemistry electives. This program is not currently accredited by the Canadian Society for Chemistry.

Completion of Mathematics MATH 222 and MATH 315 during U1 is strongly recommended.

* Denotes courses with CEGEP equivalents.

** Students who have successfully completed MATH 150 and MATH 151 are not required to take MATH 222.

**Bio-Physical Sciences Core**

BIOL 219 Physical Biology of the Cell (4 credits)
BIOL 319 Introduction to Biophysics (3 credits)
BIOL 395 Quantitative Biology Seminar 1 (1 credits)
CHEM 212 Introductory Organic Chemistry 1 (4 credits)*
MATH 222 Calculus 3 (3 credits)**
MATH 223 Linear Algebra (3 credits)
MATH 315 Ordinary Differential Equations (3 credits)
MATH 323 Probability (3 credits)
PHYS 329 Statistical Physics with Biophysical applications (3 credits)

**Chemistry**

CHEM 222 Organic Chemistry 2 (4 credits)*
CHEM 223 Introductory Physical Chemistry 1 (2 credits)
CHEM 243 Introductory Physical Chemistry 2 (2 credits)
CHEM 281 Inorganic Chemistry 1 (3 credits)
CHEM 283 Physical Chemistry Laboratory (2 credits)
CHEM 267 Introductory Chemical Analysis (3 credits)
CHEM 345 Introduction to Quantum Chemistry (3 credits)
CHEM 355 Applications of Quantum Chemistry (3 credits)
CHEM 367 Instrumental Analysis 1 (3 credits)
CHEM 377 Instrumental Analysis 2 (3 credits)
CHEM 493 Advanced Physical Chemistry Laboratory (2 credits)
PHYS 242 Electricity and Magnetism (2 credits)
Complementary Courses (6-7 credits)

3 credits of:
CHEM 302 Introductory Organic Chemistry 3 (3 credits)
CHEM 381 Inorganic Chemistry 2 (3 credits)

3-4 credits of:
BIOL 300 Molecular Biology of the Gene (3 credits)
BIOL 301 Cell and Molecular Laboratory (4 credits)
BIOL 316 Biomembranes and Organelles (3 credits)
BIOL 551 Principles of Cellular Control (3 credits)
CHEM 302 Introductory Organic Chemistry 3 (3 credits)
CHEM 381 Inorganic Chemistry 2 (3 credits)
CHEM 502 Advanced Bio-Organic Chemistry (3 credits)
CHEM 514 Biophysical Chemistry (3 credits)
CHEM 520 Methods in Chemical Biology (3 credits)
CHEM 555 NMR Spectroscopy (3 credits)
CHEM 575 Chemical Kinetics (3 credits)
COMP 208 Computers in Engineering (3 credits)
Rationale cont.

Program retirements:
The Chemistry Department recently reviewed its programs and retired the BSc Liberal Program – Chemistry – Physical, which was under-utilized. All other programs in the Chemistry Department have healthy enrollment.
Major Chemistry (59 credits)
Offered by: Chemistry     Degree: Bachelor of Science

Program Requirements
Program Prerequisites
PRE-PROGRAM REQUIREMENTS:

Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

Required Courses (53 credits)
The required courses in this program consist of 53 credits in chemistry, physics and mathematics, listed below. The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level but the Chemistry courses must be replaced by courses in that discipline if students wish to be eligible for admission to the Ordre des chimistes du Québec. Students from outside Quebec or transfer students should consult the Academic Adviser. See http://www.chemistry.mcgill.ca/advising/inside/advisors.php.

A computer science course, either COMP 202 or COMP 208, is strongly recommended during U1 for students who have no previous introduction to computer programming. Students should contact their adviser on this matter. Completion of Mathematics MATH 222 during U1 is also strongly recommended. Physics PHYS 242 should be completed during U2.

* Denotes courses with CEGEP equivalents.

** Students who have successfully completed MATH 150 and MATH 151 are not required to take MATH 222.

CHEM 212 Introductory Organic Chemistry 1 (4 credits) *
CHEM 222 Introductory Organic Chemistry 2 (4 credits) *
CHEM 223 Introductory Physical Chemistry 1 (2 credits)
CHEM 243 Introductory Physical Chemistry 2 (2 credits)
CHEM 267 Introductory Chemical Analysis (3 credits)
CHEM 281 Inorganic Chemistry 1 (3 credits)
CHEM 283 Physical Chemistry Laboratory (2 credits)
CHEM 302 Introductory Organic Chemistry 3 (3 credits)
CHEM 332 Biological Chemistry (3 credits)
CHEM 345 Introduction to Quantum Chemistry (3 credits)
CHEM 355 Applications of Quantum Chemistry (3 credits)
CHEM 365 Statistical Thermodynamics (2 credits)
CHEM 367 Instrumental Analysis 1 (3 credits)
CHEM 377 Instrumental Analysis 2 (3 credits)
CHEM 381 Inorganic Chemistry 2 (3 credits)
CHEM 392 Integrated Inorganic/Organic Laboratory (3 credits)
CHEM 493 Advanced Physical Chemistry Laboratory (2 credits)
MATH 222 Calculus 3 (3 credits) **
PHYS 242 Electricity and Magnetism (2 credits)

Complementary Courses (6 credits)
6 credits of Chemistry (CHEM) courses at the 400 level or higher, or MATH 315 plus 3 credits of Chemistry courses at the 400 level or higher.
DATE: November 9th 2016

TO: Math Department

FROM: Anthony Mittermaier, Amy Blum

The attached proposal has been submitted to the Chemistry Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Chemistry, Biophysical Chemistry
Honours in Physics, Biophysical Chemistry

Would you be good enough to review this proposal and let us, Anthony Mittermaier and Amy Blum, know no later than November 11, 2016, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____ X _____ NO OBJECTIONS

____________ SOME OBJECTIONS

COMMENTS:

________________________________________________________________________

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Signature: Axel Hundemer
# New Program/Major or Minor/Concentration Proposal Form

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

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<th>Bachelor’s Program</th>
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<tbody>
<tr>
<td>Bi. Sc.</td>
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1.1 Major (Legacy = Subject)(30-char. max.)

| Chemistry               |

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

| Biophysical Chemistry   |

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

|                         |

2.0 Administering Faculty/Unit

| Science                 |

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)

| Term 201709             |

4.0 Rationale and Admission Requirements for New Proposal

In order to fully capitalize on the large and ongoing investments in biophysical research and education made by many of the Departments in the Faculty of Science, the departments of Chemistry, Biology, Physics, Physiology, Math, and Computer Science have developed an integrated Biophysics undergraduate teaching and recruitment strategy. As part of this initiative, the Department of Chemistry is proposing a new Biophysical Chemistry Option for its Honours program. Attainment of the Honours degree requires a CGPA of at least 3.00.

Continued on last page

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5.1 Program Type

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5.2 Category

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5.3 Level

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5.4 FQRSC (Research) Indicator

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5.9 FQRSC (Research) Indicator

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5.11 FQRSC (Research) Indicator

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6.0 Total Credits

| 74-75                    |

7.0 Consultation with Related Units

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Attach list of consultations.
8.0 Program Description (Maximum 150 words)

This program will train students in the fundamentals of chemistry and will give them physical, computational, and mathematical skills needed for advanced biophysical chemistry research and the biomedical and biotechnology industries. The program features integrative, interdisciplinary courses in bio-physical sciences.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

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

| Program Requirement: Note: Attainment of the Honours degree requires a CGPA of at least 3.00. |
| Program Prerequisites |
| PRE-PROGRAM REQUIREMENTS: Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222. |

Required Courses (65 credits)

The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level. Students completing this program will not be eligible for admission to the Ordre des chimistes du Québec without additional chemistry electives. This program is not currently accredited by the Canadian Society for Chemistry.

Completion of Mathematics MATH 222 and MATH 315 during U1 is strongly recommended.

* Denotes courses with CEGEP equivalents.
** Students who have successfully completed MATH 150 and MATH 151 are not required to take MATH 222.

Bio-Physical Sciences Core

| BIOL 219 Physical Biology of the Cell (4 credits) |
| BIOL 319 Introduction to Biophysics (3 credits) |
| BIOL 395 Quantitative Biology Seminar 1 (1 credits) |
| CHEM 212 Introductory Organic Chemistry 1 (4 credits)* |
| MATH 222 Calculus 3 (3 credits)** |
| MATH 223 Linear Algebra (3 credits) |
| MATH 315 Ordinary Differential Equations (3 credits) |
| MATH 323 Probability (3 credits) |
| PHYS 329 Statistical Physics with Biophysical applications (3 credits) |

Chemistry

| CHEM 222 Organic Chemistry 2 (4 credits)* |
| CHEM 223 Introductory Physical Chemistry 1 (2 credits) |
| CHEM 243 Introductory Physical Chemistry 2 (2 credits) |
| CHEM 281 Inorganic Chemistry 1 (3 credits) |
| CHEM 283 Physical Chemistry Laboratory (2 credits) |
| CHEM 267 Introductory Chemical Analysis (3 credits) |
| CHEM 345 Introduction to Quantum Chemistry (3 credits) |
| CHEM 355 Applications of Quantum Chemistry (3 credits) |
| CHEM 367 Instrumental Analysis 1 (3 credits) |
| CHEM 377 Instrumental Analysis 2 (3 credits) |
| CHEM 470 Honours Research Project (6 credits) |
| CHEM 493 Advanced Physical Chemistry Laboratory (2 credits) |
| PHYS 242 Electricity and Magnetism (2 credits) |

Attach extra page(s) as needed
Complementary Courses (9-10 credits)

3 credits of:
- CHEM 302 Introductory Organic Chemistry 3 (3 credits)
- CHEM 381 Inorganic Chemistry 2 (3 credits)

6-7 credits of:
- BIOL 300 Molecular Biology of the Gene (3 credits)
- BIOL 301 Cell and Molecular Laboratory (4 credits)
- BIOL 316 Biomembranes and Organelles (3 credits)
- BIOL 551 Principles of Cellular Control (3 credits)
- CHEM 302 Introductory Organic Chemistry 3 (3 credits)
- CHEM 381 Inorganic Chemistry 2 (3 credits)
- CHEM 502 Advanced Bio-Organic Chemistry (3 credits)
- CHEM 514 Biophysical Chemistry (3 credits)
- CHEM 520 Methods in Chemical Biology (3 credits)
- CHEM 555 NMR Spectroscopy (3 credits)
- CHEM 575 Chemical Kinetics (3 credits)
- COMP 208 Computers in Engineering (3 credits)
Rationale cont.

Program retirements:
The Chemistry Department recently reviewed its programs and retired the BSc Liberal Program – Chemistry – Physical, which was under-utilized. All other programs in the Chemistry Department have healthy enrollment.
Honours Chemistry (71 credits)

Program Requirements
Note: Attainment of the Honours degree requires a CGPA of at least 3.00.

Program Prerequisites

PRE-PROGRAM REQUIREMENTS:

Students entering from the Freshman program must have included CHEM 110 and CHEM 120 or CHEM 115, BIOL 111 or BIOL 112, MATH 133, MATH 140/MATH 141 or MATH 150/MATH 151, PHYS 131/PHYS 142, or their equivalents in their Freshman year. Quebec students must have completed the DEC with appropriate science and mathematics courses. Note that students who have successfully completed MATH 150 and MATH 151 do not have to take MATH 222.

Required Courses (53 credits)
The required courses in this program consist of 56 credits in chemistry, physics and mathematics, listed below. The courses marked with an asterisk (*) are omitted from the program of students who have successfully completed them at the CEGEP level but the Chemistry courses must be replaced by courses in that discipline if students wish to be eligible for admission to the Ordre des chimistes du Québec. Students from outside Quebec or transfer students should consult the Academic Adviser. See http://www.chemistry.mcgill.ca/advising/inside/advisors.php.

A computer science course, either COMP 202 or COMP 208, is strongly recommended during U1 for students who have no previous introduction to computer programming. Students should contact their adviser on this matter. Completion of Mathematics MATH 222 during U1 is also strongly recommended. Physics PHYS 242 should be completed during U2.

* Denotes courses with CEGEP equivalents.
** Students who have successfully completed MATH 150 and MATH 151 are not required to take MATH 222.

CHEM 212 Introductory Organic Chemistry 1 (4 credits) *
CHEM 222 Introductory Organic Chemistry 2 (4 credits) *
CHEM 223 Introductory Physical Chemistry 1 (2 credits)
CHEM 243 Introductory Physical Chemistry 2 (2 credits)
CHEM 267 Introductory Chemical Analysis (3 credits)
CHEM 281 Inorganic Chemistry 1 (3 credits)
CHEM 283 Physical Chemistry Laboratory (2 credits)
CHEM 302 Introductory Organic Chemistry 3 (3 credits)
CHEM 332 Biological Chemistry (3 credits)
CHEM 345 Introduction to Quantum Chemistry (3 credits)
CHEM 355 Applications of Quantum Chemistry (3 credits)
CHEM 365 Statistical Thermodynamics (2 credits)
CHEM 367 Instrumental Analysis 1 (3 credits)
CHEM 377 Instrumental Analysis 2 (3 credits)
CHEM 381 Inorganic Chemistry 2 (3 credits)
CHEM 392 Integrated Inorganic/Organic Laboratory (3 credits)
CHEM 493 Advanced Physical Chemistry Laboratory (2 credits)
MATH 222 Calculus 3 (3 credits) **
PHYS 242 Electricity and Magnetism (2 credits)

Complementary Courses (18 credits)
6 credits of research*:
* Students may take up to 12 Research Project credits but only 6 of these may be used to fulfil the program requirement.
CHEM 470 Research Project 1 (6 credits)
CHEM 480 Research Project 2 (3 credits)
12 credits of additional Chemistry courses as follows:
6 credits of Chemistry courses at the 300 level or higher, or MATH 315 plus 3 credits of Chemistry courses at the 300 level or higher, and
6 credits of Chemistry courses at the 400 level or higher.
DATE: ___November 9th 2016___

TO: Math Department

FROM: Anthony Mittermaier, Amy Blum

The attached proposal has been submitted to the Chemistry Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Chemistry, Biophysical Chemistry
                  Honours in Physics, Biophysical Chemistry

Would you be good enough to review this proposal and let us, Anthony Mittermaier and Amy Blum, know no later than ___November 11, 2016____, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

____X_____ NO OBJECTIONS  ____________ SOME OBJECTIONS

COMMENTS:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Signature: ___Axel Hundemer_____________________________________________
# New Program/Major or Minor/Concentration Proposal Form

## 1.0 Degree Title
Please specify the two degrees for concurrent degree programs

<table>
<thead>
<tr>
<th>B.Sc.</th>
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</thead>
</table>

## 1.1 Major (Legacy= Subject)(30-char. max.)

<table>
<thead>
<tr>
<th>Physics</th>
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</table>

## 1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

<table>
<thead>
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## 1.3 Minor (with Concentration, if Applicable) (30 char. max.)

## 2.0 Administering Faculty/Unit

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## 3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)  
Term

<table>
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## 4.0 Rationale and Admission Requirements for New Proposal

The Physics Department has recently hired several biological physicists, and there is a growing interest, among both students and faculty, in a program that prepares students of physics with the specific training required work in this exciting and rapidly expanding area. Through conversations among students and professors, there is anecdotal evidence that we are currently losing many gifted students to similar biophysics/biological physics based programs at other universities in Canada. Using existing courses, we can create a Biological Physics Concentration that will give excellent preparation for this field, while still allowing continuity in other areas of physics. The admission requirements are the same as the existing Major Physics program (attached). The Department of Physics has recently conducted a review of programs and is satisfied that there are no programs that need to be revised or retired due to low enrollment.

## 5.0 Program Information
Please check appropriate box(es)

### 5.1 Program Type

- Bachelor’s Program
- Master’s
- M.Sc. (Applied) Program
- Dual Degree/Concurrent Program
- Certificate
- Diploma
- Graduate Certificate
- Graduate Diploma
- Ph.D. Program
- Doctorate Program
- (Other than Ph.D.)
- Private Program
- Off-Campus Program
- Distance Education Program
- (By Correspondence)
- Other (Please specify)

### 5.2 Category

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

### 5.3 Level

- Undergraduate
- Dental/Law/Medicine
- Continuing Studies (Non-Credit)
- Collegial
- Masters & Grad Dips & Certs
- Doctorate
- Post-Graduate Medicine/Dentistry
- Graduate Qualifying
- Postdoctoral Fellows

### 5.4 FQRSC (Research) Indicator
(for GPS) Yes  No

## 6.0 Total Credits

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## 7.0 Consultation with Related Units

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Financial Consult

<table>
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<tr>
<th>Yes  X  No</th>
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</table>

Attach list of consultations.
### 8.0 Program Description (Maximum 150 words)

The Physics Major program with a concentration in Biological Physics keeps a strong core of foundational physics and specializes through adding courses in biology, mathematics, physiology, computer science and chemistry. Specifically, the program adds five to seven courses in biology which provide background in molecular and cell biology, a course in computer science, a course in organic chemistry, and the introductory and advanced biophysics courses offered by the Physics Department, which will function as integrative courses. This program provides students with the skills necessary to continue on to graduate studies in biophysics / biological physics, or for a research career in hospital, Industrial, or university settings.

### 9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

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

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<th>B.Sc.; Major in Physics; Biological Physics Option (61-82 credits)</th>
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<td><strong>Required Courses (63 credits)</strong></td>
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<td>Bio-Physical Sciences Core (27 credits)</td>
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<td>BIOL 219 Physical Biology of the Cell (4 credits)</td>
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<td>BIOL 395 Quantitative Biology Seminar 1 (1 credits)</td>
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<tr>
<td>CHEM 212 Introductory Organic Chemistry 1 (4 credits)*</td>
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<tr>
<td>MATH 222 Calculus 3 (3 credits)*</td>
</tr>
<tr>
<td>MATH 223 Linear Algebra (3 credits)</td>
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<tr>
<td>MATH 315 Ordinary Differential Equations (3 credits)</td>
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<td>MATH 323 Probability (3 credits)</td>
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<tr>
<td>PHYS 319 Introduction to Biophysics (3 credits)</td>
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<tr>
<td>PHYS 329 Statistical Physics with Biophysical Application (3 credits)</td>
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<tr>
<td>*Students who have taken the equivalent of CHEM 212 or MATH 222 can make up the credits with complementary 3 or 4 credit courses in consultation with the program adviser.</td>
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<tr>
<td>Biology and Mathematics (6 credits)</td>
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<tr>
<td>BIOL 202 Basic Genetics (3 credits)</td>
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<td>MATH 314 Advanced Calculus (3 credits)</td>
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<td><strong>Physics (30 credits)</strong></td>
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<td>PHYS 230 Dynamics of Simple Systems (3 credits)</td>
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<td>PHYS 232 Heat and Waves (3 credits)</td>
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<td>PHYS 241 Signal Processing (3 credits)</td>
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<td>PHYS 257 Experimental Methods 1 (3 credits)</td>
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<td>PHYS 340 Majors Electricity and Magnetism (3 credits)</td>
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<td>PHYS 342 Majors Electromagnetic Waves (3 credits)</td>
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<td>PHYS 446 Majors Quantum Physics (3 credits)</td>
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<td>PHYS 449 Majors Research Project (3 credits)</td>
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<td>PHYS 519 Advanced Biophysics (3 credits)</td>
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**Complementary Courses (18-19 credits)**

3 credits selected from:
- PHYS 339 Measurements Laboratory in General Physics (3 credits)
- PHYS 439 Majors Laboratory in Modern Physics (3 credits)

3 credits selected from:
- PHYS 432 Physics of Fluids (3 credits)
- PHYS 434 Optics (3 credits)
- PHYS 447 Applications of Quantum Mechanics (3 credits)
- CHEM 514 Biophysical Chemistry (3 credits)
- MATH 437 Mathematical Methods in Biology (3 credits)
- PHGY 425 Analyzing Physiological Systems (3 credits)

6 to 7 credits selected from:
- BIOL 300 Molecular Biology of the Gene (3 credits)
- BIOL 301 Cell and Molecular Biology Laboratory (4 credits)
- BIOL 303 Developmental Biology (3 credits)
- BIOL 306 Neural Basis of Behavior (3 credits)
- BIOL 313 Eukaryotic Cell Biology (3 credits)
- BIOL 316 Biomembranes and Organelles (3 credits)
- BIOL 551 Principles of Cellular Control (3 credits)

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Attach extra page(s) as needed

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Submitted by

Name
Phone
Email
Submission Date

To be completed by ARR:

CIP Code
Major Physics (60 credits)

Offered by: Physics  Degree: Bachelor of Science

Program Requirements

Program Prerequisites

Students entering Physics programs from the Freshman program must have successfully completed the courses below or their equivalents. Quebec students must have completed the DEC with appropriate science and mathematics courses.

- CHEM 110 General Chemistry 1 (4 credits) (/study/2016-2017/courses/chem-110)
- CHEM 120 General Chemistry 2 (4 credits) (/study/2016-2017/courses/chem-120)
- PHYS 131 Mechanics and Waves (4 credits) (/study/2016-2017/courses/phys-131)
- PHYS 142 Electromagnetism and Optics (4 credits) (/study/2016-2017/courses/phys-142)

One of:

- BIOL 111 Principles: Organismal Biology (3 credits) (/study/2016-2017/courses/biol-111)
- BIOL 112 Cell and Molecular Biology (3 credits) (/study/2016-2017/courses/biol-112)

- MATH 133 Linear Algebra and Geometry (3 credits) (/study/2016-2017/courses/math-133) and either MATH 140 (/study/2016-2017/courses/math-140)/141 or MATH 150 (/study/2016-2017/courses/math-150)/151.

- MATH 133 Linear Algebra and Geometry (3 credits) (/study/2016-2017/courses/math-133)
- MATH 140 Calculus 1 (3 credits) (/study/2016-2017/courses/math-140)
- MATH 141 Calculus 2 (4 credits) (/study/2016-2017/courses/math-141)
- MATH 150 Calculus A (4 credits) (/study/2016-2017/courses/math-150)
- MATH 151 Calculus B (4 credits) (/study/2016-2017/courses/math-151)

U1 Required Courses (21 credits)

- MATH 222 Calculus 3 (3 credits) (/study/2016-2017/courses/math-222)
- MATH 223 Linear Algebra (3 credits) (/study/2016-2017/courses/math-223)
- PHYS 230 Dynamics of Simple Systems (3 credits) (/study/2016-2017/courses/phys-230)
- PHYS 232 Heat and Waves (3 credits) (/study/2016-2017/courses/phys-232)
- PHYS 241 Signal Processing (3 credits) (/study/2016-2017/courses/phys-241)
- PHYS 257 Experimental Methods 1 (3 credits) (/study/2016-2017/courses/phys-257)
- PHYS 258 Experimental Methods 2 (3 credits) (/study/2016-2017/courses/phys-258)

U2 Required Courses (24 credits)

- MATH 314 Advanced Calculus (3 credits) (/study/2016-2017/courses/math-314)
- MATH 315 Ordinary Differential Equations (3 credits) (/study/2016-2017/courses/math-315)
PHYS 328 Electronics (3 credits) (/study/2016-2017/courses/phys-328)
PHYS 331 Topics in Classical Mechanics (3 credits) (/study/2016-2017/courses/phys-331)
PHYS 333 Thermal and Statistical Physics (3 credits) (/study/2016-2017/courses/phys-333)
PHYS 339 Measurements Laboratory in General Physics (3 credits) (/study/2016-2017/courses/phys-339)
PHYS 340 Majors Electricity and Magnetism (3 credits) (/study/2016-2017/courses/phys-340)
PHYS 342 Majors Electromagnetic Waves (3 credits) (/study/2016-2017/courses/phys-342)

U3 Required Courses (15 credits)

PHYS 434 Optics (3 credits) (/study/2016-2017/courses/phys-434)
PHYS 439 Majors Laboratory in Modern Physics (3 credits) (/study/2016-2017/courses/phys-439)
PHYS 446 Majors Quantum Physics (3 credits) (/study/2016-2017/courses/phys-446)
PHYS 447 Applications of Quantum Mechanics (3 credits) (/study/2016-2017/courses/phys-447)
PHYS 449 Majors Research Project (3 credits) (/study/2016-2017/courses/phys-449)

It is possible for students to transfer from the Major to the Honours program after the U1 year if they have passed all U1 Required courses and MATH 314 (/study/2016-2017/courses/math-314) and MATH 315 (/study/2016-2017/courses/math-315) with a C or better, and obtained a GPA of 3.5 or better in these courses. The written permission of an adviser is required for this change of program.

Note: The missing MATH 249 (/study/2016-2017/courses/math-249) and PHYS 260 (/study/2016-2017/courses/phys-260) from the U1 Honours Year should be taken in U2.

Faculty of Science—2016-2017 (last updated Aug. 26, 2016) (disclaimer (/study/2016-2017/disclaimer))
CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE: _ November 9th 2016

TO: Biology department

FROM: Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Physics, Biological physics
Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than _ November 11, 2016 __, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

______ X____ NO OBJECTIONS ___________ SOME OBJECTIONS

COMMENTS: ___________________________ Nancy Nelson on behalf of the Curriculum Committee, Department of Biology

__________________________

Signature: _________________________

Date: _ Nov 10 2016__________
CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE:  November 9th 2016

TO:  Computer Science department

FROM:  Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles:  Major in Physics, Biological physics
Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than November 11, 2016, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

X  NO OBJECTIONS  SOME OBJECTIONS

COMMENTS:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Signature:  Michael Jey (CS Academic Committee)

Date:  10 Nov 2016
DATE:  _21_ November 9th 2016

TO:  Mathematics department

FROM:  Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles:  Major in Physics, Biological physics
Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than _November 11, 2016__, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____X______ NO OBJECTIONS  ___________ SOME OBJECTIONS

COMMENTS:
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Signature:  ____Axel Hundemer, Undergraduate Program Director________
CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE: _November 9th 2016_

TO: Physiology department

FROM: Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Physics, Biological physics
Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than _November 11, 2016_, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

____X____ NO OBJECTIONS

___________ SOME OBJECTIONS

COMMENTS:
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

Signature:  

Date: _November 14, 2016_
1.0 Degree Title
Please specify the two degrees for concurrent degree programs

B.Sc.

2.0 Administering Faculty/Unit

Science

1.1 Major (Legacy= Subject)(30-char. max.)

Physics

2.0 Offering Faculty/Department

Science/Physics

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

Biological Physics

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)

Term

201709

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

4.0 Rationale and Admission Requirements for New Proposal

The physics department has recently hired several biological physicists, and there is a growing interest, among both students and faculty, in a program that prepares students of physics with the specific training required to work in this exciting and rapidly expanding area. Through conversations among students and professors, there is anecdotal evidence that we are currently losing many gifted students to similar biophysics/biological physics based programs at other universities in Canada. Using existing courses, we can create a biological physics concentration that will give excellent preparation for this field, while still allowing continuation in other areas of physics. The admission requirements are the same as the existing Honours Physics program (attached). The Department of Physics has recently conducted a review of programs and is satisfied that there are no programs that need to be revised or retired due to low enrollment.

5.0 Program Information
Please check appropriate box(es)

5.1 Program Type

☑ Bachelor’s Program

Master’s

M.Sc. (Applied) Program

Dual Degree/Concurrent Program Certificate

Diploma

Graduate Certificate

Graduate Diploma

Ph.D. Program

Doctorate Program

(Other than Ph.D.)

Private Program

Off-Campus Program

Distance Education Program (By Correspondence)

Other (Please specify)

☑ 5.2 Category

Faculty Program (FP)

Major

Joint Major

Major Concentration (CON)

Minor

Minor Concentration (CON)

Honours (HON)

Joint Honours Component (HC)

Internship/Co-op

Thesis (T)

Non-Thesis (N)

Other

Please specify

5.3 Level

☑ Undergraduate

Bachelor’s Program

Master’s

M.Sc. (Applied) Program

Dual Degree/Concurrent Program

Certificate

Diploma

Graduate Certificate

Graduate Diploma

Ph.D. Program

Doctorate Program

(Other than Ph.D.)

Private Program

Off-Campus Program

Distance Education Program (By Correspondence)

Other (Please specify)

5.4 FQRSC (Research) Indicator
(for GPS) Yes ☑ No

5.5 Program Type

Undergraduate

Bachelor’s Program

Master’s

M.Sc. (Applied) Program

Dual Degree/Concurrent Program

Certificate

Diploma

Graduate Certificate

Graduate Diploma

Ph.D. Program

Doctorate Program

(Other than Ph.D.)

Private Program

Off-Campus Program

Distance Education Program (By Correspondence)

Other (Please specify)

5.6 Program Type

Undergraduate

Bachelor’s Program

Master’s

M.Sc. (Applied) Program

Dual Degree/Concurrent Program

Certificate

Diploma

Graduate Certificate

Graduate Diploma

Ph.D. Program

Doctorate Program

(Other than Ph.D.)

Private Program

Off-Campus Program

Distance Education Program (By Correspondence)

Other (Please specify)

5.7 Program Type

Undergraduate

Bachelor’s Program

Master’s

M.Sc. (Applied) Program

Dual Degree/Concurrent Program

Certificate

Diploma

Graduate Certificate

Graduate Diploma

Ph.D. Program

Doctorate Program

(Other than Ph.D.)

Private Program

Off-Campus Program

Distance Education Program (By Correspondence)

Other (Please specify)

5.8 Program Type

Undergraduate

Bachelor’s Program

Master’s

M.Sc. (Applied) Program

Dual Degree/Concurrent Program

Certificate

Diploma

Graduate Certificate

Graduate Diploma

Ph.D. Program

Doctorate Program

(Other than Ph.D.)

Private Program

Off-Campus Program

Distance Education Program (By Correspondence)

Other (Please specify)

5.9 Program Type

Undergraduate

Bachelor’s Program

Master’s

M.Sc. (Applied) Program

Dual Degree/Concurrent Program

Certificate

Diploma

Graduate Certificate

Graduate Diploma

Ph.D. Program

Doctorate Program

(Other than Ph.D.)

Private Program

Off-Campus Program

Distance Education Program (By Correspondence)

Other (Please specify)

6.0 Total Credits

4.0 to 82

7.0 Consultation with Related Units

Yes ☑ No

Financial Consult

Yes ☑ No ☑

Attach list of consultations.
8.0 Program Description (Maximum 150 words)

The Physics Honours program with a concentration in Biological Physics keeps a strong core of foundational physics and specializes through adding courses in biology, mathematics, physiology, computer science and chemistry. Compared to the Majors Biological Physics concentration, the Honours program will give a more rigorous preparation, with additional research experience, for students with a strong interest in biophysics. In the final year of this program students will have an opportunity to carry out a research project within a biophysics lab in the department. This program will provide a very strong foundation for any student wishing to pursue graduate studies in biophysics, as well as a research career in industrial, hospital, or academic laboratory settings.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

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

**B.Sc.; Honours in Physics; Biological Physics Option (81-82 credits)**

**Required Courses (63 credits)**

**Bio-Physical Sciences Core (24 credits)**
BIOL 219 Physical Biology of the Cell (4 credits)
BIOL 395 Quantitative Biology Seminar 1 (1 credit)
CHEM 212 Introductory Organic Chemistry 1 (4 credits)*
MATH 247 Honours Applied Linear Algebra (3 credits)
MATH 315 Ordinary Differential Equations (3 credits)
MATH 323 Probability (3 credits)

**Physics (33 credits)**

PHYS 241 Signal Processing (3 credits)
PHYS 251 Honours Classical Mechanics 1 (3 credits)
PHYS 253 Thermal Physics (3 credits)
PHYS 257 Experimental Methods 1 (3 credits)
PHYS 258 Experimental Methods 2 (3 credits)
PHYS 350 Honours Electricity and Magnetism (3 credits)
PHYS 352 Honours Electromagnetic Waves (3 credits)
PHYS 446 Majors Quantum Physics (3 credits)

**Complementary Courses Cont.**

3 credits selected from:
PHYS 432 Physics of Fluids (3 credits)
PHYS 434 Optics (3 credits)
PHYS 447 Applications of Quantum Mechanics (3 credits)
CHEM 514 Biophysical Chemistry (3 credits)
MATH 437 Mathematical Methods in Biology (3 credits)
PHGY 425 Analyzing Physiological Systems (3 credits)

6 to 7 credits selected from:
BIOL 300 Molecular Biology of the Gene (3 credits)
BIOL 301 Cell and Molecular Biology Laboratory (4 credits)
BIOL 303 Developmental Biology (3 credits)
BIOL 306 Neural Basis of Behavior (3 credits)
BIOL 313 Eukaryotic Cell Biology (3 credits)
BIOL 316 Biomembranes and Organelles (3 credits)
BIOL 551 Principles of Cellular Control (3 credits)

**Biology and Mathematics (6 credits)**

BIOL 202 Basic Genetics (3 credits)
MATH 248 Honours Advanced Calculus (3 credits)

**Physics (33 credits)**

PHYS 241 Signal Processing (3 credits)
PHYS 251 Honours Classical Mechanics 1 (3 credits)
PHYS 253 Thermal Physics (3 credits)
PHYS 257 Experimental Methods 1 (3 credits)
PHYS 258 Experimental Methods 2 (3 credits)
PHYS 350 Honours Electricity and Magnetism (3 credits)
PHYS 352 Honours Electromagnetic Waves (3 credits)
PHYS 446 Majors Quantum Physics (3 credits)

**Complementary Courses Cont.**

3 credits selected from:
PHYS 432 Physics of Fluids (3 credits)
PHYS 434 Optics (3 credits)
PHYS 447 Applications of Quantum Mechanics (3 credits)
CHEM 514 Biophysical Chemistry (3 credits)
MATH 437 Mathematical Methods in Biology (3 credits)
PHGY 425 Analyzing Physiological Systems (3 credits)

6 to 7 credits selected from:
BIOL 300 Molecular Biology of the Gene (3 credits)
BIOL 301 Cell and Molecular Biology Laboratory (4 credits)
BIOL 303 Developmental Biology (3 credits)
BIOL 306 Neural Basis of Behavior (3 credits)
BIOL 313 Eukaryotic Cell Biology (3 credits)
BIOL 316 Biomembranes and Organelles (3 credits)
BIOL 551 Principles of Cellular Control (3 credits)

3 credits selected from:
PHYS 339 Measurements Laboratory in General Physics (3 credits)
PHYS 359 Honours Laboratory in Modern Physics 1 (3 credits)

/Continued in next column

Attach extra page(s) as needed
Honours Physics (78 credits)

Offered by: Physics     Degree: Bachelor of Science

Program Requirements

Students entering this program for the first time should have high standing in mathematics and physics. In addition, a student who has not completed the equivalent of MATH 222 (/study/2016-2017/courses/math-222) must take it in the first term without receiving credit toward the 78 credits required in the Honours program.

A student whose average in the required and complementary courses in any year falls below a GPA of 3.00, or whose grade in any individual required or complementary course falls below a C (unless it is improved to a C or higher in a supplementary examination or by retaking the course), may not register in the Honours program the following year, or graduate with the Honours degree, except with the permission of the Department.

Program Prerequisites

Students entering Physics programs from the Freshman program must have successfully completed the courses below or their equivalents. Quebec students must have completed the DEC with appropriate science and mathematics courses.

- CHEM 110 General Chemistry 1 (4 credits) (/study/2016-2017/courses/chem-110)
- CHEM 120 General Chemistry 2 (4 credits) (/study/2016-2017/courses/chem-120)
- PHYS 131 Mechanics and Waves (4 credits) (/study/2016-2017/courses/phys-131)
- PHYS 142 Electromagnetism and Optics (4 credits) (/study/2016-2017/courses/phys-142)

One of:

- BIOL 111 Principles: Organismal Biology (3 credits) (/study/2016-2017/courses/biol-111)
- BIOL 112 Cell and Molecular Biology (3 credits) (/study/2016-2017/courses/biol-112)

MATH 133 (/study/2016-2017/courses/math-133) and either MATH 140 (/study/2016-2017/courses/math-140)/141 or MATH 150 (/study/2016-2017/courses/math-150)/151.

- MATH 133 Linear Algebra and Geometry (3 credits) (/study/2016-2017/courses/math-133)
- MATH 140 Calculus 1 (3 credits) (/study/2016-2017/courses/math-140)
- MATH 141 Calculus 2 (4 credits) (/study/2016-2017/courses/math-141)
- MATH 150 Calculus A (4 credits) (/study/2016-2017/courses/math-150)
- MATH 151 Calculus B (4 credits) (/study/2016-2017/courses/math-151)

U1 Required Courses (27 credits)

- MATH 247 Honours Applied Linear Algebra (3 credits) (/study/2016-2017/courses/math-247)
- MATH 248 Honours Advanced Calculus (3 credits) (/study/2016-2017/courses/math-248)
- MATH 249 Honours Complex Variables (3 credits) (/study/2016-2017/courses/math-249)
- MATH 325 Honours Ordinary Differential Equations (3 credits) (/study/2016-2017/courses/math-325)
- PHYS 241 Signal Processing (3 credits) (/study/2016-2017/courses/phys-241)
PHYS 251 Honours Classical Mechanics 1 (3 credits) (/study/2016-2017/courses/phys-251)
PHYS 257 Experimental Methods 1 (3 credits) (/study/2016-2017/courses/phys-257)
PHYS 258 Experimental Methods 2 (3 credits) (/study/2016-2017/courses/phys-258)
PHYS 260 Modern Physics and Relativity (3 credits) (/study/2016-2017/courses/phys-260)

U2 Required Courses (24 credits)

MATH 475 Honours Partial Differential Equations (3 credits) (/study/2016-2017/courses/math-475)
PHYS 253 Thermal Physics (3 credits) (/study/2016-2017/courses/phys-253)
PHYS 350 Honours Electricity and Magnetism (3 credits) (/study/2016-2017/courses/phys-350)
PHYS 351 Honours Classical Mechanics 2 (3 credits) (/study/2016-2017/courses/phys-351)
PHYS 357 Honours Quantum Physics 1 (3 credits) (/study/2016-2017/courses/phys-357)
PHYS 359 Honours Laboratory in Modern Physics 1 (3 credits) (/study/2016-2017/courses/phys-359)

PHYS 362 Statistical Mechanics (3 credits) (/study/2016-2017/courses/phys-362)
PHYS 457 Honours Quantum Physics 2 (3 credits) (/study/2016-2017/courses/phys-457)

PHYS 352 Honours Electromagnetic Waves (3 credits) (/study/2016-2017/courses/phys-352)
PHYS 551 Quantum Theory (3 credits) (/study/2016-2017/courses/phys-551)

U3 Required Courses (6 credits)

PHYS 459D1 Honours Research Thesis (3 credits) (/study/2016-2017/courses/phys-459d1)
PHYS 459D2 Honours Research Thesis (3 credits) (/study/2016-2017/courses/phys-459d2)
PHYS 469 Honours Laboratory in Modern Physics 2 (3 credits) (/study/2016-2017/courses/phys-469)

PHYS 479 Honours Research Project (3 credits) (/study/2016-2017/courses/phys-479)

U3 Complementary Courses (21 credits)

6 credits selected from:
Note: PHYS 459D1 (/study/2016-2017/courses/phys-459d1) and PHYS 459D2 (/study/2016-2017/courses/phys-459d2) are taken together.

PHYS 459D1 Honours Research Thesis (3 credits) (/study/2016-2017/courses/phys-459d1)
PHYS 459D2 Honours Research Thesis (3 credits) (/study/2016-2017/courses/phys-459d2)
PHYS 469 Honours Laboratory in Modern Physics 2 (3 credits) (/study/2016-2017/courses/phys-469)
PHYS 479 Honours Research Project (3 credits) (/study/2016-2017/courses/phys-479)

15 credits selected from the list below (students may substitute one or more courses with any 3-credit course approved by the Department of Physics):

PHYS 432 Physics of Fluids (3 credits) (/study/2016-2017/courses/phys-432)
PHYS 434 Optics (3 credits) (/study/2016-2017/courses/phys-434)
PHYS 479 Honours Research Project (3 credits) (/study/2016-2017/courses/phys-479)
PHYS 514 General Relativity (3 credits) (/study/2016-2017/courses/phys-514)
PHYS 519 Advanced Biophysics (3 credits) (/study/2016-2017/courses/phys-519)
PHYS 521 Astrophysics (3 credits) (/study/2016-2017/courses/phys-521)
PHYS 557 Nuclear Physics (3 credits) (/study/2016-2017/courses/phys-557)
PHYS 558 Solid State Physics (3 credits) (/study/2016-2017/courses/phys-558)
PHYS 559 Advanced Statistical Mechanics (3 credits) (/study/2016-2017/courses/phys-559)
PHYS 562 Electromagnetic Theory (3 credits) (/study/2016-2017/courses/phys-562)

PHYS 567 Particle Physics (3 credits) (/study/2016-2017/courses/phys-567)

Faculty of Science—2016-2017 (last updated Aug. 26, 2016) (disclaimer (/study/2016-2017/disclaimer))
DATE: _November 9th 2016_

TO: Biology department

FROM: Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Physics, Biological physics
Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than _November 11, 2016_, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

______ X_____ NO OBJECTIONS

____________ SOME OBJECTIONS

COMMENTS: __________________ Nancy Nelson on behalf of the Curriculum Committee, Department of Biology

______________________________

Signature: _______________________

Date: __Nov 10 2016__
CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE: __November 9th 2016

TO: Computer Science department

FROM: Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Physics, Biological physics
                Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than __November 11, 2016_____, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

X NO OBJECTIONS ______________ SOME OBJECTIONS

COMMENTS:

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Signature: ____________________________ (CS Academic Committee)

Date: __10 Nov 2016__________________
CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE: November 9th 2016

TO: Mathematics department

FROM: Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Physics, Biological physics
Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than November 11, 2016, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____X____ NO OBJECTIONS

________________________ SOME OBJECTIONS

COMMENTS:

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Signature: Axel Hundemer, Undergraduate Program Director
CONSULTATION REPORT FORM
RE: COURSE / PROGRAM PROPOSALS

DATE: November 9th 2016

TO: Physiology department

FROM: Paul François, Andrew Cumming

The attached proposal has been submitted to the Physics Curriculum Committee, and it has been decided that your department should be consulted.

Program Titles: Major in Physics, Biological physics
Honours in Physics, Biological physics

Would you be good enough to review this proposal and let us, Paul François and Andrew Cumming, know no later than November 11, 2016, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____ X _____ NO OBJECTIONS

___________ SOME OBJECTIONS

COMMENTS:
____________________________________________________________________
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____________________________________________________________________

Signature: ____________________________

Date: November 14, 2016
# Revision for GEOG 504

**Summary of Changes**

<table>
<thead>
<tr>
<th>Course Title, Course Description</th>
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<tbody>
<tr>
<td><strong>Current Data</strong></td>
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<tr>
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<td>• one term</td>
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<tr>
<td>Credit Weight or CEU's</td>
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<td>Course Activities</td>
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<tr>
<td>Course Title</td>
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<tr>
<td><strong>Course Title on Transcript</strong></td>
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<tr>
<td><strong>Course Title on Calendar</strong></td>
</tr>
<tr>
<td><strong>New Data</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Rationale**

The existing course name (Industrial Restructuring: Geographic Implications) reflects the main theme of economic geography back in the 1980s (i.e., 'industrial restructuring' was very much the focal point of economic geography following the publication of Bluestone and Harrison's work on the deindustrialization of America in 1982). The discipline has changed significantly since then and the new, more simple (though admittedly perhaps also more generic) title of 'Advanced Economic Geography' reflects the fact that we have moved on to other things than 'industrial restructuring'. The course will deal with more contemporary topics, debates and concepts in economic geography such as evolutionary economic geography, innovation and technological change, global production networks and geographies of inequality.
<table>
<thead>
<tr>
<th><strong>Course Description</strong></th>
<th>The objective of this seminar course is to develop an understanding of the geographical consequences of a variety of new forms of economic and social organization that are emerging in the North American and Western European settings. Key themes: technological and managerial change, changing labour processes, industrial re-location.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teaching Dept.</strong></td>
<td>0288 : Geography</td>
</tr>
<tr>
<td><strong>Administering Faculty/Unit</strong></td>
<td>SC : Faculty of Science</td>
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<tr>
<td><strong>Prerequisites</strong></td>
<td>Prerequisites: GEOG 311 or permission of instructor</td>
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<td><strong>Corequisites</strong></td>
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<td><strong>Restrictions</strong></td>
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<td><strong>Supplementary Calendar Info</strong></td>
<td>1. Winter</td>
</tr>
<tr>
<td><strong>Additional Course Charges</strong></td>
<td></td>
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<tr>
<td><strong>Campus</strong></td>
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<tr>
<td><strong>Projected Enrollment</strong></td>
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</tr>
<tr>
<td><strong>Requires Resources Not Currently Available</strong></td>
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<tr>
<td><strong>Explanation for Required Resources</strong></td>
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<td><strong>Consultation Reports Attached?</strong></td>
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<td><strong>Effective Term of Implementation</strong></td>
<td>201801</td>
</tr>
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<td><strong>File Attachments</strong></td>
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<td><strong>For Continuing Studies Use</strong></td>
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### Approvals Summary

Show all comments

| Faculty | SCTP |

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<thead>
<tr>
<th>Version No.</th>
<th>Departmental Curriculum Committee</th>
<th>Departmental Meeting</th>
<th>Departmental Chair</th>
<th>Other Faculty</th>
<th>Curric/Academic Committee</th>
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<tr>
<td>1</td>
<td>Michel F Lapointe</td>
<td>Meeting Date: Nov 28 2016</td>
<td>Approval Date: Dec 1 2016</td>
<td>View Comments</td>
<td>Approved by Department Meeting Created on: Oct 27 2016</td>
<td>Approved</td>
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## Summary of Changes

| Course Title, Course Description, Prerequisites |

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<th>Current Data</th>
<th>New Data</th>
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<td>Program Affected?</td>
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<tr>
<td>Course Title on Transcript</td>
<td>Infrared &amp; Raman Spectroscopy</td>
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<td>Infrared and Raman Spectroscopy.</td>
</tr>
<tr>
<td>Course Title on Transcript</td>
<td>Fundamentals of Spectroscopy</td>
</tr>
<tr>
<td>Course Title on Calendar</td>
<td>Fundamentals of Spectroscopy</td>
</tr>
<tr>
<td>Rationale</td>
<td>Students are very interested in a course on the fundamentals of spectroscopy, but the very narrow focus on just vibrational spectroscopy does not reflect where the field and interest have moved over time. We would like to broaden the focus a bit while retaining the aspects of the course that worked well.</td>
</tr>
<tr>
<td>Responsible Instructor</td>
<td></td>
</tr>
<tr>
<td>Course Description</td>
<td>Applications of group theory to vibrational spectroscopy; theory of molecular vibrations; determination of molecular structures and vibrational assignments; typical vibrational studies and recent developments.</td>
</tr>
<tr>
<td>Fundamentals of advanced spectroscopic methods used in Materials chemistry. Topics may include vibrational (Raman and IR), optical (fluorescence, absorbance, ultrafast, and confocal), and surface based (XPS, Auger) spectroscopies, as well as electron microscopies.</td>
<td></td>
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<td>Teaching Dept.</td>
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<tr>
<td>Administering Faculty/Unit</td>
<td>GR : Graduate Studies</td>
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<td>Prerequisites</td>
<td>CHEM 355 or equivalent or by permission of instructor</td>
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### Approvals Summary

Show all comments

<table>
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<th>Version No.</th>
<th>Departmental Curriculum Committee</th>
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<th>Faculty</th>
<th>SCTP</th>
<th>Version Status</th>
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<td>Approved</td>
<td>Masad J Damha</td>
<td>Meeting Date: Nov 11 2016</td>
<td>Approval Date: Nov 11 2016</td>
<td>View Comments</td>
<td>Amy Blum</td>
<td>Meeting Date: Nov 10 2016</td>
<td>Approval Date: Dec 2 2016</td>
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<td></td>
<td></td>
<td>Approved by Faculty Meeting</td>
<td>Created on: Nov 11 2016</td>
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</tbody>
</table>
1.0 Degree Title
Specify the two degrees for concurrent degree programs

B.Sc

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

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

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

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

1.5 Complete Program Title
B.Sc.: Major in Biology, Quantitative Biology Option

2.0 Administering Faculty/Unit
Science

2.1 Offering Faculty/Department
Science/Biology

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: 201709

4.0 Existing Credit Weight
73

4.1 Proposed Credit Weight
73

5.0 Rationale for revised program
This revision combines three types of changes:
1. Harmonization of the program organization with the new Bio-physical umbrella in order to better highlight the relationships and commonalities among multidisciplinary life-sciences programs.
   a. BIOL 200 and 201 are replaced with the more interdisciplinary BIOL 219.
   b. BIOL 301 has been made a required course for both streams.
   c. PHYS 333 is replaced with the more interdisciplinary PHYS 329.
2. MATH 324 has been moved into the required list.
3. As the prerequisites have been changed for the complementary course, COMP 251, its prerequisites MATH 235 and MATH 240 have been added to the complementary courses.

6.0 Revised Program Description (Maximum 150 words)
(no change)
### 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)

**B.Sc.; Major in Biology, Quantitative Biology Option**

**Required Courses (29 credits)**

**Biology (24 credits)**
- 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 395 Quantitative Biology Seminar 1 (1 credit)
- BIOL 495 Quantitative Biology Seminar 2 (1 credit)

**Chemistry (4 credits)**
- CHEM 212 Introductory Organic Chemistry 1 (4 credits) *

*Students who have taken the equivalent of CHEM 212 can make up the credits with a complementary 3 or 4 credit course in consultation with a stream adviser.

**Computer Science (3 credits)**
- 3 credits from:
  - COMP 202 Foundations of Programming (3 credits)
  - COMP 250 Introduction to Computer Science (3 credits)

**Math (9-12 credits)**
- MATH 222 Calculus 3 (3 credits) *
- MATH 223 Linear Algebra (3 credits)
- MATH 315 Ordinary Differential Equations (3 credits)
- MATH 323 Probability (3 credits)
  * For students who have NOT taken MATH 150 and MATH 151.

**Physics (6 credits)**
- PHYS 230 Dynamics of Simple Systems (3 credits)
- PHYS 232 Heat and Waves (3 credits)

**Course Requirements for Quantitative Biology Streams (25 credits):**

### Stream 1: Theoretical Ecology and Evolutionary Biology (24 credits)

**Biology**
- BIOL 205 Biology of Organisms (3 credits)
- BIOL 206 Methods in Biology of Organisms (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 308 Ecological Dynamics (3 credits)

Field Courses - 3 credits from the following list or any other field course with permission:
- BIOL 240 Monteregian Flora (3 credits)
- BIOL 331 Ecology/Behaviour Field Course (3 credits)
- BIOL 334 Applied Tropical Ecology (3 credits)
- BIOL 432 Limnology (3 credits)

### Stream 2: Physical Sciences Core (31 credits)

**Bio-Physical Sciences Core (31 credits)**
- BIOL 219 Physical Biology of the Cell (4 credits)
- BIOL 301 Cell and Molecular Laboratory (4 credits)
- BIOL 395 Quantitative Biology Seminar 1 (credit)
- CHEM 212 Introductory Organic Chemistry 1 (4 credits)*
- COMP 202 Foundations of Programming (3 credits)**
- MATH 222 Calculus 3 (3 credits)*
- MATH 223 Linear Algebra (3 credits)
- MATH 315 Ordinary Differential Equations (3 credits)
- MATH 323 Probability (3 credits)
- MATH 324 Statistics (3 credits)

*Students who have taken the equivalent of CHEM 212 or MATH 222 can make up the credits with complementary 3 or 4 credit courses in consultation with a stream adviser.

**Students who have sufficient knowledge of programming should take COMP 250 Introduction to Computer Science rather than COMP 202.

**Biology (6 credits)**
- BIOL 202 Basic Genetics (3 credits)
- BIOL 215 Introduction to Ecology and Evolution (3 credits)

**Physics (6 credits)**
- PHYS 230 Dynamics of Simple Systems (3 credits)
- PHYS 232 Heat and Waves (3 credits)

**Course Requirements for Quantitative Biology Streams (21 credits) from one of the following two streams:**

**Stream 1: Theoretical Ecology and Evolutionary Biology (21 credits)**

**Biology**
- BIOL 205 Biology of Organisms (3 credits)
- BIOL 206 Methods in Biology of Organisms (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 308 Ecological Dynamics (3 credits)

Field Courses - 3 credits from the following list or any other field course with permission:
- BIOL 240 Monteregian Flora (3 credits)
- BIOL 331 Ecology/Behaviour Field Course (3 credits)
- BIOL 334 Applied Tropical Ecology (3 credits)
- BIOL 432 Limnology (3 credits)

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

**B.Sc.; Major in Biology, Quantitative Biology Option**

**Required Courses (43 credits)**

**Bio-Physical Sciences Core (31 credits)**
- BIOL 219 Physical Biology of the Cell (4 credits)
- BIOL 301 Cell and Molecular Laboratory (4 credits)
- BIOL 395 Quantitative Biology Seminar 1 (credit)
- CHEM 212 Introductory Organic Chemistry 1 (4 credits)*
- COMP 202 Foundations of Programming (3 credits)**
- MATH 222 Calculus 3 (3 credits)*
- MATH 223 Linear Algebra (3 credits)
- MATH 315 Ordinary Differential Equations (3 credits)
- MATH 323 Probability (3 credits)
- MATH 324 Statistics (3 credits)

*Students who have taken the equivalent of CHEM 212 or MATH 222 can make up the credits with complementary 3 or 4 credit courses in consultation with a stream adviser.

**Students who have sufficient knowledge of programming should take COMP 250 Introduction to Computer Science rather than COMP 202.

**Biology (6 credits)**
- BIOL 202 Basic Genetics (3 credits)
- BIOL 215 Introduction to Ecology and Evolution (3 credits)

**Physics (6 credits)**
- PHYS 230 Dynamics of Simple Systems (3 credits)
- PHYS 232 Heat and Waves (3 credits)

**Course Requirements for Quantitative Biology Streams (21 credits) from one of the following two streams:**

**Stream 1: Theoretical Ecology and Evolutionary Biology (21 credits)**

**Biology**
- BIOL 205 Biology of Organisms (3 credits)
- BIOL 206 Methods in Biology of Organisms (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 308 Ecological Dynamics (3 credits)

Field Courses - 3 credits from the following list or any other field course with permission:
- BIOL 240 Monteregian Flora (3 credits)
- BIOL 331 Ecology/Behaviour Field Course (3 credits)
- BIOL 334 Applied Tropical Ecology (3 credits)
- BIOL 432 Limnology (3 credits)
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)

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Title</th>
<th>Credit Weight</th>
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<tr>
<td>9</td>
<td>BIOL 301 Cell and Molecular Laboratory</td>
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<td></td>
<td>BIOL 310 Biodiversity and Ecosystems</td>
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<tr>
<td></td>
<td>BIOL 324 Ecological Genetics</td>
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<td></td>
<td>BIOL 432 Limnology</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>BIOL 434 Theoretical Ecology</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 435 Natural Selection</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 465 Conservation Biology</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 509 Methods in Molecular Ecology</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 510 Advances in Community Ecology</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 515 Advances in Aquatic Ecology</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 540 Ecology of Species Invasions</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 594 Advanced Evolutionary Ecology</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>BIOL 596 Advanced Experimental Design</td>
<td>1 credit</td>
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<td></td>
<td>BIOL 597 Advanced Biostatistics</td>
<td>2 credits</td>
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<tr>
<td></td>
<td>BIOL 598 Advanced Design and Statistics</td>
<td>3 credits</td>
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</tr>
<tr>
<td></td>
<td>MATH 324 Statistics</td>
<td>3 credits</td>
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</table>

* Students choose either both BIOL 596 and BIOL 597, or BIOL 598.

Stream 2: Physical Biology (25 credits)

<table>
<thead>
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<th>Credits</th>
<th>Course Title and Crse Num</th>
<th>Title</th>
<th>Credit Weight</th>
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</thead>
<tbody>
<tr>
<td>300</td>
<td>BIOL 301 Cell and Molecular Laboratory</td>
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</tr>
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<td></td>
<td>BIOL 319 Introduction to Biophysics</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>PHYS 333 Thermal and Statistical Physics</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>PHYS 446 Majors Quantum Physics</td>
<td>3 credits</td>
<td></td>
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</table>

300-level complementary courses: 6 credits from the following:

<table>
<thead>
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<tr>
<td></td>
<td>BIOL 300 Molecular Biology of the Gene</td>
<td>3 credits</td>
<td></td>
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<tr>
<td></td>
<td>BIOL 303 Developmental Biology</td>
<td>3 credits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIOL 306 Neural Basis of Behaviour</td>
<td>3 credits</td>
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<tr>
<td></td>
<td>BIOL 309 Mathematical Models in Biology</td>
<td>3 credits</td>
<td></td>
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<tr>
<td></td>
<td>BIOL 313 Eukaryotic Cell Biology</td>
<td>3 credits</td>
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</tr>
</tbody>
</table>

500-level complementary courses: 6 credits from the following:

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<tr>
<td></td>
<td>BIOL 518 Advanced Topics in Cell Biology</td>
<td>3 credits</td>
<td></td>
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<td></td>
<td>BIOL 520 Gene Activity in Development</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 524 Topics in Molecular Biology</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 530 Advances in Neuroethology</td>
<td>3 credits</td>
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<td></td>
<td>BIOL 551 Principles of Cellular Control</td>
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<td></td>
<td>BIOL 588 Advances in Molecular/Cellular Neurobiology</td>
<td>3 credits</td>
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Complementary Courses

Quantitative Biology - Theoretical Ecology and Evolutionary Biology, and Physical Biology streams

9 credits from the following: Recommendations for either Theoretical Ecology and Evolutionary Biology or Physical Biology streams

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<tr>
<td></td>
<td>BIOL 466 Independent Research Project</td>
<td>3 credits</td>
<td></td>
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<tr>
<td></td>
<td>COMP 206 Introduction to Software Systems</td>
<td>3 credits</td>
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</table>

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

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<td>BIOL 432 Limnology</td>
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* Students choose either both BIOL 596 and BIOL 597, or BIOL 598.

Stream 2: Physical Biology (21 credits)

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<td></td>
<td>BIOL 319 Introduction to Biophysics</td>
<td>3 credits</td>
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<td>PHYS 329 Statistical Physics with Biophysical Application</td>
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Complementary Courses

Quantitative Biology - Theoretical Ecology and Evolutionary Biology, and Physical Biology streams

9 credits from the following: Recommendations for either Theoretical Ecology and Evolutionary Biology or Physical Biology streams

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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)

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credit Weight</th>
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</thead>
<tbody>
<tr>
<td>COMP 250</td>
<td>Introduction to Computer Science</td>
<td>3 credits</td>
</tr>
<tr>
<td>COMP 251</td>
<td>Algorithms and Data Structures</td>
<td>3 credits</td>
</tr>
<tr>
<td>COMP 252</td>
<td>Numerical Computing</td>
<td>3 credits</td>
</tr>
<tr>
<td>COMP 253</td>
<td>Computer Tools for Life Sciences</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 314</td>
<td>Advanced Calculus</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 317</td>
<td>Numerical Analysis</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 319</td>
<td>Introduction to Partial Differential Equations</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 326</td>
<td>Nonlinear Dynamics and Chaos</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 327</td>
<td>Matrix Numerical Analysis</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 348</td>
<td>Topics in Geometry</td>
<td>3 credits</td>
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<td>MATH 437</td>
<td>Mathematical Methods in Biology</td>
<td>3 credits</td>
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<tr>
<td>MATH 447</td>
<td>Introduction to Stochastic Processes</td>
<td>3 credits</td>
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* Students may take COMP 350 OR MATH 317.

Recommendations for Physical Biology stream

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Weight</th>
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<tbody>
<tr>
<td>BIEN 310</td>
<td>Introduction to Biomolecular Engineering</td>
<td>3 credits</td>
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<td>BIEN 320</td>
<td>Molecular, Cellular and Tissue Biomechanics</td>
<td>3 credits</td>
</tr>
<tr>
<td>BIEN 340</td>
<td>Transport Processes in Biological Systems</td>
<td>3 credits</td>
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<td>BIEN 510</td>
<td>Nanoparticles in the Medical Sciences</td>
<td>3 credits</td>
</tr>
<tr>
<td>BIEN 530</td>
<td>Imaging and Bioanalytical Instrumentation</td>
<td>3 credits</td>
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<tr>
<td>CHEM 222</td>
<td>Introductory Organic Chemistry 2</td>
<td>4 credits</td>
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<tr>
<td>MATH 324</td>
<td>Statistics</td>
<td>3 credits</td>
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<tr>
<td>PHYS 242</td>
<td>Electricity and Magnetism</td>
<td>2 credits</td>
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<td>PHYS 257</td>
<td>Experimental Methods I</td>
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<tr>
<td>PHYS 342</td>
<td>Majors Electromagnetic Waves</td>
<td>3 credits</td>
</tr>
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<td>PHYS 434</td>
<td>Optics</td>
<td>3 credits</td>
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<tr>
<td>PHYS 519</td>
<td>Advanced Biophysics</td>
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<tr>
<td>PHYS 534</td>
<td>Nanoscience and Nanotechnology</td>
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* PHYS 242 is required for PHYS 342 and PHYS 434.

Recommendations for Theoretical Ecology and Evolutionary Biology stream

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credit Weight</th>
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<tr>
<td>MATH 204</td>
<td>Principles of Statistics</td>
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<tr>
<td>MATH 242</td>
<td>Analysis</td>
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<tr>
<td>MATH 324</td>
<td>Statistics</td>
<td>3 credits</td>
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<tr>
<td>MATH 340</td>
<td>Discrete Structures</td>
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<td>MATH 423</td>
<td>Regression and Analysis of Variance</td>
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<tr>
<td>MATH 524</td>
<td>Nonparametric Statistics</td>
<td>4 credits</td>
</tr>
<tr>
<td>MATH 525</td>
<td>Sampling Theory and Applications</td>
<td>4 credits</td>
</tr>
<tr>
<td>PHYS 333</td>
<td>Thermal and Statistical Physics</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

* PHYS 333 is now required for the Physical Biology stream

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 250</td>
<td>Introduction to Computer Science</td>
<td>3 credits</td>
</tr>
<tr>
<td>COMP 251</td>
<td>Algorithms and Data Structures</td>
<td>3 credits</td>
</tr>
<tr>
<td>COMP 252</td>
<td>Numerical Computing</td>
<td>3 credits</td>
</tr>
<tr>
<td>COMP 253</td>
<td>Computer Tools for Life Sciences</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 314</td>
<td>Advanced Calculus</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 317</td>
<td>Numerical Analysis</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 319</td>
<td>Introduction to Partial Differential Equations</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 326</td>
<td>Nonlinear Dynamics and Chaos</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 327</td>
<td>Matrix Numerical Analysis</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 348</td>
<td>Topics in Geometry</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 437</td>
<td>Mathematical Methods in Biology</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 447</td>
<td>Introduction to Stochastic Processes</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

* Students may take COMP 350 OR MATH 317.

**MATH 235 or MATH 240 are required for COMP 251

Recommendations for Physical Biology stream

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIEN 310</td>
<td>Introduction to Biomolecular Engineering</td>
<td>3 credits</td>
</tr>
<tr>
<td>BIEN 320</td>
<td>Molecular, Cellular and Tissue Biomechanics</td>
<td>3 credits</td>
</tr>
<tr>
<td>BIEN 340</td>
<td>Transport Processes in Biological Systems</td>
<td>3 credits</td>
</tr>
<tr>
<td>BIEN 510</td>
<td>Nanoparticles in the Medical Sciences</td>
<td>3 credits</td>
</tr>
<tr>
<td>BIEN 530</td>
<td>Imaging and Bioanalytical Instrumentation</td>
<td>3 credits</td>
</tr>
<tr>
<td>CHEM 222</td>
<td>Introductory Organic Chemistry 2</td>
<td>4 credits</td>
</tr>
<tr>
<td>MATH 324</td>
<td>Statistics</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHYS 242</td>
<td>Electricity and Magnetism</td>
<td>2 credits</td>
</tr>
<tr>
<td>PHYS 257</td>
<td>Experimental Methods I</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHYS 342</td>
<td>Majors Electromagnetic Waves</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHYS 434</td>
<td>Optics</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHYS 519</td>
<td>Advanced Biophysics</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHYS 534</td>
<td>Nanoscience and Nanotechnology</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

* PHYS 242 is required for PHYS 342 and PHYS 434.

Recommendations for Theoretical Ecology and Evolutionary Biology stream

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 310</td>
<td>Biodiversity and Ecosystems</td>
<td>3 credits</td>
</tr>
<tr>
<td>BIOL 324</td>
<td>Ecological Genetics</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Analysis</td>
<td>1 (3 credits)</td>
</tr>
<tr>
<td>MATH 340</td>
<td>Discrete Structures</td>
<td>2 (3 credits)</td>
</tr>
<tr>
<td>MATH 423</td>
<td>Regression and Analysis of Variance</td>
<td>3 credits</td>
</tr>
<tr>
<td>MATH 524</td>
<td>Nonparametric Statistics</td>
<td>4 credits</td>
</tr>
<tr>
<td>MATH 525</td>
<td>Sampling Theory and Applications</td>
<td>4 credits</td>
</tr>
<tr>
<td>PHYS 333</td>
<td>Statistical Physics with Biophysical Application</td>
<td>3 credits</td>
</tr>
</tbody>
</table>
8.0 Consultation with Related Units  
[X] Yes  [ ] No  
Financial Consult  [ ] Yes  [X] No  
Attach list of consultations

9. Approvals

<table>
<thead>
<tr>
<th>Routing Sequence</th>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department</td>
<td>GREGOR FUSMANU, CHAIR</td>
<td>[Signature]</td>
<td>Dec 6 2016</td>
</tr>
<tr>
<td>Curric/Acad Committee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty 1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Faculty 2</td>
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<td>CGPS</td>
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<td>APC</td>
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<tr>
<td>Senate</td>
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</table>

Submitted by

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
<th>Submission Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To be completed by ARR:

CIP Code

10. FQRSC (Research) Indicator (for GPS):  Yes  No
Hi Jackie,

thanks for sending the program revisions for Quantitative Biology. There are no objections from Physics, we approve the changes.

best wishes,

Andrew

---------- Forwarded message ----------
From: Jackie Vogel <jackie.vogel@mcgill.ca>
Date: Thu, Nov 24, 2016 at 9:00 PM
Subject: consultation request for revised QB majors and honours
To: paul francois <paulf@physics.mcgill.ca>, Dr. Anthony Mittermaier <anthony.mittermaier@mcgill.ca>, Tamara Western <tamara.western@mcgill.ca>, Michael Hendricks, Dr. <michael.hendricks@mcgill.ca>, Melania Cristescu <melania.cristescu@mcgill.ca>

hello Paul and Tony,

as we are adding the new stat mech course to the required courses for the QB physical biology stream, I am asking for a consultation from Physics and Chemistry for approval and/or comments/objections for both programs. Paul, could you pass this to the correct person?

The existing and revised programs are provided in the attached forms. I believe an email response to this request is sufficient.

thanks

Jackie

<BIOL_QuantBiol_Maj program_revision 24nov2016_TW.doc> <BIOL_QuantBiol_Hon program_revision 24nov2016_TW.doc>
Hi Jackie,

I approve the new versions of the quantitative biology option.

Best,
Axel

---

From: Jacalyn Vogel, Prof. <jackie.vogel@mcgill.ca>
Sent: November 24, 2016 8:42:42 PM
To: hundemer@math.mcgill.ca; kelome@math.mcgill.ca
Cc: Tamara Western, Prof.; Michael Hendricks, Dr.; Melania Cristescu
Subject: consultation request for revised QB majors and honours

hello Axel and Armel

we are adding MATH 324 to the required courses for the QB physical biology stream and adding MATH 235 and MATH 240 as complementary courses as these are new pre/co reqs for COMP 251. I am therefore asking for a consultation from Math for approval and/or comments/objections for both programs.

The existing and revised programs are provided in the attached forms. I believe an email response to this request is sufficient.

thanks

Jackie
Hi Jackie, Tamara,

Sorry for the delay. The Chemistry Department has no problem with these programs.

Thanks!

Tony

-----Original Message-----
From: Jacalyn Vogel, Prof.
Sent: Thursday, November 24, 2016 2:15 PM
To: paul francois <paulf@physics.mcgill.ca>; Anthony Mittermaier, Dr. <anthony.mittermaier@mcgill.ca>
Cc: Tamara Western, Prof. <tamara.western@mcgill.ca>; Michael Hendricks, Dr. <michael.hendricks@mcgill.ca>; Melania Cristescu <melania.cristescu@mcgill.ca>
Subject: consultation request for revised QB majors and honours

hello Paul and Tony,

as we are adding the new stat mech course to the required courses for the QB physical biology stream, I am asking for a consultation from Physics and Chemistry for approval and/or comments/objections for both programs. Paul, could you pass this to the correct person?

The existing and revised programs are provided in the attached forms. I believe an email response to this request is sufficient.

thanks

Jackie
1.0 Degree Title
Specify the two degrees for concurrent degree programs
B.Sc.

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

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

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

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

1.5 Complete Program Title
B.Sc.: Honours in Biology, Quantitative Biology Option

2.0 Administering Faculty/Unit
Science

Offering Faculty/Department
Science/Biology

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: 201709

4.0 Existing Credit Weight
Proposed Credit Weight
79
79

5.0 Rationale for revised program
This revision combines three types of changes:
1. Harmonization of the program organization with the new Bio-physical umbrella in order to better highlight the relationships and commonalities among multidisciplinary life-science programs.
   a. BIOL 200 and 201 are replaced with the more interdisciplinary BIOL 219.
   b. BIOL 301 has been made a required course for both streams
   c. PHYS 333 is replaced with the more interdisciplinary PHYS 329.
2. MATH 324 has been moved to the required list
3. As the prerequisites have been changed for the complementary course, COMP 251, its prerequisites MATH 235 and MATH 240 have been added to the complementary courses.

6.0 Revised Program Description (Maximum 150 words)
(no change)
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)

### B.Sc.; Honours in Biology, Quantitative Biology Option

#### Required Courses (45 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (14 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 200 Molecular Biology</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 201 Cell Biology and Metabolism</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 202 Basic Genetics</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 215 Introduction to Ecology and Evolution</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 395 Quantitative Biology Seminar 1</td>
<td>(1 credit)</td>
<td></td>
</tr>
<tr>
<td>BIOL 495 Quantitative Biology Seminar 2</td>
<td>(1 credit)</td>
<td></td>
</tr>
</tbody>
</table>

**Research Component (6 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 468 Independent Research Project 3</td>
<td>(6 credits)</td>
<td></td>
</tr>
</tbody>
</table>

#### Chemistry (4 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 212 Introductory Organic Chemistry 1</td>
<td>(4 credits)</td>
<td></td>
</tr>
</tbody>
</table>

* Students who have taken the equivalent of CHEM 212 can make up the credits with a complementary 3 or 4 credit course in consultation with a stream adviser.

#### Computer Science (3 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 202 Foundations of Programming</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>COMP 250 Introduction to Computer Science</td>
<td>(3 credits)</td>
<td></td>
</tr>
</tbody>
</table>

#### Math and Physics Core Courses (15-18 credits)

6 credits of either MATH or PHYS courses to be taken at the honours level. Honours equivalents of core Math and Physics courses are listed below. All 500-level Math courses are considered as honours courses and can be applied to the 6 credit requirement.

#### Math

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 222 Calculus 3</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 223 Linear Algebra</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 247 Honours Applied Linear Algebra</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 315 Ordinary Differential Equations</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 323 Probability</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 325 Honours Ordinary Differential Equations</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 356 Honours Probability</td>
<td>(3 credits)</td>
<td></td>
</tr>
</tbody>
</table>

* For students who have NOT taken MATH 150 and MATH 151

** Students take MATH 223 or MATH 247

+ Students take MATH 315 or MATH 325

++ Students take MATH 323 or MATH 356

---

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

### B.Sc.; Honours in Biology, Quantitative Biology Option

#### Required Courses (49 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-Physical Sciences Core (31 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 219 Physical Biology of the Cell</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 301 Cell and Molecular Laboratory</td>
<td>(4 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 395 Quantitative Biology Seminar (1 credit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 212 Introductory Organic Chemistry 1</td>
<td>(4 credits)</td>
<td></td>
</tr>
<tr>
<td>COMP 202 Foundations of Programming</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 222 Calculus 3</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 223 Linear Algebra</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 247 Honours Applied Linear Algebra</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 315 Ordinary Differential Equations</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 323 Honours Ordinary Differential Equations</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 324 Statistics</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH 357 Honours Statistics</td>
<td>(3 credits)</td>
<td></td>
</tr>
</tbody>
</table>

* Students who have taken the equivalent of CHEM 212 or MATH 222 can make up the credits with complementary 3 or 4 credit courses in consultation with a stream adviser.

** Students who have sufficient knowledge of programming should take COMP 250 Introduction to Computer Science rather than COMP 202

*** Students take MATH 223 or MATH 247

+ Students take MATH 315 or MATH 325

++ Students take MATH 323 or MATH 356

+++ Students take MATH 324 or MATH 357

**Note:** 6 credits of either MATH or PHYS courses to be taken at the honours level. Honours equivalents of core Math and Physics courses are listed below. All 500-level Math courses are considered as honours courses and can be applied to the 6 credit requirement.

#### Biology (6 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 202 Basic Genetics</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 215 Introduction to Ecology and Evolution</td>
<td>(3 credits)</td>
<td></td>
</tr>
</tbody>
</table>

**Research Component (6 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 468 Independent Research Project 3</td>
<td>(6 credits)</td>
<td></td>
</tr>
</tbody>
</table>

#### Physics (6 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 230 Dynamics of Simple Systems</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>PHYS 232 Heat and Waves</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>PHYS 251 Honours Classical Mechanics 1</td>
<td>(3 credits)</td>
<td></td>
</tr>
<tr>
<td>PHYS 253 Thermal Physics</td>
<td>(3 credits)</td>
<td></td>
</tr>
</tbody>
</table>

* Students take PHYS 230 or PHYS 251

** Students take PHYS 232 or PHYS 253

---

Attach extra page(s) as needed
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)

**Physics**
6 credits from:
- PHYS 230 Dynamics of Simple Systems (3 credits) *
- PHYS 232 Heat and Waves (3 credits) **
- PHYS 251 Honours Classical Mechanics 1 (3 credits) *
- PHYS 253 Thermal Physics (3 credits) **
* Students take PHYS 230 or PHYS 251
** Students take PHYS 232 or PHYS 253

**Complementary Courses (30-31 credits)**
Course Requirements for Quantitative Biology Streams:
24 or 25 credits from one of the following two streams:

**Stream 1: Theoretical Ecology and Evolutionary Biology (24 credits)**

**Biology**
12 credits from the following:
- BIOL 205 Biology of Organisms (3 credits)
- BIOL 206 Methods in Biology of Organisms (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 308 Ecological Dynamics (3 credits)

**Field Courses**
3 credits from the following list or any other field course with permission:
- BIOL 240 Monteregian Flora (3 credits)
- BIOL 331 Ecology/Behaviour Field Course (3 credits)
- BIOL 334 Applied Tropical Ecology (3 credits)
- BIOL 432 Limnology (3 credits)

9 credits chosen from the following list, of which 6 credits must be at the 400 level or above:
* Students choose either both BIOL 596 and BIOL 597, or BIOL 598.

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

**Course Requirements for Quantitative Biology Streams (21 credits from one of the following two streams):**

**Stream 1: Theoretical Ecology and Evolutionary Biology (21 credits)**

**Biology**
12 credits from the following list:
- BIOL 205 Biology of Organisms (3 credits)
- BIOL 206 Methods in Biology of Organisms (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 308 Ecological Dynamics (3 credits)

**Field Courses**
3 credits from the following list or any other field course with permission:
- BIOL 240 Monteregian Flora (3 credits)
- BIOL 331 Ecology/Behaviour Field Course (3 credits)
- BIOL 334 Applied Tropical Ecology (3 credits)
- BIOL 432 Limnology (3 credits)

6 credits chosen from the following list of courses at the 400 level or above:

- BIOL 432 Limnology (3 credits)
- BIOL 434 Theoretical Ecology (3 credits)
- BIOL 435 Natural Selection (3 credits)
- BIOL 465 Conservation Biology (3 credits)
- BIOL 509 Methods in Molecular Ecology (3 credits)
- BIOL 510 Advances in Community Ecology (3 credits)
- BIOL 515 Advances in Aquatic Ecology (3 credits)
- BIOL 540 Ecology of Species Invasions (3 credits)
- BIOL 594 Advanced Evolutionary Ecology (3 credits)
- BIOL 596 Advanced Experimental Design (1 credit) *
- BIOL 597 Advanced Biostatistics (2 credits) *
- BIOL 598 Advanced Design and Statistics (3 credits) *

**Stream 2: Physical Biology (21 credits)**

- BIOL 319 Introduction to Biophysics (3 credits)
- PHYS 319 Introduction to Biophysics (3 credits)
- **PHYS 329 Statistical Physics with Biophysical Application (3 credits)**
- PHYS 446 Majors Quantum Physics (3 credits)
* Students choose either BIOL 319 or PHYS 319
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)

<table>
<thead>
<tr>
<th>Stream 2: Physical Biology (25 credits)</th>
<th>13 credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 301 Cell and Molecular Laboratory (4 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOL 319 Introduction to Biophysics (3 credits) *</td>
<td></td>
</tr>
<tr>
<td>PHYS 319 Introduction to Biophysics (3 credits) *</td>
<td></td>
</tr>
<tr>
<td>PHYS 333 Thermodynamic and Statistical Physics (3 credits) **</td>
<td></td>
</tr>
<tr>
<td>PHYS 362 Statistical Mechanics (3 credits) **</td>
<td></td>
</tr>
<tr>
<td>PHYS 446 Majors Quantum Physics (3 credits)</td>
<td></td>
</tr>
</tbody>
</table>
* Students choose either BIOL 319 or PHYS 319
** Students choose either PHYS 333 or PHYS 362

300-level complementary courses: 6 credits from the following:
- BIOL 300 Molecular Biology of the Gene (3 credits)
- BIOL 303 Developmental Biology (3 credits)
- BIOL 306 Neural Basis of Behaviour (3 credits)
- BIOL 309 Mathematical Models in Biology (3 credits)
- BIOL 313 Eukaryotic Cell Biology (3 credits)

500-level complementary courses: 6 credits from the following:
- BIOL 518 Advanced Topics in Cell 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 551 Principles of Cellular Control (3 credits)
- BIOL 588 Advances in Molecular/Cellular Neurobiology (3 credits)

Recommended Courses (9 credits)

300-level complementary courses: 6 credits from the following:
- BIOL 300 Molecular Biology of the Gene (3 credits)
- BIOL 303 Developmental Biology (3 credits)
- BIOL 306 Neural Basis of Behaviour (3 credits)
- BIOL 309 Mathematical Models in Biology (3 credits)
- BIOL 313 Eukaryotic Cell Biology (3 credits)

500-level complementary courses: 6 credits from the following:
- BIOL 518 Advanced Topics in Cell 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 551 Principles of Cellular Control (3 credits)
- BIOL 588 Advances in Molecular/Cellular Neurobiology (3 credits)

Recommended Courses (9 credits)

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

<table>
<thead>
<tr>
<th>300-level complementary courses: 6 credits from the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 300 Molecular Biology of the Gene (3 credits)</td>
</tr>
<tr>
<td>BIOL 303 Developmental Biology (3 credits)</td>
</tr>
<tr>
<td>BIOL 306 Neural Basis of Behaviour (3 credits)</td>
</tr>
<tr>
<td>BIOL 309 Mathematical Models in Biology (3 credits)</td>
</tr>
<tr>
<td>BIOL 313 Eukaryotic Cell Biology (3 credits)</td>
</tr>
</tbody>
</table>

500-level complementary courses: 6 credits from the following:
- BIOL 518 Advanced Topics in Cell 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 551 Principles of Cellular Control (3 credits)
- BIOL 588 Advances in Molecular/Cellular Neurobiology (3 credits)

Recommended Courses (9 credits)

Recommendations for either Theoretical Ecology and Evolutionary Biology or Physical Biology streams

- 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 350 Numerical Computing (3 credits) *
- COMP 364 Computer Tools for Life Sciences (3 credits)
- MATH 314 Advanced Calculus (3 credits)
- MATH 317 Numerical Analysis (3 credits) *
- MATH 319 Introduction to Partial Differential Equations (3 credits)
- MATH 326 Nonlinear Dynamics and Chaos (3 credits)
- MATH 327 Matrix Numerical Analysis (3 credits)
- MATH 328 Discrete Structures 1 (3 credits) **
- MATH 348 Topics in Geometry (3 credits)
- MATH 437 Mathematical Methods in Biology (3 credits)
- MATH 447 Introduction to Stochastic Processes (3 credits) *
- Students may take COMP 350 OR MATH 317.

** MATH 235 or MATH 240 are required for COMP 251

Recommendations for Physical Biology stream

- BIEN 310 Introduction to Biomolecular Engineering (3 credits)
- BIEN 320 Molecular, Cellular and Tissue Biomechanics (3 credits)
- BIEN 340 Transport Processes in Biological Systems (3 credits)
- BIEN 510 Nanoparticles in the Medical Sciences (3 credits)
- BIEN 530 Imaging and Bioanalytical Instrumentation (3 credits)
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)

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

**Recommendations for Physical Biology stream**

BIEN 310 Introduction to Biomolecular Engineering (3 credits)
BIEN 320 Molecular, Cellular and Tissue Biomechanics (3 credits)
BIEN 340 Transport Processes in Biological Systems (3 credits)
BIEN 510 Nanoparticles in the Medical Sciences (3 credits)
BIEN 530 Imaging and Bioanalytical Instrumentation (3 credits)
CHEM 222 Introductory Organic Chemistry 2 (4 credits)
PHYS 242 Electricity and Magnetism (2 credits) *
PHYS 257 Experimental Methods 1 (3 credits)
PHYS 342 Majors Electromagnetic Waves (3 credits)
PHYS 413 Physical Basis of Physiology (3 credits)
PHYS 434 Optics (3 credits)
PHYS 446 Majors Quantum Physics (3 credits)
PHYS 519 Advanced Biophysics (3 credits)
PHYS 534 Nanoscience and Nanotechnology (3 credits)
* PHYS 242 is required for PHYS 342 and PHYS 434.

**Recommendations for Theoretical Ecology and Evolutionary Biology stream**

MATH 204 Principles of Statistics 2 (3 credits)
MATH 242 Analysis 1 (3 credits)
MATH 324 Statistics (3 credits)
MATH 340 Discrete Structures 2 (3 credits)
MATH 423 Regression and Analysis of Variance (3 credits)
MATH 524 Nonparametric Statistics (4 credits)
MATH 525 Sampling Theory and Applications (4 credits)
PHYS 333 Thermal and Statistical Physics (3 credits) **
* PHYS 333 is now required for the Physical Biology stream

MATH 242 Analysis 1 (3 credits)
MATH 324 Statistics (3 credits)
MATH 340 Discrete Structures 2 (3 credits)
MATH 423 Regression and Analysis of Variance (3 credits)
MATH 524 Nonparametric Statistics (4 credits)
MATH 525 Sampling Theory and Applications (4 credits)
PHYS 329 Statistical Physics with Biophysical Application (3 credits) **
* PHYS 333 is now required for the Physical Biology stream

* PHYS 242 is required for PHYS 342 and PHYS 434.
10. FQRSC (Research) Indicator (for GPS): Yes  No
Hi Jackie,

thanks for sending the program revisions for Quantitative Biology. There are no objections from Physics, we approve the changes.

best wishes,
Andrew

---------- Forwarded message ----------
From: Jackie Vogel <jackie.vogel@mcgill.ca>
Date: Thu, Nov 24, 2016 at 9:00 PM
Subject: consultation request for revised QB majors and honours
To: paul francosis <paulf@physics.mcgill.ca>, Dr. Anthony Mittermaier <anthony.mittermaier@mcgill.ca>, Tamara Western <tamara.western@mcgill.ca>, Michael Hendricks, Dr. <michael.hendricks@mcgill.ca>, Melania Cristescu <melania.cristescu@mcgill.ca>

hello Paul and Tony,

as we are adding the new stat mech course to the required courses for the QB physical biology stream, I am asking for a consultation from Physics and Chemistry for approval and/or comments/objections for both programs. Paul, could you pass this to the correct person?

The existing and revised programs are provided in the attached forms. I believe an email response to this request is sufficient.

thanks
Jackie

<BIOL_QuantBiol_Maj program_revision 24nov2016_TW.doc> <BIOL_QuantBiol_Hon program_revision 24nov2016_TW.doc>
Hi Jackie,

I approve the new versions of the quantitative biology option.

Best,
Axel
Hi Jackie, Tamara,

Sorry for the delay. The Chemistry Department has no problem with these programs.

Thanks!

Tony

-----Original Message-----
From: Jacalyn Vogel, Prof.
Sent: Thursday, November 24, 2016 2:15 PM
To: paul francois <paulf@physics.mcgill.ca>; Anthony Mittermaier, Dr. <anthony.mittermaier@mcgill.ca>
Cc: Tamara Western, Prof. <tamara.western@mcgill.ca>; Michael Hendricks, Dr. <michael.hendricks@mcgill.ca>; Melania Cristescu <melania.cristescu@mcgill.ca>
Subject: consultation request for revised QB majors and honours

hello Paul and Tony,

as we are adding the new stat mech course to the required courses for the QB physical biology stream, I am asking for a consultation from Physics and Chemistry for approval and/or comments/objections for both programs. Paul, could you pass this to the correct person?

The existing and revised programs are provided in the attached forms. I believe an email response to this request is sufficient.

thanks

Jackie
This revision combines two types of changes:

1. Harmonization of the program organization with the new Bio-physical umbrella in order to better highlight the relationships and commonalities among multidisciplinary life-sciences programs.
   a. BIOL 200 and 201 are replaced with the more interdisciplinary BIOL 219.
   b. Addition of the interdisciplinary BIOL 395 seminar course (Quant. Biology Seminar).
   c. BIOL 301 has been changed to a required course (was complementary).

2. Program title is corrected to read Joint Major in Biology and Mathematics as that is more appropriate.
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)

B.Sc.; Major in Biology and Mathematics (76 credits)

Required Courses (34 credits)

BIOL 200 Molecular Biology (3 credits)
BIOL 201 Cell Biology and Metabolism (3 credits)
BIOL 215 Introduction to Ecology and Evolution (3 credits)
CHEM 212 Introductory Organic Chemistry 1 (4 credits)
COMP 202 Foundations of Programming (3 credits)
MATH 222 Calculus 3 (3 credits)
MATH 223 Linear Algebra (3 credits)
MATH 243 Analysis 1 (3 credits)
MATH 247Honours Applied Linear Algebra (3 credits)
MATH 315 Ordinary Differential Equations (3 credits)
MATH 323 Probability (3 credits)

* If a student has already taken CHEM 212 or its equivalent, the credits can be made up with a complementary course in consultation with the Program Adviser.
** Students who have sufficient knowledge in a programming language should take COMP 250 (3 credits) "Introduction to Computer Science" rather than COMP 202.
*** Students may take either MATH 223 or MATH 247.

Complementary Courses (42 credits)

For the 42 credits, students complete 24 credits of BIOL, NEUR, PHGY, PSYC courses including one of three streams (Ecology and Evolutionary Ecology, Molecular Evolution, Neurosciences) and 18 credits of MATH courses.

Math or Biology Research Course
Note: Students selecting a BIOL course count this toward their 24 credits of BIOL, NEUR, PHGY, PSYC courses while students selecting a MATH course count this toward their 18 credits of MATH courses.

3 credits from the following Math or Biology research courses:
BIOL 466 Independent Research Project 1 (3 credits)
BIOL 467 Independent Research Project 2 (3 credits)
MATH 410 Majors Project (3 credits)

Of the remaining complementary courses, at least 6 credits must be at the 400 level or above.

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

B.Sc.; Joint Major in Biology and Mathematics (76 credits)

Required Courses (37 credits)

Bio-Physical Sciences Core (28 credits)

BIOL 219 - Physical Biology of the Cell (4 credits)
BIOL 301 Cell & Molecular Biology Laboratory (4 credits)
BIOL 395 Quantitative Biology Seminar 1 (1 credit)
CHEM 212 Introductory Organic Chemistry 1 (4 credits)
COMP 202 Foundations of Programming (3 credits)
MATH 222 Calculus 3 (3 credits)
MATH 223 Linear Algebra 3 (3 credits)
MATH 247 Honours Applied Linear Algebra (3 credits)
MATH 315 Ordinary Differential Equations (3 credits)
MATH 323 Probability (3 credits)

* If a student has already taken CHEM 212 or its equivalent, or MATH 222 or its equivalent, the credits can be made up with complementary courses in consultation with the Program Adviser.
** Students who have sufficient knowledge in a programming language should take COMP 250 "Introduction to Computer Science" rather than COMP 202.
*** Students may take either MATH 223 or MATH 247.

Biology and Mathematics Core (9 credits)

BIOL 215 Introduction to Ecology and Evolution (3 credits)
MATH 242 Analysis 1 (3 credits)
MATH 243 Analysis 2 (3 credits)

Complementary Courses (39 credits)

For the 39 credits, students complete 21 credits of BIOL, NEUR, PHGY, PSYC courses including one of three streams (Ecology and Evolutionary Ecology, Molecular Evolution, Neurosciences) and 18 credits of MATH courses.

Math or Biology Research Course
Note: Students selecting a BIOL course count this toward their 21 credits of BIOL, NEUR, PHGY, PSYC courses while students selecting a MATH course count this toward their 18 credits of MATH courses.

3.6 credits from the following Math or Biology research courses:
BIOL 466 Independent Research Project 1 (3 credits)
BIOL 467 Independent Research Project 2 (3 credits)
BIOL 468 Independent Research Project 3 (6 credits)
MATH 410 Majors Project (3 credits)
### Math Courses

15 credits (if MATH 410 was selected as a research course) or 18 credits of MATH courses chosen from Sequence 1 or 2 and from "Remaining Math Courses" as follows:

**Sequence 1: Theory**
- 12 credits from the following courses:
  - * Students may take either MATH 317 or MATH 327.
  - MATH 314 Advanced Calculus (3 credits)
  - MATH 317 Numerical Analysis (3 credits)*
  - MATH 319 Introduction to Partial Differential Equations (3 credits)
  - MATH 326 Nonlinear Dynamics and Chaos (3 credits)
  - MATH 327 Matrix Numerical Analysis (3 credits)*

**Sequence 2: Statistics**
- 9 credits from the following:
  - MATH 324 Statistics (3 credits)
  - MATH 423 Regression and Analysis of Variance (3 credits)
  - MATH 447 Introduction to Stochastic Processes (3 credits)

**Remaining Math Courses**
- Remaining 3-9 credits of MATH courses may be chosen from any of the two preceding sequences and/or from the following list:
  - MATH 204 Principles of Statistics 2 (3 credits)
  - MATH 340 Discrete Structures 2 (3 credits)
  - MATH 437 Mathematical Methods in Biology (3 credits)
  - MATH 523 Generalized Linear Models (4 credits)
  - MATH 524 Nonparametric Statistics (4 credits)
  - MATH 525 Sampling Theory and Applications (4 credits)
  - BIOL, NEUR, PHGY, PHYS, PSYC Courses
    - 21 credits (if BIOL course was selected as a research course) or 24 credits of BIOL, NEUR, PHGY, PHYS, PSYC courses including one of three streams.

*Note: Some courses in the streams may have prerequisites.*

### Ecology and Evolutionary Ecology Stream

At least 15 credits selected as follows:

- 3 credits of:
  - BIOL 206 Methods in Biology of Organisms (3 credits)

- 3 credits from the following field courses or any other field course with permission:
  - BIOL 240 Montrean Flora (3 credits)
  - BIOL 331 Ecology/Behaviour Field Course (3 credits)
  - BIOL 334D1 Applied Tropical Ecology (1.5 credits)

---

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

**Of the remaining complementary courses, at least 6 credits must be at the 400 level or above.**

**Math Courses**

15 credits (if MATH 410 was selected as a research course) or 18 credits of MATH courses chosen from Stream 1 or 2 and from "Remaining Math Courses" as follows:

**Stream 1: Theory**
- 12 credits from the following courses:
  - * Students may take either MATH 317 or MATH 327.
  - MATH 314 Advanced Calculus (3 credits)
  - MATH 317 Numerical Analysis (3 credits)*
  - MATH 319 Introduction to Partial Differential Equations (3 credits)
  - MATH 326 Nonlinear Dynamics and Chaos (3 credits)
  - MATH 327 Matrix Numerical Analysis (3 credits)*

**Stream 2: Statistics**
- 9 credits from the following:
  - MATH 324 Statistics (3 credits)
  - MATH 423 Regression and Analysis of Variance (3 credits)
  - MATH 447 Introduction to Stochastic Processes (3 credits)

**Remaining Math Courses**
- Remaining 3-9 credits of MATH courses may be chosen from any of the two preceding sequences and/or from the following list:
  - MATH 204 Principles of Statistics 2 (3 credits)
  - MATH 340 Discrete Structures 2 (3 credits)
  - MATH 437 Mathematical Methods in Biology (3 credits)
  - MATH 523 Generalized Linear Models (4 credits)
  - MATH 524 Nonparametric Statistics (4 credits)
  - MATH 525 Sampling Theory and Applications (4 credits)
  - BIOL, NEUR, PHGY, PHYS, PSYC Courses

**BIOL, NEUR, PHGY, PHYS, PSYC Courses**
- 18 credits if one 3 credit BIOL course was selected as a research course; 15 credits if took 6 credits of BIOL research) or 21 credits of BIOL, NEUR, PHGY, PHYS, PSYC courses including one of three streams.

*Note: Some courses in the streams may have prerequisites.*

**Ecology and Evolutionary Ecology Stream**

At least 15 credits selected as follows:

- BIOL 206 Methods in Biology of Organisms (3 credits)

- 3 credits from the following field courses or any other field course with permission:
  - BIOL 240 Montrean Flora (3 credits)
  - BIOL 331 Ecology/Behaviour Field Course (3 credits)
  - BIOL 334D1 Applied Tropical Ecology (1.5 credits)
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)

- BIOL 334D2 Applied Tropical Ecology (1.5 credits)
- BIOL 432 Limnology (3 credits)
- BIOL 573 Vertebrate Palaeontology Field Course (3 credits)

At least 9 credits chosen from the following list, of which 6 credits must be at the 400 level or above:

- BIOL 202 Basic Genetics (3 credits)
- BIOL 205 Biology of Organisms (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 305 Animal Diversity (3 credits)
- BIOL 308 Ecological Dynamics (3 credits)
- BIOL 310 Biodiversity and Ecosystems (3 credits)
- BIOL 324 Ecological Genetics (3 credits)
- BIOL 334D2 Applied Tropical Ecology (1.5 credits)
- BIOL 466 Independent Research Project 1 (3 credits)
- BIOL 467 Independent Research Project 2 (3 credits)
- BIOL 468 Independent Research Project 3 (6 credits)
- BIOL 509 Methods in Molecular Ecology (3 credits)
- BIOL 592 Integrated Bioinformatics (3 credits)
- BIOL 594 Advanced Evolutionary Ecology (3 credits)

Molecular Evolution Stream
At least 16 credits selected as follows:

- 7 credits from:
  - BIOL 202 Basic Genetics (3 credits)
  - BIOL 301 Cell and Molecular Laboratory (4 credits)

  At least 9 credits from the following list, of which 6 credits must be at the 400 level or above.

- BIOL 303 Developmental Biology (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 313 Eukaryotic Cell Biology (3 credits)
- BIOL 466 Independent Research Project 1 (3 credits)
- BIOL 467 Independent Research Project 2 (3 credits)
- BIOL 468 Independent Research Project 3 (6 credits)
- BIOL 518 Advanced Topics in Cell Biology (3 credits)
- BIOL 569 Developmental Evolution (3 credits)
- BIOL 592 Integrated Bioinformatics (3 credits)

Neurosciences Stream
At least 15 credits selected as follows:

- 3 credits from:
  - BIOL 306 Neural Basis of Behaviour (3 credits)

  At least 12 credits selected from:

  - BIOL 320 Evolution of Brain and Behaviour (3 credits)
  - BIOL 389 Laboratory in Neurobiology (3 credits)
  - BIOL 466 Independent Research Project 1 (3 credits)
  - BIOL 467 Independent Research Project 2 (3 credits)
  - BIOL 468 Independent Research Project 3 (6 credits)
  - BIOL 530 Advances in Neuroethology (3 credits)
  - BIOL 580 Genetic Approaches to Neural Systems (3 credits)

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

- BIOL 334D2 Applied Tropical Ecology (1.5 credits)
- BIOL 432 Limnology (3 credits)
- BIOL 573 Vertebrate Palaeontology Field Course (3 credits)

At least 9 credits chosen from the following list:

- BIOL 202 Basic Genetics (3 credits)
- BIOL 205 Biology of Organisms (3 credits)
- BIOL 304 Evolution (3 credits)
- BIOL 305 Animal Diversity (3 credits)
- BIOL 308 Ecological Dynamics (3 credits)
- BIOL 310 Biodiversity and Ecosystems (3 credits)
- BIOL 324 Ecological Genetics (3 credits)
- BIOL 434 Theoretical Ecology (3 credits)
- BIOL 466 Independent Research Project 1 (3 credits)
- BIOL 467 Independent Research Project 2 (3 credits)
- BIOL 468 Independent Research Project 3 (6 credits)
- BIOL 509 Methods in Molecular Ecology (3 credits)
- BIOL 573 Vertebrate Palaeontology Field Course (3 credits)
- BIOL 592 Integrated Bioinformatics (3 credits)

Molecular Evolution Stream
At least 15 credits selected as follows:

- BIOL 202 Basic Genetics (3 credits)

  At least 12 credits selected from the following list:

  - BIOL 303 Developmental Biology (3 credits)
  - BIOL 304 Evolution (3 credits)
  - BIOL 313 Eukaryotic Cell Biology (3 credits)
  - BIOL 466 Independent Research Project 1 (3 credits)
  - BIOL 467 Independent Research Project 2 (3 credits)
  - BIOL 468 Independent Research Project 3 (6 credits)
  - BIOL 518 Advanced Topics in Cell Biology (3 credits)
  - BIOL 569 Developmental Evolution (3 credits)
  - BIOL 592 Integrated Bioinformatics (3 credits)

Neurosciences Stream
At least 15 credits selected as follows:

- BIOL 306 Neural Basis of Behaviour (3 credits)

  At least 12 credits selected from:

  - BIOL 320 Evolution of Brain and Behaviour (3 credits)
  - BIOL 389 Laboratory in Neurobiology (3 credits)
  - BIOL 530 Advances in Neuroethology (3 credits)
  - BIOL 580 Genetic Approaches to Neural Systems (3 credits)
### 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)

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<tr>
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<th>Course Title</th>
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</tr>
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<tbody>
<tr>
<td>NEUR 310</td>
<td>Cellular Neurobiology</td>
<td>3 credits</td>
</tr>
<tr>
<td>NEUR 507</td>
<td>Topics in Radionuclide Imaging</td>
<td>3 credits</td>
</tr>
<tr>
<td>NEUR 570</td>
<td>Human Brain Imaging</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHGY 314</td>
<td>Integrative Neuroscience</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHGY 425</td>
<td>Analyzing Physiological Systems</td>
<td>3 credits</td>
</tr>
<tr>
<td>PHGY 552</td>
<td>Cellular and Molecular Physiology</td>
<td>3 credits</td>
</tr>
<tr>
<td>PSYC 427</td>
<td>Sensorimotor Behaviour</td>
<td>3 credits</td>
</tr>
<tr>
<td>PSYT 455</td>
<td>Neurochemistry</td>
<td>3 credits</td>
</tr>
<tr>
<td>PSYT 502</td>
<td>Brain Evolution and Psychiatry</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

**Remaining BIOL, NEUR, PHGY, PSYC**

For the remaining BIOL, NEUR, PHGY, PSYC complementary course credits, if any, students top up their credits to the necessary **21-24 credits** with any course listed in the above three streams. Other relevant courses may be substituted with the approval of the Program Adviser.

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

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<td>Brain Evolution and Psychiatry</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

**Remaining BIOL, NEUR, PHGY, PSYC**

For the remaining BIOL, NEUR, PHGY, PSYC complementary course credits, if any, students top up their credits to the necessary **18-21 credits** with any course listed in the above three streams. Other relevant courses may be substituted with the approval of the Program Adviser.
10. FQRSC (Research) Indicator (for GPS): Yes  No
Hi Tamara,

I just learned that both programs were approved unanimously!

Axel

---

Hi Axel,

I hope this went well & that the approvals by Math of the revised Biology-Math & Physiology-Math programs are pending. This is the last thing we’re waiting for before finalizing and distributing the AC documents for Monday’s meeting so please let me know how it went.

Thanks, Tamara

---

Tamara L Western
Associate Dean (Academic)
Faculty of Science, McGill University

---

Hi Tamara,

our department meeting was canceled due to general meeting fatigue (we had the cyclical review visitors last week and plenty of visiting candidates for various open positions). However, the department will vote on the
new versions of our joint programs with Biology and Physiology by email with a deadline of Wednesday night. I can send you the results on Thursday morning. Sorry about the delay!

Axel
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. Integrative features of the program include interdisciplinary introductory and seminar courses in bio-physical sciences, and a joint independent studies project.

Students may complete this program with a maximum of 74 credits or a minimum of 63 credits. This depends upon the student’s choice of complementary courses (the need to take COMP 222; COMP 462 versus COMP 561) and whether or not the student is exempt from taking CHEM 212 and MATH 222.

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.

Old program description:

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. 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)

B.Sc.: Major in Computer Science and Biology (69-73 cr.)

Required Courses [48-52 credits]
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)

* 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 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 — (MATH 240 is in the list of Complementaries below)
**** Students take either COMP 462 or COMP 561.

Required Biology and/or Chemistry 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 I (4 credits)*

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

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

.../continued

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

B.Sc.: Joint Major in Computer Science and Biology [63-74 cr.]

Required Courses [36-46 credits]

Bio-Physical Sciences Core
BIOL 219 Physical Biology of the Cell (4 credits)
BIOL 301 Cell and Molecular Laboratory (4 credits)
BIOL 305 Quantitative Biology Seminar I (1 credit)
CHEM 212 Introductory Organic Chemistry I (4 credits)*
COMP 202 Foundations of Programming (3 credits) **
MATH 222 Calculus 3 (3 credits)*
MATH 223 Linear Algebra (3 credits)
MATH 323 Probability (3 credits)

Computer Science and Mathematics
COMP 206 Introduction to Software Systems (3 credits)
COMP 250 Introduction to Computer Science (3 credits)
COMP 251 Algorithms and Data Structures (3 credits)
MATH 240 Discrete Structures I (3 credits)

Biology
BIOL 202 Basic Genetics (3 credits)
BIOL 215 Introduction to Ecology and Evolution (3 credits)

Joint
COMP 401 Project in Biology and Computer Science (3 credits)

* 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.

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

Complementary Credits [27-28 credits]

3-4 credits from the following:
COMP 462 Computational Biology Methods (3 credits)
COMP 561 Computational Biology Methods and Research (4 credits)

3-6 credits from the following:
MATH 315 Ordinary Differential Equations (3 credits)
MATH 324 Statistics (3 credits)

The remaining 18-21 credits is to be chosen from the following, with at least 9 credits at the 400 level or above:

.../continued
<table>
<thead>
<tr>
<th>Computer Science Block</th>
<th>Biology Block</th>
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<td>All COMP courses at the 400 level or above (except COMP 400, 401, 499, 462, 561).</td>
<td>BIO 300 Molecular Biology of the Gene (3 credits)</td>
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<td>COMP 273 Introduction to Computer Systems (3 credits)</td>
<td>BIO 303 Developmental Biology (3 credits)</td>
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<tr>
<td>COMP 302 Programming Languages and Paradigms (3 credits)</td>
<td>BIO 304 Evolution (3 credits)</td>
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<td>COMP 303 Software Development (3 credits)</td>
<td>BIO 306 Neural Basis of Behavior (3 credits)</td>
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<td>BIO 309 Mathematical Models in Biology (3 credits)</td>
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<td>COMP 322 Introduction to C++ (1 credit)</td>
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<td>COMP 360 Algorithm Design Techniques (3 credits)</td>
<td>BIO 319 Introduction to Biophysics (3 credits)</td>
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<tr>
<td>COMP 361D1 Software Engineering Project (3 credits)</td>
<td>BIO 320 Evolution of Brain and Behavior (3 credits)</td>
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<tr>
<td>COMP 361D2 Software Engineering Project (3 credits)</td>
<td>BIO 370 Human Genetics Applied (3 credits)</td>
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<td>MATH 240 Discrete Structures 1 (2 credits)</td>
<td>BIO 389 Laboratory in Neurobiology (3 credits)</td>
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<td>BIOL 316 Biomembranes and Organelles (3 credits)</td>
<td>BIO 395 Quantitative Biology Seminar 1 (1 credit)</td>
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<td>BIOL 580 Genetics Approaches to Neural Systems (3 credits)</td>
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<td>BIOL 588 Advances in Molecular/Cellular Neurobiology (3 credits)</td>
<td><strong>Students must take both COMP 361D1 and COMP 361D2.</strong></td>
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10. FQRSC (Research) Indicator (for GPS): Yes  No

Rationale [continued]

2. MATH 240 Discrete Structures 1 has recently become a co-requisite for COMP 251 Algorithms and Data Structures. MATH 240 currently is the Complementary course list for this Joint Major CS/Bio program, but COMP 251 is in the Required list. The co-requisite change means that MATH 240 would effectively become a Required course. We are therefore moving MATH 240 from the Complementary list into the Required list.

3. BIOL 316 and BIOL 495 are removed from the complementary courses as both are likely to be discontinued in the near future.

Note: The apparent reduction in credit weight (69-73 to 63-74) mostly comes from better accounting of the possibility for students not to take MATH 222 and CHEM 212 and instead replace them with electives.

Program title is corrected to read Joint Major, as is more appropriate.
CONSULTATION REPORT FORM

PROGRAM REVISION (JOINT MAJOR CS/BIO and JOINT HONOURS CS/BIO) PROPOSAL

DATE: November 7, 2016

TO: Prof. Axel Hundemer, Dept. of Mathematics and Statistics
    Prof. Michael Hendricks, Dept. Biology
    Prof. Melania Cristescu, Dept. Biology

FROM: Prof. Mathieu Blanchette, School of Computer Science

Please see the attached a Program Revision proposal for the Joint Major in Computer Science and Biology, and the Joint Honours in Computer Science and Biology. There are several associated revisions which involve your departments, some of which we have discussed in the past.

Most of the proposed changes stem of the Faculty's efforts (led by AD Western) to harmonize the different Biology-based joint programs. All have been developed in collaboration with the working group she led.

Dept. of Mathematics and Statistics:

- MATH 240 is moved from a Complementary course to a Required course for the joint Major, as it is now a prerequisite for COMP 251. [This change was already approved by your department; it is simply being lumped with the other changes below. The Honours program already had that course as a required course.]

- Students are now given the choice between taking either MATH 324 Statistics or MATH 315 Ordinary Differential Equations. In the old program, MATH 324 was required and MATH 315 was not included.

Dept. of Biology

- BIOL 200 (3 credits) and BIOL 201 (3 credits) are now replaced by the newly created BIOL 219 Physical Biology of the Cell (4 credits).

- COMP 499 Bioinformatics seminar is now replaced by the existing BIOL 395 Quantitative Biology Seminar. This change was made in consultation and agreement with Prof. Vogel, who co-teaches BIOL 395.

- BIOL 495 and BIOL 316 are removed from the list of complementary course, as they are likely to be discontinued (as per Prof. Vogel’s suggestion).

Please let me know if you have any objections or comments.

[X] NO OBJECTIONS

COMMENTS:

Signature: Axel Hundemer
Date: Nov 21, 2016
This program is revised to better reflect the interdisciplinary nature of the field of bioinformatics.

### Program Description

This program will train students in the fundamentals of biology - with a focus on molecular biology - and will give them computational and mathematical skills needed to manage, analyze, and model large biological datasets. Two integrative features of the program are a three-credit joint independent studies course, and a one-credit seminar course. Compared to its non-Honours counterpart, the Honours program requires additional research credits and a larger number of advanced courses. Students must have and maintain a minimum CGPA of 3.5. Students may complete this program with a maximum of 77 credits or a minimum of 66 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. It is highly recommended that Freshman BIOL, CHEM, MATH, and PHYS courses be selected with an adviser to ensure they meet the core requirements of the COMP-BIO program.

**Old Program Description:**

This program will train students in the fundamentals of biology - with a focus on molecular biology - and will give them computational and mathematical skills needed to manage, analyze, and model large biological datasets. Two integrative features of the program are a three-credit joint independent studies course, and a one-credit seminar course. Compared to its non-Honours counterpart, the Honours program requires additional research credits and a larger number of advanced courses. Students must have and maintain a minimum CGPA of 3.5. Students may complete this program with a maximum of 79 credits or a minimum of 75 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. It is highly recommended that Freshman BIOL, CHEM, MATH, and PHYS courses be selected with an adviser to ensure they meet the core requirements of the COMP-BIO program.

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- Faculty Program (FP) |
- Honours (HON) |
- Joint Honours Component (HC) |
- Internship/Co-op |
- Thesis (T) |
- Non-Thesis (N) |
- Other |

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| Science |

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| Science/Comp. Sci. and Biol. |

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Please give reasons in 5.0 “Rationale” in the case of retirement |

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<th>Proposed Credit Weight</th>
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| 75-79 | 66-77 |

| 5.0 Rationale for revised program |

This revision combines two types of changes: |

1. Harmonization of the program organization with the new Bio-physical umbrella in order to better highlight the relationships and commonalities among multidisciplinary life-science programs. |
   a. BIOL 200 and 201 are replaced with the more interdisciplinary BIOL 219. |
   b. COMP 499 (Undergraduate Bioinformatics Seminar) is replaced by the similar, interdisciplinary BIOL 395 (Quantitative Biology Seminar 1). |
   c. We are now giving students the choice between MATH 324 (Statistics) that is currently in the program and MATH 315 (Ordinary differential equations) that is part of the common Bio-physical core. This affords students increased flexibility. |

.../continued on last page

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<tr>
<th>6.0 Revised Program Description (Maximum 150 words)</th>
</tr>
</thead>
</table>

This program is revised to better reflect the interdisciplinary nature of the field of bioinformatics.

**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. It is highly recommended that Freshman BIOL, CHEM, MATH, and PHYS courses be selected with an adviser to ensure they meet the core requirements of the COMP-BIO program.

Old program description: This program will train students in the fundamentals of biology - with a focus on molecular biology - and will give them computational and mathematical skills needed to manage, analyze, and model large biological datasets. Two integrative features of the program are a three-credit joint independent studies course, and a one-credit seminar course. Compared to its non-Honours counterpart, the Honours program requires additional research credits and a larger number of advanced courses. Students must have and maintain a minimum CGPA of 3.5. Students may complete this program with a maximum of 79 credits or a minimum of 75 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. It is highly recommended that Freshman BIOL, CHEM, MATH, and PHYS courses be selected with an adviser to ensure they meet the core requirements of the COMP-BIO program.
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)

B.Sc.; Honours in Computer Science and Biology (75-79 cr.)

Required Courses (54-58 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.

**Students who have sufficient knowledge in a programming language are not required to take COMP 202
*** Students take either COMP 462 or COMP 561.

Required Mathematics and Statistics Courses (4-5 credits from):
MATH 222 Calculus 3 (3 credits)*
MATH 223 Linear Algebra (3 credits)
MATH 240 Discrete Structures (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 252 Honours Algorithms and Data Structures (3 credits)***
COMP 462 Computational Biology Methods (3 credits)****
COMP 561 Computational Biology Methods and Research (4 credits)***

Required Biology and/or Chemistry 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 (7 credits from):
COMP 402D1 Honours Project in Computer Science and Biology (3 credits)
COMP 402D2 Honours Project in Computer Science and Biology (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
.../continued

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

B.Sc.; Joint Honours in Computer Science and Biology (66-77 cr.)

Required Courses (39-49 credits)

Bio-Physical Sciences Core
BIOL 219 Physical Biology of the Cell (4 credits)
BIOL 301 Cell and Molecular Laboratory (4 credits)
BIOL 305 Quantitative Biology Seminar 1 (4 credits)
COMP 202 Foundations of Programming (3 credits)**
CHEM 212 Introductory Organic Chemistry 1 (4 credits)*
MATH 222 Calculus 3 (3 credits)*
MATH 223 Linear Algebra (3 credits)
MATH 323 Probability (3 credits)

Computer Science and Mathematics
COMP 206 Introduction to Software Systems (3 credits)
COMP 250 Introduction to Computer Science (3 credits)
COMP 252 Honours Algorithms and Data Structures (3 credits)
MATH 240 Discrete Structures 1 (3 credits)

Biology
BIOL 202 Basic Genetics (3 credits)
BIOL 215 Introduction to Ecology and Evolution (3 credits)

Joint
COMP 402D1 Honours Project in Computer Science and Biology (3 credits)
COMP 402D2 Honours Project in Computer Science and Biology (3 credits)

* 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.

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

Complementary Credits (27-28 credits)

3-4 credits from the following:
COMP 462 Computational Biology Methods (3 credits)
COMP 561 Computational Biology Methods and Research (4 credits)

3-6 credits from the following:
MATH 315 Ordinary Differential Equations (3 credits)
MATH 324 Statistics (3 credits)

The remaining 18-21 credits is to be chosen from the following, with at least 9 credits at the 400 level or above:

.../continued
### Computer Science Block

Note: 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 (2 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 362 Honours Algorithm Design Techniques (3 credits)
- COMP 361D1 Software Engineering Project (3 credits)*
- COMP 361D2 Software Engineering Project (3 credits)*

* Students must take both COMP 361D1 and COMP 361D2.

### 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)
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- 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 (1 credit)
- 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 (1 credit)
- BIOL 509 Methods in Molecular Ecology (3 credits)
- BIOL 514 Neurobiology of Learning and Memory (3 credits)
- BIOL 518 Advanced Topics in Cell Biology (3 credits)
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- 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)

### Computer Science Block

9-12 credits from the following, with 3-6 credits at the 400 level or above:

- 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 (2 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 361D1 Software Engineering Project (3 credits)**
- COMP 361D2 Software Engineering Project (3 credits)**
- COMP 362 Honours Algorithm Design Techniques (3 credits)

** Students must take both COMP 361D1 and COMP 361D2.

### Biology Block

9-12 credits from the following, with 3-6 credits at the 400 level or above:

- BIOL 300 Molecular Biology of the Gene (3 credits)
- BIOL 303 Developmental Biology (3 credits)
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- 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)
### 8.0 Consultation with Related Units

- [ ] Yes
- [ ] No

Attach list of consultations

### 9. Approvals

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Submitted by

- Name
- Phone
- Email
- Submission Date

To be completed by ARR:

- CIP Code

### 10. FQRSC (Research) Indicator (for GPS): Yes  No

**Rationale [continued]**

2. BIOL 316 and BIOL 495 are removed from the complementary courses as both are likely to be discontinued in the near future.

Note: The apparent reduction in credit weight (69-73 to 66-77) mostly comes from better accounting of the possibility for students not to take MATH 222 and CHEM 212 and instead replace them with electives.

Program title is corrected to read Joint Honours, as is more appropriate.
CONSULTATION REPORT FORM

PROGRAM REVISION (JOINT MAJOR CS/BIO and JOINT HONOURS CS/BIO) PROPOSAL

DATE: November 7, 2016

TO: Prof. Axel Hundemer, Dept. of Mathematics and Statistics
    Prof. Michael Hendricks, Dept. Biology
    Prof. Melania Cristescu, Dept. Biology

FROM: Prof. Mathieu Blanchette, School of Computer Science

Please see the attached a Program Revision proposal for the Joint Major in Computer Science and Biology, and the Joint Honours in Computer Science and Biology. There are several associated revisions which involve your departments, some of which we have discussed in the past.

Most of the proposed changes stem of the Faculty’s efforts (led by AD Western) to harmonize the different Biology-based joint programs. All have been developed in collaboration with the working group she led.

Dept. of Mathematics and Statistics:

- MATH 240 is moved from a Complementary course to a Required course for the joint Major, as it is now a prerequisite for COMP 251. [This change was already approved by your department; it is simply being lumped with the other changes below. The Honours program already had that course as a required course.]

- Students are now given the choice between taking either MATH 324 Statistics or MATH 315 Ordinary Differential Equations. In the old program, MATH 324 was required and MATH 315 was not included.

Dept. of Biology

- BIOL 200 (3 credits) and BIOL 201 (3 credits) are now replaced by the newly created BIOL 219 Physical Biology of the Cell (4 credits).

- COMP 499 Bioinformatics seminar is now replaced by the existing BIOL 395 Quantitative Biology Seminar. This change was made in consultation and agreement with Prof. Vogel, who co-teaches BIOL 395.

- BIOL 495 and BIOL 316 are removed from the list of complementary course, as they are likely to be discontinued (as per Prof. Vogel’s suggestion).

Please let me know if you have any objections or comments.

X NO OBJECTIONS

COMMENTS:

Signature: Axel Hundemer
Date: Nov 21, 2016
1.0 Degree Title
Specify the two degrees for concurrent degree programs

B.Sc.

2.0 Administering Faculty/Unit

Science

1.1 Major (Legacy = Subject) (30-char. max.)

Physiology and Mathematics

2.0 Administering Faculty/Unit

Offering Faculty/Department

Medicine/Physiology

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)
- Major
- Joint Major
- Major Concentration (CON)
- Minor
- Minor Concentration (CON)

- Honours (HON)
- Joint Honours Component (HC)
- Internship/Co-op
- Thesis (T)
- Non-Thesis (N)
- Other

Please specify

1.5 Complete Program Title

B.Sc.; Joint Major in Physiology and Mathematics

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: 201709

4.0 Existing Credit Weight

77

Proposed Credit Weight

79

5.0 Rationale for revised program

This revision combines four types of changes:
1. Harmonization of the program organization with the new Bio-physical umbrella in order to better highlight the relationships and commonalities among multidisciplinary life-science programs.
   a. BIOL 200 and BIOL201/BIOC 212 are replaced with the more interdisciplinary BIOL 219.
   b. Addition of interdisciplinary seminar course BIOL 395.
   c. Addition of introductory programing courses as suggested as part of the Bio-Physical Sciences core.
2. Due to the significant neurophysiology content of both PHGY 311 and PHGY 314, students now are only required to take one of these two courses (moved to complementary list).
3. MATH 317 has been added as a new required course to give students greater background for upper level courses
4. Program title is corrected to read Joint Major, as is more appropriate.

6.0 Revised Program Description (Maximum 150 words)

(none)
### B.Sc.; Major in Physiology and Mathematics (77 credits)

**Required Courses (62 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>BIOL 200</td>
<td>Molecular Biology</td>
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<tr>
<td>BIOL 309</td>
<td>Mathematical Models in Biology</td>
<td>3</td>
</tr>
<tr>
<td>BMDE 519</td>
<td>Biomedical Signals and Systems</td>
<td>3</td>
</tr>
<tr>
<td>MATH 222</td>
<td>Calculus 3</td>
<td>3</td>
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<tr>
<td>MATH 242</td>
<td>Analysis 1</td>
<td>3</td>
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<tr>
<td>MATH 243</td>
<td>Analysis 2</td>
<td>3</td>
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<tr>
<td>MATH 319</td>
<td>Introduction to Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 323</td>
<td>Probability</td>
<td>3</td>
</tr>
<tr>
<td>MATH 324</td>
<td>Statistics</td>
<td>3</td>
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<tr>
<td>MATH 326</td>
<td>Nonlinear Dynamics and Chaos</td>
<td>3</td>
</tr>
<tr>
<td>MATH 437</td>
<td>Mathematical Methods in Biology</td>
<td>3</td>
</tr>
<tr>
<td>PHGY 209</td>
<td>Mammalian Physiology 1</td>
<td>3</td>
</tr>
<tr>
<td>PHGY 210</td>
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<td>PHGY 311</td>
<td>Channels, Synapses &amp; Hormones</td>
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<td>PHGY 312</td>
<td>Respiratory, Renal, &amp; Cardiovascular Physiology</td>
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<td>PHGY 313</td>
<td>Blood, Gastrointestinal, &amp; Immune Systems</td>
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</tr>
<tr>
<td>PHGY 461D1</td>
<td>Experimental Physiology</td>
<td>4.5</td>
</tr>
<tr>
<td>PHGY 461D2</td>
<td>Experimental Physiology</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**Complementary Courses (15 credits)**

- 3 credits, one of:
  - BIOL 212 Molecular Mechanisms of Cell Function (3 credits)
  - BIOL 201 Cell Biology and Metabolism (3 credits)
- 3 credits, one of:
  - MATH 223 Linear Algebra (3 credits)
  - MATH 247 Honours Applied Linear Algebra (3 credits)
- 3 credits, one of:
  - MATH 248 Honours Advanced Calculus (3 credits)
  - MATH 314 Advanced Calculus (3 credits)
- 3 credits, one of:
  - MATH 315 Ordinary Differential Equations (3 credits)
  - MATH 325 Honours Ordinary Differential Equations (3 credits)
- 3 credits, one of:
  - PHYS 413 Physical Basis of Physiology (3 credits)
  - PHYS 519 Advanced Biophysics (3 credits)

### B.Sc.; Joint Major in Physiology and Mathematics (79 credits)

**Required Courses (20 credits)**

**Bio-Physical Sciences Core**

- BIOL 219 Physical Biology of the Cell (4 credits)
- BIOL 395 Quantitative Biology Seminar I (1 credit)
- MATH 222 Calculus 3 (3 credits)
- MATH 223 Linear Algebra (3 credits)*
- MATH 247 Honours Applied Linear Algebra (3 credits)*
- MATH 315 Ordinary Differential Equations (3 credits)**
- MATH 323 Probability (3 credits)
- MATH 325 Honours Ordinary Differential Equations (3 credits)**

* Students may take either MATH 223 or MATH 247

**Physiology and Mathematics Core**

- BIOL 309 Mathematical Models in Biology (3 credits)
- BMDE 519 Biomedical Signals and Systems (3 credits)
- MATH 242 Analysis 1 (3 credits)
- MATH 243 Analysis 2 (3 credits)
- MATH 248 Honours Advanced Calculus (3 credits)**
- MATH 314 Advanced Calculus (3 credits)**
- MATH 317 Numerical Analysis (3 credits)
- MATH 319 Introduction to Partial Differential Equations (3 credits)
- MATH 324 Statistics (3 credits)
- MATH 326 Nonlinear Dynamics and Chaos (3 credits)
- MATH 437 Mathematical Methods in Biology (3 credits)
- PHGY 209 Mammalian Physiology 1 (3 credits)
- PHGY 210 Mammalian Physiology 2 (3 credits)
- PHGY 212 Introductory Physiology Laboratory 1 (1 credit)
- PHGY 213 Introductory Physiology Laboratory 2 (1 credit)
- PHGY 311 Channels, Synapses & Hormones (3 credits)
- PHGY 312 Respiratory, Renal, & Cardiovascular Physiology (3 credits)
- PHGY 313 Blood, Gastrointestinal, & Immune Systems Physiology (3 credits)
- PHGY 461D1 Experimental Physiology (4.5 credits)
- PHGY 461D2 Experimental Physiology (4.5 credits)

**Complementary Courses (9 credits)**

- 3 credits, one of:
  - COMP 202 Foundations of Programming (3 credits)
  - COMP 250 Introduction to Computer Science (3 credits)
- 3 credits, one of:
  - PHGY 311 Channels, Synapses & Hormones (3 credits)
  - PHGY 314 Integrative Neuroscience (3 credits)
- 3 credits, one of:
  - PHYS 413 Physical Basis of Physiology (3 credits)
  - PHYS 519 Advanced Biophysics (3 credits)
8.0 Consultation with Related Units  
\[\checkmark\text{Yes}\quad \square \text{No}\]

Financial Consult  
\[\square \text{Yes}\quad \checkmark \text{No}\]

Attach list of consultations

9. Approvals

<table>
<thead>
<tr>
<th>Routing Sequence</th>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department</td>
<td>Dr. John Orlowski</td>
<td>J. Orlowski</td>
<td>November 8, 2016</td>
</tr>
<tr>
<td>Curric/Acad Committee</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Faculty 1</td>
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<td>Senate</td>
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Submitted by

<table>
<thead>
<tr>
<th>Name</th>
<th>Sonia Viselli</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone</td>
<td>514-398-3689</td>
<td>To be completed by ARR:</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:sonia.viselli@mcgill.ca">sonia.viselli@mcgill.ca</a></td>
<td>CIP Code</td>
</tr>
<tr>
<td>Submission Date</td>
<td>November 8, 2016</td>
<td></td>
</tr>
</tbody>
</table>

10. FQRSC (Research) Indicator (for GPS): Yes  No
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE:    November 8, 2016

To:    Dr. Paul François, Department of Physics

From:    Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Physics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____ X ___ NO OBJECTIONS    _____ SOME OBJECTIONS

COMMENTS:

We have no objection on the replacement of PHYS333 by PHYS329 in the Major Physiology and Physics Program.

Signature:     

Date:     November 9th, 2016
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE: November 8, 2016

To: Prof. Michael Langer, School of Computer Science

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Mathematics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

\[ X \text{ NO OBJECTIONS} \quad \text{SOME OBJECTIONS}\]

COMMENTS:

Signature: [Signature]

Date: 9 Nov 2016
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE: November 8, 2016

To: Professor Jack C. Sonkey, Dept. of Physics

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Physics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

[Signature]

COMMENTS:

I do not object to replacing Phys 333 with Phys 329 in the Major Physiology & Physics Program

Date: 2016-11-09
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE: November 8, 2016

To: Ms. Nancy Nelson, Dept. of Biology

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Mathematics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

X NO OBJECTIONS

SOME OBJECTIONS

COMMENTS:

Signed by Nancy Nelson on behalf of the department of Biology Curriculum Committee

Signature: ____________________________

Date: Nov. 10 2016
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE:   November 8, 2016

To:      Biology Department

From:    Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Physics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

____X____ NO OBJECTIONS

______ SOME OBJECTIONS

COMMENTS:

Signed by Nancy Nelson on behalf of the Biology Curriculum Committee

Signature: 

Date:       Nov 10 2016
Hi Tamara,

I just learned that both programs were approved unanimously!

Axel

Hi Axel,

I hope this went well & that the approvals by Math of the revised Biology-Math & Physiology-Math programs are pending. This is the last thing we’re waiting for before finalizing and distributing the AC documents for Monday’s meeting so please let me know how it went.

Thanks, Tamara

__________________________________________________________
Tamara L Western
Associate Dean (Academic)
Faculty of Science, McGill University

Dawson Hall, 853 Sherbrooke St. West, Montreal, QC, Canada H3A 0G5
Ph: 514 398 6983, Fax: 514 398 8102, Email: tamara.western@mcgill.ca
http://biology.mcgill.ca/faculty/western/
__________________________________________________________

Hi Tamara,

our department meeting was canceled due to general meeting fatigue (we had the cyclical review visitors last week and plenty of visiting candidates for various open positions). However, the department will vote on the
new versions of our joint programs with Biology and Physiology by email with a deadline of Wednesday night. I can send you the results on Thursday morning. Sorry about the delay!

Axel
<table>
<thead>
<tr>
<th>1.0 Degree Title</th>
<th>2.0 Administering Faculty/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify the two degrees for concurrent degree programs</td>
<td>Science</td>
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<tr>
<td>B.Sc.</td>
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<table>
<thead>
<tr>
<th>1.1 Major (Legacy= Subject) (30-char. max.)</th>
<th>1.2 Concentration (Legacy = Concentration/Option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiology and Physics</td>
<td>If applicable (30 char. max.)</td>
</tr>
</tbody>
</table>

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

| 1.4 Category | |
|---------------||
| □ Faculty Program (FP) | □ Honours (HON) |
| □ Major | □ Joint Honours Component (HC) |
| □ Joint Major | □ Internship/Co-op |
| □ Major Concentration (CON) | □ Thesis (T) |
| □ Minor | □ Non-Thesis (N) |
| □ Minor Concentration (CON) | □ Other |
| Please specify | |

| 1.5 Complete Program Title | |
|---------------------------||
| B.Sc.; Joint Major in Physiology and Physics | |

<table>
<thead>
<tr>
<th>2.0 Administering Faculty/Unit</th>
<th>3.0 Effective Term of revision or retirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>Please give reasons in 5.0 &quot;Rationale&quot; in the case of retirement (Ex. Sept. 2004 = 200409)</td>
</tr>
<tr>
<td></td>
<td>□ Retirement</td>
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<tr>
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<td>Term: 201709</td>
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</tbody>
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<table>
<thead>
<tr>
<th>4.0 Existing Credit Weight</th>
<th>Proposed Credit Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>82</td>
</tr>
</tbody>
</table>

<p>| 5.0 Rationale for revised program | |
|----------------------------------||
| This revision combines three changes: | |
| 1. Harmonization of the program organization with the new Bio-physical umbrella in order to better highlight the relationships and commonalities among multidisciplinary life-science programs. | |
| a. The interdisciplinary course BIOL 219 Physical Biology of the Cell has been added to the program, filling a gap left by the current waiving of BIOL 200 and BIOL201/BIOC 212 due to lack space in the program | |
| b. PHYS 333 is replaced with the more interdisciplinary PHYS 329 | |
| c. Addition of interdisciplinary seminar course BIOL 395, | |
| 2. Due to the significant neurophysiology content of both PHGY 311 and PHGY 314, students now are only required to take one of these two courses (moved to complementary list). | |
| 3. Program title is corrected to read Joint Major, as is more appropriate. | |</p>
<table>
<thead>
<tr>
<th>B.Sc.; Major in Physiology and Physics (80 credits)</th>
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<tr>
<td><strong>U1 Required Courses (26 credits)</strong></td>
</tr>
<tr>
<td>MATH 222 Calculus 3 (3 credits)</td>
</tr>
<tr>
<td>PHGY 209 Mammalian Physiology 1 (3 credits)</td>
</tr>
<tr>
<td>PHGY 210 Mammalian Physiology 2 (3 credits)</td>
</tr>
<tr>
<td>PHGY 212 Introductory Physiology Laboratory 1 (1 credit) *</td>
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<tr>
<td>PHGY 213 Introductory Physiology Laboratory 2 (1 credit) *</td>
</tr>
<tr>
<td>PHYS 230 Dynamics of Simple Systems (3 credits)</td>
</tr>
<tr>
<td>PHYS 232 Heat and Waves (3 credits)</td>
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<td>PHYS 241 Signal Processing (3 credits)</td>
</tr>
<tr>
<td>PHYS 257 Experimental Methods 1 (3 credits)</td>
</tr>
<tr>
<td>PHYS 258 Experimental Methods 2 (3 credits)</td>
</tr>
</tbody>
</table>

* The corequisite BIOL 200, BIOL 201 is waived for this program.

| **U2 Required Courses (21 credits)**            |
| MATH 326 Nonlinear Dynamics and Chaos (3 credits) |
| PHYS 230 Dynamics of Simple Systems (3 credits)   |
| PHYS 232 Heat and Waves (3 credits)               |
| PHYS 241 Signal Processing (3 credits)            |
| PHYS 257 Experimental Methods 1 (3 credits)       |
| PHYS 258 Experimental Methods 2 (3 credits)       |

| **U3 Required Courses (21 credits)**            |
| BMDE 519 Biomedical Signals and Systems (3 credits) |
| PHGY 461D1 Experimental Physiology (4.5 credits)  |
| PHYS 339 Measurements Laboratory in General Physics (3 credits) |
| PHYS 340 Majors Electricity and Magnetism (3 credits) |
| PHYS 446 Majors Quantum Physics (3 credits)       |

| **U1 Complementary Courses (6 credits)**         |
| 3 credits, one of:                               |
| MATH 315 Ordinary Differential Equations (3 credits) |
| MATH 325 Honours Ordinary Differential Equations (3 credits) |

| **U2 Complementary Courses (3 credits)**         |
| 3 credits, one of:                               |
| MATH 223 Linear Algebra (3 credits)              |
| MATH 247 Honours Applied Linear Algebra (3 credits) |

| **U3 Complementary Courses (3 credits)**         |
| 3 credits, one of:                               |
| PHYS 413 Physical Basis of Physiology (3 credits) |
| PHYS 519 Advanced Biophysics (3 credits)         |

---

<table>
<thead>
<tr>
<th>B.Sc.; Joint Major in Physiology and Physics (82 credits)</th>
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<tr>
<td><strong>Required Courses (76 credits)</strong></td>
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<tr>
<td><strong>Bio-Physical Sciences Core</strong></td>
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<tr>
<td>BIOL 219 Physical Biology of the Cell (4 credits)</td>
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<tr>
<td>BIOL 395 Quantitative Biology Seminar 1 (1 credit)</td>
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<td>MATH 222 Calculus 3 (3 credits)</td>
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<td>MATH 223 Linear Algebra (3 credits)*</td>
</tr>
<tr>
<td>MATH 247 Honours Applied Linear Algebra (3 credits)*</td>
</tr>
<tr>
<td>MATH 315 Ordinary Differential Equations (3 credits)**</td>
</tr>
<tr>
<td>MATH 325 Honours Ordinary Differential Equations (3 credits)**</td>
</tr>
<tr>
<td>PHYS 329 Statistical Physics with Biophysical Application (3 credits)</td>
</tr>
</tbody>
</table>

*Students may take either MATH 223 or MATH 247
** Students may take either MATH 315 or MATH 325

| **Physiology and Physics Core**                        |
| BMDE 519 Biomedical Signals and Systems (3 credits)    |
| MATH 248 Honours Advanced Calculus (3 credits)***      |
| MATH 314 Advanced Calculus (3 credits)***              |
| MATH 326 Nonlinear Dynamics and Chaos (3 credits)      |
| MATH 437 Mathematical Methods in Biology (3 credits)   |
| PHYS 209 Mammalian Physiology 1 (3 credits)            |
| PHYS 210 Mammalian Physiology 2 (3 credits)            |
| PHYS 212 Introductory Physiology Laboratory 1 (1 credit) |
| PHYS 213 Introductory Physiology Laboratory 2 (1 credit) |
| PHYS 312 Respiratory, Renal, & Cardiovascular Physiology (3 credits) |
| PHYS 313 Blood, Gastrointestinal, & Immune Systems Physiology (3 credits) |
| PHYS 314 Integrative Neuroscience (3 credits)          |
| PHYS 333 Thermal and Statistical Physics (3 credits)   |
| MATH 325 Honours Ordinary Differential Equations (3 credits)** |

| **Complementary Courses (6 credits)**                  |
| 3 credits, one of:                                     |
| PHGY 311 Channels, Synapses & Hormones (3 credits)     |
| PHGY 314 Advanced Calculus (3 credits)                 |

*** Students may take either MATH 248 or MATH 314

---

Attach extra page(s) as needed
8.0 Consultation with Related Units  X Yes  □ No  Financial Consult  □ Yes  □ No

Attach list of consultations

9. Approvals
Routing Sequence  Name  Signature  Date
Department  Dr. John Oriowski  [Signature]  November 8, 2016
Curric/Acad Committee
Faculty 1
Faculty 2
Faculty 3
CGPS
SCTP
APC
Senate

Submitted by
Name  Sonia Viselli  To be completed by ARR:
Phone  514-398-3689  CIP Code
Email  sonia.viselli@mcgill.ca
Submission Date  November 8, 2016

10. FQRSC (Research) Indicator (for GPS): Yes  No
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE: November 8, 2016

To: Dr. Paul François, Department of Physics

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Physics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

X NO OBJECTIONS

COMMENTS:

We have no objection on the replacement of PHYS333 by PHYS329 in the Major Physiology and Physics Program.

Signature: Paul François

Date: November 9th 2016
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE: November 8, 2016

To: Prof. Michael Langer, School of Computer Science

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Mathematics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

[Marked] NO OBJECTIONS

COMMENTS:

[Blank space]

Signature: [Signature]

Date: 9 Nov 2016
DATE: November 8, 2016

To: Professor Jack C. Sonkey, Dept. of Physics

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Physics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_______ NO OBJECTIONS _______ SOME OBJECTIONS

COMMENTS:

I do not object to replacing PHYS 333 WITH PHYS 329 IN THE MAJOR PHYSIOLOGY & PHYSICS PROGRAM

Signature: 

Date: 2016-11-09
CONSULTATION REPORT FORM  
COURSE/PROGRAM PROPOSALS

DATE: November 8, 2016

To: Ms. Nancy Nelson, Dept. of Biology

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Mathematics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

___X___ NO OBJECTIONS  

_________ SOME OBJECTIONS

COMMENTS:

Signed by Nancy Nelson on behalf of the department of Biology Curriculum Committee

Signature: __________________________

Date: Nov. 10 2016
CONSULTATION REPORT FORM
COURSE/PROGRAM PROPOSALS

DATE: November 8, 2016

To: Biology Department

From: Dr. A. Khadra, Department of Physiology

Attached is a program revision to the Major Physiology and Physics program. Would you be kind enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal.

_____X____ NO OBJECTIONS  _________ SOME OBJECTIONS

COMMENTS:

Signed by Nancy Nelson on behalf of the Biology Curriculum Committee

Signature: ________________________________

Date: Nov 10 2016
The BSc Major in Geography provides students with strong training in the theory and tools of physical geography, the science of how physical, chemical and biological processes interact at various spatial and temporal scales to produce distinct environments over the planet, different suites of ecosystem services and also different sustainability challenges for human communities that depend on them. The program includes core training in systematic areas of physical geography (geomorphology, hydrology, soil biogeochemistry, biogeography and climatology), as well as field courses providing hands on exposure to environmental data collection, and courses in quantitative techniques and in GIS and Remote Sensing.
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)

**B.Sc.; Major in Geography (58 Credits)**

**Required Courses (22 credits)**

<table>
<thead>
<tr>
<th>Subj Code/Crse Num</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 201</td>
<td>Introductory Geo-Information Science</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 203</td>
<td>Environmental Systems</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 216</td>
<td>Geography of the World Economy (3 credits)</td>
<td></td>
</tr>
<tr>
<td>GEOG 217</td>
<td>Cities in the Modern World (3 credits)</td>
<td></td>
</tr>
<tr>
<td>GEOG 272</td>
<td>Earth’s Changing Surface (3 credits)</td>
<td></td>
</tr>
<tr>
<td>GEOG 290</td>
<td>Local Geographical Excursion (1 credit)</td>
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</tr>
<tr>
<td>GEOG 302</td>
<td>Environmental Management 1 (3 credits)</td>
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</tr>
<tr>
<td>GEOG 351</td>
<td>Quantitative Methods</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 290</td>
<td>Local Geographical Excursion (1 credit)</td>
<td>1</td>
</tr>
</tbody>
</table>

**Complementary Courses (36 credits)**

- **3 credits of statistics**
  - BIOL 373 Biometry (3 credits)
  - GEOG 202 Statistics and Spatial Analysis (3 credits)
  - MATH 203 Principles of Statistics 1 (3 credits)
  - PSYC 204 Introduction to Psychological Statistics (3 credits)
  - SOCI 350 Statistics in Social Research (3 credits)

- **12 credits of systematic physical geography**
  - GEOG 305 Soils and Environment (3 credits)
  - GEOG 321 Climatic Environments (3 credits)
  - GEOG 322 Environmental Hydrology (3 credits)
  - GEOG 372 Running Water Environments (3 credits)
  - GEOG 470 Wetlands (3 credits)

- **3 credits of field courses**
  - GEOG 495 Field Studies - Physical Geography (3 credits)
  - GEOG 496 Geographical Excursion (3 credits)
  - GEOG 499 Subarctic Field Studies (3 credits)

**3 credits of GIS techniques**

- GEOG 306 Raster Geo-Information Science (3 credits)
- GEOG 308 Principles of Remote Sensing (3 credits)

/Continued on next page

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

**B.Sc.; Major in Geography (58 Credits)**

**Required Courses (13 credits)**

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<thead>
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<th>Subj Code/Crse Num</th>
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</tr>
<tr>
<td>GEOG 290</td>
<td>Local Geographical Excursion (1 credit)</td>
<td>1</td>
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</tbody>
</table>

**Complementary Courses (45 credits)**

- **3 credits of statistics**
  - BIOL 373 Biometry (3 credits)
  - GEOG 202 Statistics and Spatial Analysis (3 credits)
  - MATH 203 Principles of Statistics 1 (3 credits)
  - PSYC 204 Introduction to Psychological Statistics (3 credits)
  - SOCI 350 Statistics in Social Research (3 credits)

- **12 credits of systematic physical geography**
  - GEOG 305 Soils and Environment (3 credits)
  - GEOG 321 Climatic Environments (3 credits)
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  - GEOG 495 Field Studies - Physical Geography (3 credits)
  - GEOG 496 Geographical Excursion (3 credits)
  - GEOG 499 Subarctic Field Studies (3 credits)

- **3 credits of GIS techniques**
  - GEOG 306 Raster Geo-Information Science (3 credits)
  - GEOG 308 Principles of Remote Sensing (3 credits)

**6 or 9 credits of 300 level environmental analysis/techniques**

- GEOG 306 Raster Geo-Information Science (3 credits)
- GEOG 307 Socio-economic applications of GIS (3 credits)
- GEOG 308 Principles of Remote Sensing (3 credits)
- GEOG 384 Principles of the Geoweb (3 credits)

/Continued on next page
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)

**Complementary Courses Cont.**

15 credits from approved courses in Geography, or elsewhere in the Faculty of Science, or in the Faculty of Engineering

*(At least 9 credits of which are to be taken outside Geography. Students may also include any courses that are not already counted towards the GIS techniques or the systematic physical geography requirements. Admission to 500-level courses in Geography requires the instructor's permission. It is not advisable to take more than one 500-level course in a term.)*

**Geography Approved Course List - Major, Honours and Liberal Programs**

GEOG 404 Environmental Management 2 (3 credits)
GEOG 501 Modelling Environmental Systems (3 credits)
GEOG 505 Global Biogeochemistry (3 credits)
GEOG 506 Advanced Geographic Information Science (3 credits)
GEOG 523 Global Ecosystems and Climate (3 credits)
GEOG 535 Remote Sensing and Interpretation (3 credits)
GEOG 536 Geocryology (3 credits)
GEOG 537 Advanced Fluvial Geomorphology (3 credits)
GEOG 550 Historical Ecology Techniques (3 credits)
GEOG 555 Ecological Restoration (3 credits)
URBP 556 Urban Economy: A Spatial Perspective (3 credits)

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

**Complementary Courses Cont.**

6 or 9 credits *(In Environment, Earth System and Sustainability sciences)*
- ENVR 200 The Global Environment (3 credits)
- ENVR 201 Society, Environment & Sustainability (3 credits)
- ENVR 202 The Evolving Earth (3 credits)
- ESYS 200 Earth System Processes (3 credits)
- ESYS 300 Investigating the Earth System (3 credits)
- GEOG 302 Environmental Management (3 credits)
- GEOG 360 Analyzing Sustainability (3 credits)
- GEOG 460 Research in Sustainability (3 credits)

**9 credits on human-environment linkages**
- GEOG 210 Global Places and Peoples (3 credits)
- GEOG 216 Geography of the World Economy (3 credits)
- GEOG 217 Cities in the Modern World (3 credits)
- GEOG 221 Environment and Health (3 credits)
- GEOG 303 Health Geography (3 credits)
- GEOG 310 Development and Livelihoods (3 credits)
- GEOG 311 Economic Geography (3 credits)
- GEOG 315 Urban Transportation Geography (3 credits)

6 credits of approved advanced courses in Geography, or elsewhere in the Faculty of Science, including any geography courses from the above complementary lists.

Admission to 500-level courses in Geography requires the instructor's permission. It is not advisable to take more than one 500-level course in a term.

**Geography Approved Course List - Major, Honours and Liberal Programs**

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GEOG 501 Modelling Environmental Systems (3 credits)
GEOG 505 Global Biogeochemistry (3 credits)
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GEOG 523 Global Ecosystems and Climate (3 credits)
GEOG 535 Remote Sensing and Interpretation (3 credits)
GEOG 536 Geocryology (3 credits)
GEOG 537 Advanced Fluvial Geomorphology (3 credits)
GEOG 550 Historical Ecology Techniques (3 credits)
GEOG 555 Ecological Restoration (3 credits)
8.0 Consultation with Related Units  ☑ Yes  ☐ No  
Financial Consult  ☐ Yes  ☑ No 

Attach list of consultations

9. Approvals
Routing Sequence  Name  Signature  Date
Department  Michel Lapointe, Geog UAC Chair  [Signature]  Nov 28, 2016 
Curric/Acad Committee  
Faculty 1  
Faculty 2  
Faculty 3  
CGPS  
SCTP  
APC  
Senate  

Submitted by
Name  
Phone  
Email  
Submission Date  

To be completed by ARR:
CIP Code  

10. FQRSC (Research) Indicator (for GPS):  Yes  No
Tamara L Western  
Associate Dean (Academic)  
Faculty of Science, McGill University  

Dawson Hall, 853 Sherbrooke St. West, Montreal, QC, Canada H3A 0G5  
Ph: 514 398 6983, Fax: 514 398 8102, Email: tamara.western@mcgill.ca  
http://biology.mcgill.ca/faculty/western/  

---

From: Michel F. Lapointe, Prof.  
Sent: Monday, December 05, 2016 12:09 AM  
To: Tamara Western, Prof. <tamara.western@mcgill.ca>  
Subject: TR: Consult with ESYS Chairs to include 2 ESYS courses to BSc Geography

Tamara

see favorable email below from Chair of EPSC

Michel

De : jeff.eh@gmail.com <jeff.eh@gmail.com> de la part de Jeff McKenzie <jeffrey.mckenzie@mcgill.ca>
Envoyé : dimanche 4 décembre 2016 17:58
À : Michel F. Lapointe, Prof.; Jeanne Paquette, Dr.
Cc : John R. Gyakum, Prof.; Nigel Roulet, Prof.
Objet : Re: Consult with ESYS Chairs to include 2 ESYS courses to BSc Geography

Dear Michel,

I support this changes to add ESYS 200 and ESYS 300 to the BSc Geography complementary list. Atmospheric and Oceanic Sciences is also making a similar revision, which we also supported. I think the inclusion of these courses in your undergraduate program will strengthen the courses with increased enrollment.

Sincerely,
Jeff
Hi Malek,

See below.

---

Tamara L Western  
Associate Dean (Academic)  
Faculty of Science, McGill University

---

Dawson Hall, 853 Sherbrooke St. West, Montreal, QC, Canada H3A 0G5  
Ph: 514 398 6983, Fax: 514 398 8102, Email: tamara.western@mcgill.ca  
http://biology.mcgill.ca/faculty/western/

---

Hi again Tamara

MSE's (Kevin's) positive response below.
Michel

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Hello Michel,  
Apologies for the slow response.  
Yes, this is acceptable to the MSE, especially in light of the fact that these course are not required and the total enrollment is low so should not unduly impact our courses.
Thanks,  
Kevin
Thanks, Michel!

Tamara

---

Tamara L Western
Associate Dean (Academic)
Faculty of Science, McGill University

Dawson Hall, 853 Sherbrooke St. West, Montreal, QC, Canada H3A 0G5
Ph: 514 398 6983, Fax: 514 398 8102, Email: tamara.western@mcgill.ca
http://biology.mcgill.ca/faculty/western/

---

From: Michel F. Lapointe, Prof.
Sent: Tuesday, December 06, 2016 4:15 PM
To: Tamara Western, Prof. <tamara.western@mcgill.ca>
Subject: TR: TR: Consult with ESYS Chairs to include 2 ESYS courses to BSc Geography

Below, positive reply from ATOC. So we are OK for ESYS courses

m

---

De : John R. Gyakum, Prof.
Envoyé : mardi 6 décembre 2016 14:13
À : Michel F. Lapointe, Prof.; Jeffrey McKenzie, Dr.
Cc : Nigel Roulet, Prof.; John R. Gyakum, Prof.
Objet : Re: TR: Consult with ESYS Chairs to include 2 ESYS courses to BSc Geography

Hello Michel: AOS supports this revision.

Best regards,

John

On 12/4/16 11:50 AM, "Michel F. Lapointe, Prof." <michel.lapointe@mcgill.ca> wrote:

Hi John and Jeff
<table>
<thead>
<tr>
<th>1.0 Degree Title</th>
<th>2.0 Administering Faculty/Unit</th>
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<tr>
<td>Specify the two degrees for concurrent degree programs</td>
<td>Science</td>
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<tr>
<td>B.Sc.</td>
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<thead>
<tr>
<th>1.1 Major (Legacy= Subject) (30-char. max.)</th>
<th>1.2 Concentration (Legacy = Concentration/Option)</th>
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<tbody>
<tr>
<td>Earth and Planetary Sciences</td>
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<td>If applicable (30 char. max.)</td>
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<th>1.3 Minor (with Concentration, if applicable)</th>
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<th>1.4 Category</th>
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<td>Faculty Program (FP)</td>
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<td>Major</td>
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<td>Joint Major</td>
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<td>Internship/Co-op</td>
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<td>Thesis (T)</td>
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<tr>
<td>Non-Thesis (N)</td>
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<td>Other</td>
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<tr>
<th>1.5 Complete Program Title</th>
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<tr>
<td>B.Sc.; Major in Earth and Planetary Sciences</td>
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<td>Offering Faculty/Department</td>
<td>Science/Earth and Planetary Sciences</td>
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<tr>
<th>3.0 Effective Term of revision or retirement</th>
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<tbody>
<tr>
<td>Please give reasons in 5.0&quot;Rationale&quot; in the case of retirement</td>
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</tr>
<tr>
<td>(Ex. Sept. 2004 = 200409)</td>
<td>Retirement</td>
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<tr>
<td>Term:</td>
<td>201709</td>
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<th>4.0 Existing Credit Weight</th>
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<tr>
<th>5.0 Rationale for revised program</th>
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<tr>
<td>A revision of this Major program was approved in 2015, and the two versions now appear in the calendar.</td>
<td></td>
</tr>
<tr>
<td>Since the last cohort admitted to this program is now in its graduating year, it is timely to formally retire this program.</td>
<td></td>
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<table>
<thead>
<tr>
<th>6.0 Revised Program Description (Maximum 150 words)</th>
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</table>
10. FQRSC (Research) Indicator (for GPS): Yes  No
1.0 Degree Title  
Specify the two degrees for concurrent degree programs  
B.Sc.

2.0 Administering Faculty/Unit  
Science

1.1 Major (Legacy = Subject) (30-char. max.)  
Earth Sciences

2.0 Administering Faculty/Unit  
Science/Earth and Planetary Sciences

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

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: 201709

4.0 Existing Credit Weight  
75

   Proposed Credit Weight  
n/a

5.0 Rationale for revised program  
A revision of this Honours program was approved in 2015, and the two versions now appear in the calendar.  
Since the last cohort admitted in this program is now in its graduating year, it is timely to formally retire this program.

6.0 Revised Program Description (Maximum 150 words)
8.0 Consultation with Related Units □ Yes □ No  
Financial Consult □ Yes □ No  
Attach list of consultations

9. Approvals
Routing Sequence Name Signature Date
Department Jeffrey McKenzie (Chair) December 2, 2016
Curric/Acad Committee
Faculty 1
Faculty 2
Faculty 3
CGPS
SCTP
APC
Senate

Submitted by
Name Jeanne Paquette
Phone 514-398-4402
Email Jeanne.paquette@mcgill.ca
Submission Date December 2, 2016

To be completed by ARR:
CIP Code

10. FQRSC (Research) Indicator (for GPS): Yes No
### 1.0 Degree Title
Specify the two degrees for concurrent degree programs

| B.Sc. Science |

#### 1.1 Major (Legacy = Subject) (30 char. max.)

| Major Environment |

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

| Earth Sciences and Economics |

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

#### 1.4 Category

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

#### 1.5 Complete Program Title

- B.Sc., Major Environment, Earth Sciences and Economics

### 2.0 Administering Faculty/Unit

| Faculty of Agricultural & Environmental Sciences |

### 3.0 Effective Term of revision or retirement

Please give reasons in 8.0 “Rationale” in the case of retirement
(Ex. Sept. 2004 = 200409)

| Fall 2017 |

### 4.0 Existing Credit Weight

| 66 credits |

### 5.0 Description (Maximum 150 words)

Minor revisions to bring course sets up to date

### 6.0 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)

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

See: bsc_Earth Sci EconATTACHMENT_Sept2016.doc
8.0 Rationale

Minor revisions are needed to bring the domain up-to-date (to add new courses, to remove courses that are retired or have not been offered recently).

9.0 Approvals

<table>
<thead>
<tr>
<th>Routing Sequence</th>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>Department</td>
<td>Sylvie deBlois, Director, MSE</td>
<td>[Signature]</td>
<td>DEC 16</td>
</tr>
<tr>
<td>Curric/Acad Committee</td>
<td>Kevin Manaugh, Chair. Undergrad Affairs</td>
<td>[Signature]</td>
<td>01/12/2016</td>
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<tr>
<td>Faculty 1</td>
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Submitted by

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<tr>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
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</tbody>
</table>

To be completed by ARR:

CIP Code
Course list

Deleted courses shown as strikeout, added courses or other changes are shown as underlined italics. Numbers in superscript refer to comments in the rationale.

Program Requirements
Note: Students are required to take a maximum of 34 credits at the 200 level and a minimum of 15 credits at the 400 level or higher in this program. This includes core and required courses.

Location Note: When planning your schedule and registering for courses, you should verify where each course is offered because courses for this program are taught at both McGill’s Downtown campus and at the Macdonald campus in Sainte-Anne-de-Bellevue.

Core: Required Courses (18 credits)
Location Note: Core required courses are taught at both McGill's Downtown campus and at the Macdonald campus in Sainte-Anne-de-Bellevue. You should register in Section 001 of an ENVR course that you plan to take on the Downtown campus, and in Section 051 of an ENVR course that you plan to take on the Macdonald campus.

ENVR 200 (3) The Global Environment
ENVR 201 (3) Society, Environment and Sustainability
ENVR 202 (3) The Evolving Earth
ENVR 203 (3) Knowledge, Ethics and Environment
ENVR 301 (3) Environmental Research Design
ENVR 400 (3) Environmental Thought

Core: Complementary Course - Senior Research Project (3 credits)
AGRI 519 (6) Sustainable Development Plans
ENVR 401 (3) Environmental Research
ENVR 451 (6) Research in Panama

Domain: Required Courses (15 credits)
ECON 230D1 (3) Microeconomic Theory
ECON 230D2 (3) Microeconomic Theory
ECON 405 (3) Natural Resource Economics
EPSC 210 (3) Introductory Mineralogy
EPSC 212 (3) Introductory Petrology
EPSC 220 (3) Principles of Geochemistry
EPSC 355 (3) Sedimentary Geology

Domain: Complementary Courses (24 credits)
AEBI 427 (6) Barbados Interdisciplinary Project
AGRI 519 (6) Sustainable Development Plans
ENVR 401 (3) Environmental Research
ENVR 451 (6) Research in Panama

Program Requirements
Note: Students are required to take a maximum of 34 credits at the 200 level and a minimum of 15 credits at the 400 level or higher in this program. This includes core and required courses.

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ENVR 200 (3) The Global Environment
ENVR 201 (3) Society, Environment and Sustainability
ENVR 202 (3) The Evolving Earth
ENVR 203 (3) Knowledge, Ethics and Environment
ENVR 301 (3) Environmental Research Design
ENVR 400 (3) Environmental Thought

Core: Complementary Course - Senior Research Project (3 credits)
Only 3 credits will be applied to the program; extra credits will count as electives.

AEBI 427 (6) Barbados Interdisciplinary Project
AGRI 519 (6) Sustainable Development Plans
ENVR 401 (3) Environmental Research
ENVR 451 (6) Research in Panama

Domain: Required Courses (15 credits)
ECON 230D1 (3) Microeconomic Theory
ECON 230D2 (3) Microeconomic Theory
ECON 405 (3) Natural Resource Economics
EPSC 210 (3) Introductory Mineralogy
EPSC 212 (3) Introductory Petrology
EPSC 220 (3) Principles of Geochemistry
EPSC 240 (3) Geology in the Field
EPSC 355 (3) Sedimentary Geology

Domain: Complementary Courses (24 credits)
<table>
<thead>
<tr>
<th>List A (9 cr):</th>
<th>List B (12 cr):</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 333 (3) Resource Economics</td>
<td>AGRI 435 (3) Soil and Water Quality Management</td>
</tr>
<tr>
<td>ECON 326 (3) Ecological Economics</td>
<td>ANTH 339 (3) Animal Diversity</td>
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**Statistics (one of):**
Note: Credit given for Statistics courses is subject to certain restrictions. Students in Science should consult the "Course Overlap" information in the "Course Requirements" section for the Faculty of Science.

- AEMA 310 (3) Statistics Methods
- GEOG 202 (3) Statistics and Spatial Analysis
- MATH 203 (3) Principles of Statistics 1

**List A Economic Resources (9 12 cr):**
- AGEC 333 (3) Resource Economics
- ECON 209 (3) Macroeconomic Analysis and Applications
- ECON 305 (3) Industrial Organization
- ECON 313 (3) Economic Development 1
- ECON 314 (3) Economic Development 2
- ECON 408 (3) Public Sector Economics 1
- ECON 409 (3) Public Sector Economics 2
- ECON 326 (3) Ecological Economics
- ECON 347 (3) Economics of Climate Change
- ECON 416 (3) Topics in Economic Development
- ECON 511 (3) Energy, Economy and Environment
- ECON 525 (3) Project Analysis
- ENVB 437 (3) Assessing Environmental Impact
- ENVR 422 (3) Montreal Urban Sustainability Analysis

**List B Natural Resources (12 9 cr):**
- AGRI 435 (3) Soil and Water Quality Management
- AGRI 550 Sustained Tropical Agriculture
- ANTH 339 (3) Ecological Anthropology
- ANTH 451 (3) Research in Society and Development in Africa
- BIOL 305 (3) Animal Diversity
- BIOL 451 (3) Research in Ecology and Development in Africa
- BIOL 553 (3) Neotropical Environments
- ECON 305 (3) Industrial Organization
- ECON 313 (3) Economic Development 1
- ECON 314 (3) Economic Development 2
- ECON 408 (3) Public Sector Economics 1
- ECON 409 (3) Public Sector Economics 2
- ENVB 500 Advanced Topics in Ecotoxicology
- ENVB 529 GIS for Natural Resource Management
- ENVR 421 (3) Montreal: Environmental History and Sustainability

2 EPSC 240 (3) Geology in the Field
3 EPSC 331 (3) Field School 2
4 EPSC 355 (3) Sedimentary Geology
5 EPSC 412 (3) Field School 3
6 EPSC 425 (3) Sediments to Sequences
7 EPSC 435 (3) Applied Geophysics
8 EPSC 452 (3) Mineral Deposits
9 EPSC 519 (3) Isotope Geology
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RATIONALE FOR CHANGES:

1. Wording added to clarify that only 3 credits of the 6 credit courses will count here.

2. EPSC 240 moved from complementary course list to Domain Required Course.

3. EPSC 355 moved from Domain Required Course list to complementary course.

4. List A and List B given titles that reflect the content of the complementary courses; to clarify intent of complementary course lists and to help students focus their studies. Credit weights adjusted to reflect the transfer of ECON courses from List B (Natural Resources) to List A (Economic Resources); and, credit weights changed to reflect the domain’s emphasis on economics.

5. The following courses were added to complementary course sections: AGRI 550, ANTH 451, BIOL 451, ECON 209 (had been a hidden pre-req for ECON 326, ECON 347, ECON 305 and ECON 313), ECON 511, ENVB 500, ENVB 529, GEOG 201, GEOG 451, MIME 320, NRSC 451, SOIL 300, SOIL 315, SOIL 535. (ANTH/GEOG 451, and BIOL/NRSC 451 are the foundation courses of the Africa Field Study Semester)

6. ECON courses moved from Natural Resources complementary course list to Economic Resources complementary course list.

7. The following were removed from complementary course list relative to the other courses on the list, they are less central to the domain: ANTH 339, BIOL 305.

8. The following courses were added to Natural Resources category – relevant to the domain, and are accepted pre-reqs for SOIL 315 and SOIL 535 (the latter which have also added, see note #5): GEOG 305 and SOIL 326

This document contains email correspondence from all relevant units in regards to the Minor revisions in the BArts and BSc domains Economics and Earth’s Environment.
Earth and Planetary Science
Hi Kevin,
Thank you for sending us these forms. EPS is in support of the BSc and BArts revisions. The BSc program is obviously minor changes, and is in better alignment with our current course offerings. Jeanne Paquette has provided me with comments in support of the revised BArts program, that I agree with. I've copied these comments below.
Thanks,
Jeff McKenzie
Jeanne's Comments:

I [Jeanne] follow these students BA and BSc as their program mentor. The BA students have been struggling or outright failing in EPSC 212, the situation having become worse with the change of instructor who expects a stronger scientific background than the previous one.

The B.A. students are at serious disadvantage relative to most of their peers because they don't take EPSC 220 Principles in the Geochemistry (not required in the B.A. program). Their comments consistently mention that rock-forming processes are discussed in EPSC 212, at a level requiring more geochemistry than they get in EPSC 210, and that EPSC 212 hardly touches themes of earth resources and environmental impact that are central to their program.

The revisions are the outcome of a meeting held this summer with George McCourt, Kevin Manaugh and Kathy Roulet to discuss and propose changes to the McGill School of Environment domains (B.A. and B.Sc.) that have used as their required courses our U1 courses EPSC 210, EPSC 212, and EPSC 220 (in the B.Sc. only).

The changes signal to students in the B.A. program that they need freshman-level general chemistry as preparation for EPSC 210 Introductory Mineralogy. We also determined that EPSC 240 Geology in the Field is a more accessible and useful required course, of greater practical use to both B.A. and B.Sc. students, than EPSC 212 Introductory Petrology. All these students benefit greatly from seeing rocks in the field and getting a first-hand experience of what can be observed and measured in the field and read from maps. This is why we switched EPSC 240 and EPSC 212 in the required and complementary lists.

There is room for the 5-7 additional students that the McGill School of Environment program would bring each year in EPSC 240 Geology in the Field (currently capped at 20 but where enrolment has not exceeded 11 students so far).

Department of Plant Science
Hi Kevin,

the future of AGRI 550 is currently under discussion. I have cc’ed Associate Dean Marilyn Scott.

Best,
Martina

---------------------------------------------------------
Martina Strömvik, PhD
Associate Professor and Chair

Department of Plant Science/
McGill Centre for Bioinformatics
McGill University
Macdonald campus
21111 Lakeshore Road
Ste-Anne-de-Bellevue, QC H9X 3V9
Canada

Bioresource Engineering

Hello all,
No objections from Bioresource Engineering
Valerie

Valerie Orsat, Ph.D., Ing.
Associate Professor and Chair/Professeure agrégée et directrice
Bioresource Engineering Department/Département de génie des bioressources
McGill University/Université McGill

Hi Kevin
I have had a quick read over the documents and decided to send it to some experts in the dept on some of the topics, to double check – for example, AGEC falls under Natural Resource Sciences, so I sent it to two Ag Economists in the department to go over the revision proposals, and I sent it to a soil scientist as well. To my eye, there are no issues to object to, but I will wait to hear from my colleagues. I cannot speak to AECH and all of AGRI. AECH 110 falls under Bioresource Engineering (Chair Valerie Orsat copied), as I believe AGRI 519 does also (and AGRI 452). AGRI 550 falls under Plant Science (Chair Martina Stromvik copied).
If you don’t hear any concerns from me in the next few days, please consider that to be “no objections” and a wish of best of luck with the revised programs.
Brian

--
Brian T. Driscoll
Associate Professor of Microbiology
Chair, Department of Natural Resource Sciences
McGill University
Phone: (514) 398-7887
Office: MS3-035
Department of Mining and Materials Engineering

Kevin, I don’t think my department is affected by the proposed changes so we have no concerns or objections. George

George P. Demopoulos, Ph.D., Eng., FCIM
Gerald G. Hatch Chair Professor
and Department Chair
Department of Mining and Materials Engineering
McGill University
Wong Building, Office 2120
3610 University Street
Montreal, QC H3A 0C5
phone: 514-398-2046
Fax: 514-398-4492
george.demopoulos@mcgill.ca
https://www.mcgill.ca/materials/people/faculty/george-p-demo

BIOLOGY
Dear all,
   The Biology Curriculum Committee has reviewed the ENVR program revision and we have no objections. Kevin, do you have a consultation form for me to sign on Melania’s behalf, or is this email sufficient?

Best regards,
Nancy

Nancy Nelson | Undergraduate Advisor | Dept. of Biology | McGill University | 1205 Dr. Penfield Ave, Rm W3/25 | Montréal (Québec) H3A 1B1 | 514.398-4109 | nancy.nelson@mcgill.ca

Dear Kevin,

I referred this to our Curriculum Committee Chair Melania Cristescu. Your proposal is under consultation, and I understand, it should be possible to give you a response today.

Best,
Gregor

Economics

Hi, Kevin. Our Undergrad Director says we’re fine with these changes. Will this e-mail do as approval or do I have to struggle through the forms?

Bill

On Nov 15, 2016, at 11:42 AM, William Watson <william.watson@mcgill.ca> wrote:
Thanks for this. I’ve asked our Undergrad Director to have a look.

Bill

William Watson
Acting Chair
Department of Economics
McGill University

Geography
This is fine with Geography.
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2.0 Administering Faculty/Unit

- Faculty of Agricultural & Environmental Sciences

3.0 Effective Term of revision or retirement

- Term: Fall 2017

4.0 Existing Credit Weight

- 54 credits

5.0 Description (Maximum 150 words)

- Minor revisions to bring course sets up to date

6.0 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)

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

See: barts_Econ Earth EnvtATTACHMENT_Sept2016.doc
7.0 Consultation with Related Units

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Financial Consult

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Attach list of consultations.

8.0 Rationale

Minor revisions are needed to bring the domain up-to-date (to add new courses, to remove courses that are retired or have not been offered recently).

9.0 Approvals

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<td>Kevin Manaugh, Chair, Undergrad Affairs</td>
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Submitted by

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To be completed by ARR:

CIP Code
Course list

Deleted courses shown as strikeout, added courses or other changes are shown as underlined italics. Numbers in superscript refer to comments in the rationale.

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<td><strong>Program Prerequisites or Corequisites</strong>&lt;br&gt;<strong>Calculus Numeracy</strong>&lt;br&gt;3 credits of calculus from the following, or equivalent (e.g. CEGEP objective 00UN):&lt;br&gt;MATH 139 (4) Calculus 1 with Precalculus&lt;br&gt;MATH 140 (3) Calculus 1</td>
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<td><strong>Basic Science</strong>&lt;br&gt;3 credits of basic science, one of the following, or their equivalents (e.g. CEGEP objective Chemistry OOU1):&lt;br&gt;2 AECH 110 (4) General Chemistry 1&lt;br&gt;CHEM 110 (4) General Chemistry</td>
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<td><strong>Program Requirements</strong>&lt;br&gt;Note: Students are required to take a maximum of 34 credits at the 200 level and a minimum of 12 credits at the 400 level or higher in this program. This includes core and required courses, but does not include the domain program prerequisites or corequisites listed above.&lt;br&gt;Location Note: When planning your schedule and registering for courses, you should verify where each course is offered because courses for this program are taught at both McGill's Downtown campus and at the Macdonald campus in Sainte-Anne-de-Bellevue.</td>
<td><strong>Program Requirements</strong>&lt;br&gt;Note: Students are required to take a maximum of 34 credits at the 200 level and a minimum of 12 credits at the 400 level or higher in this program. This includes core and required courses, but does not include the domain program pre-requisites or co-requisites listed above.&lt;br&gt;Location Note: When planning your schedule and registering for courses, you should verify where each course is offered because courses for this program are taught at both McGill's Downtown campus and at the Macdonald campus in Sainte-Anne-de-Bellevue.</td>
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</table>
**Core: Complementary Course - Senior Research Project (3 credits)**  
Only 3 credits will be applied to the program; extra credits will count as electives.

- AEBI 427 (6) Barbados Interdisciplinary Project
- AGRI 519 (6) Sustainable Development Plans
- ENVR 401 (3) Environmental Research
- ENVR 451 (6) Research in Panama

**Domain: Required Courses (15 credits)**

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<td>EPSC 212</td>
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**Domain: Complementary Courses (18 credits)**  
18 credits are selected from various categories as follows:

**Statistics**

- One of the following Statistics courses or equivalent:
- Note: Credit given for Statistics courses is subject to certain restrictions. Students should consult the “Course Overlap” information in the “Course Requirements” section for the Faculty of Arts.

- AEMA 310 (3) Statistics Methods
- GEOG 202 (3) Statistics and Spatial Analysis
- MATH 203 (3) Principles of Statistics 1

**Economics (6 cr):**

- AGEC 333 (3) Resource Economics
- ECON 326 (3) Ecological Economics
- ECON 347 (3) Economics of Climate Change
- ECON 416 (3) Topics in Economic Development
- ECON 525 (3) Project Analysis

**Advanced Courses (9 cr):**

* Note: You can take BREE 217 or GEOG 322 but not both; you can take BIOL 308 or ENVB 305 but not both.

- AEBI 423 (3) Sustainable Land Use
- AGRI 435 (3) Soil and Water Quality Management
- AGRI 452 (3) Water Resources in Barbados
- AGRI 550 (3) Sustained Tropical Agriculture
- ANTH 339 (3) Ecological Anthropology
- ANTH 451 (3) Research in Society and Development in Africa
- BIOL 305 (3) Animal Diversity

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**Core: Complementary Course - Senior Research Project (3 credits)**  
Only 3 credits will be applied to the program; extra credits will count as electives.

- AEBI 427 (6) Barbados Interdisciplinary Project
- AGRI 519 (6) Sustainable Development Plans
- ENVR 401 (3) Environmental Research
- ENVR 451 (6) Research in Panama

**Domain: Required Courses (15 credits)**

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<td>EPSC 210</td>
<td>Introductory Mineralogy</td>
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<tr>
<td>4 EPSC 212</td>
<td>Introductory Petrology</td>
<td>3</td>
</tr>
<tr>
<td>5 EPSC 240</td>
<td>Geology in the Field</td>
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**Domain: Complementary Courses (18 credits)**  
18 credits are selected from various categories as follows:

**Statistics (3 cr)**

- One of the following Statistics courses or equivalent:
- Note: Credit given for Statistics courses is subject to certain restrictions. Students should consult the “Course Overlap” information in the “Course Requirements” section for the Faculty of Arts.

- AEMA 310 (3) Statistics Methods
- GEOG 202 (3) Statistics and Spatial Analysis
- MATH 203 (3) Principles of Statistics 1

**Economics (6 cr):**

- AGEC 333 (3) Resource Economics
- 6 ECON 209 (3) Macroeconomic Analysis and Applications
- ECON 326 (3) Ecological Economics
- ECON 347 (3) Economics of Climate Change
- ECON 416 (3) Topics in Economic Development
- 6 ECON 511 (3) Energy, Economy and Environment
- 8 ECON 525 (3) Project Analysis

**Advanced Courses (9 cr) chosen from two Areas**

**Area 1: Development / Environmental Management**

* Note: You can take ENVB 529 or GEOG 201 but not both.

- AEBI 423 (3) Sustainable Land Use
- AGRI 435 (3) Soil and Water Quality Management
- AGRI 550 (3) Sustained Tropical Agriculture
- ANTH 451 (3) Research in Society and Development in Africa

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**BIOL 308 (3) Ecological Dynamics**
**BIOL 451 (3) Research in Ecology and Development in Africa**
**BREE 217 (3) Hydrology and Water Resources**
**ECON 305 (3) Industrial Organization**
**ECON 313 (3) Economic Development 1**
**ECON 314 (3) Economic Development 2**
**ECON 408 (3) Public Sector Economics 1**
**ECON 409 (3) Public Sector Economics 2**
**ENVB 437 (3) Assessing Environmental Impact**
**ENVB 529 (3) GIS for Natural Resource Management**
**ENVR 421 (3) Montreal: Environmental History and Sustainability**
**ENVR 422 (3) Montreal Urban Sustainability Analysis**
**EPSC 240 (3) Geology in the Field**
**EPSC 355 (3) Sedimentary Geology**
**EPSC 549 (3) Hydrogeology**
**GEOG 302 (3) Environmental Management 1**
**GEOG 322 (3) Environmental Hydrology**
**GEOG 404 (3) Environmental Management 2**
**GEOG 451 (3) Research in Society and Development in Africa**
**GEOG 498 (3) Humans in Tropical Environments**
**HIST 510 (3) Environmental History of Latin America**
**NRSC 451 (3) Research in Ecology and Development in Africa**
**URBP 507 (3) Planning and Infrastructure**
**URBP 520 (3) Globalization: Planning and Change**

**Area 2: Environmental Resources**

* Note: You can take BREE 217 or GEOG 322 but not both; you can take BIOL 308 or ENVB 305 but not both.

**AGRI 452 (3) Water Resources in Barbados**
**ANTH 339 (3) Ecological Anthropology**
**GEOG 305 (3) Soils and Environment**
**GEOG 322* (3) Environmental Hydrology**
**SOIL 300 (3) Geosystems**

RATIONAL FOR CHANGES:

1. Heading changed to better reflect the program pre-/co-requisite objective – which is, a set minimum standard level of numeracy which all Environment students are expected to have before starting the program, or obtain while in the program.

2. Choice of program pre-/co-requisite science course reduced to freshman chemistry. CHEM 110 is the pre-req for EPSC 210, a required domain course. AECH 110 has been added to provide additional scheduling options to facilitate the completion of this requirement by the end of a student’s U1 year.

3. The pre-/co-requisites requirement is not specific to the domain; rather it applies to all three domains in the Faculty Program. Words should be hyphenated.
4 EPSC 212 has been removed from domain altogether. The course was no longer serving the objectives of the domain; furthermore, the chemistry background expected of students for this course was often beyond what Arts students could typically be expected to have.

5 EPSC 240 moved from Complementary Course list to Domain Required Course list.

6 In addition to AECH 110 (see comment #2), the following courses were added to complementary course sections: ECON 209 (had been a hidden pre-req for ECON 326, ECON 347, ECON 305 and ECON 313), ECON 511, ENVB 529, GEOG 201, GEOG 305, MIME 320, and SOIL 300.

7 The courses in the Advanced Courses section have been divided among two Areas: Development/Environmental Management; and Environmental Resources. This will provide more structure to the domain and will help students to focus their studies.

8 In addition to BIOL 111 and PHYS 101 (see comment #2), the following were removed from complementary course lists because of hidden pre-requisites: ECON 525; or relative to the other courses on the list, they are less central to the domain: ANTH 339, BIOL 305.

9 Credit value added to Heading, for consistency.
This document contains email correspondence from all relevant units in regards to the Minor revisions in the BArts and BSc domains Economics and Earth’s Environment.

Earth and Planetary Science
Hi Kevin,
Thank you for sending us these forms. EPS is in support of the BSc and BArts revisions. The BSc program is obviously minor changes, and is in better alignment with our current course offerings. Jeanne Paquette has provided me with comments in support of the revised BArts program, that I agree with. I've copied these comments below.
Thanks,
Jeff McKenzie
Jeanne's Comments:

I [Jeanne] follow these students BA and BSc as their program mentor. The BA students have been struggling or outright failing in EPSC 212, the situation having become worse with the change of instructor who expects a stronger scientific background than the previous one.

The B.A. students are at serious disadvantage relative to most of their peers because they don't take EPSC 220 Principles in the Geochemistry (not required in the B.A. program). Their comments consistently mention that rock-forming processes are discussed in EPSC 212, at a level requiring more geochemistry than they get in EPSC 210, and that EPSC 212 hardly touches themes of earth resources and environmental impact that are central to their program.

The revisions are the outcome of a meeting held this summer with George McCourt, Kevin Manaugh and Kathy Roulet to discuss and propose changes to the McGill School of Environment domains (B.A. and B.Sc.) that have used as their required courses our U1 courses EPSC 210, EPSC 212, and EPSC 220 (in the B.Sc. only).

The changes signal to students in the B.A. program that they need freshman-level general chemistry as preparation for EPSC 210 Introductory Mineralogy. We also determined that EPSC 240 Geology in the Field is a more accessible and useful required course, of greater practical use to both B.A. and B.Sc. students, than EPSC 212 Introductory Petrology. All these students benefit greatly from seeing rocks in
the field and getting a first-hand experience of what can be observed and measured in the field and read from maps. This is why we switched EPSC 240 and EPSC 212 in the required and complementary lists.

There is room for the 5-7 additional students that the McGill School of Environment program would bring each year in EPSC 240 Geology in the Field (currently capped at 20 but where enrolment has not exceeded 11 students so far).

**Department of Plant Science**

Hi Kevin,

the future of AGRI 550 is currently under discussion. I have cc’ed Associate Dean Marilyn Scott.

Best,
Martina

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Martina Strömvik, PhD
Associate Professor and Chair
Department of Plant Science/
McGill Centre for Bioinformatics
McGill University
Macdonald campus
21111 Lakeshore Road
Ste-Anne-de-Bellevue, QC H9X 3V9
Canada

**Bioresource Engineering**

Hello all,
No objections from Bioresource Engineering
Valerie

Valerie Orsat, Ph.D., Ing.
Associate Professor and Chair/Professeure agrégée et directrice
Bioresource Engineering Department/Département de génie des bioressources
McGill University/Université McGill
Hi Kevin
I have had a quick read over the documents and decided to send it to some experts in the dept on some of the topics, to double check – for example, AGEC falls under Natural Resource Sciences, so I sent it to two Ag Economists in the department to go over the revision proposals, and I sent it to a soil scientist as well. To my eye, there are no issues to object to, but I will wait to hear from my colleagues. I cannot speak to AECH and all of AGRI. AECH 110 falls under Bioresource Engineering (Chair Valerie Orsat copied), as I believe AGRI 519 does also (and AGRI 452). AGRI 550 falls under Plant Science (Chair Martina Stromvik copied). IF you don't hear any concerns from me in the next few days, please consider that to be “no objections” and a wish of best of luck with the revised programs.

Brian

--
Brian T. Driscoll
Associate Professor of Microbiology
Chair, Department of Natural Resource Sciences
McGill University
Phone: (514) 398-7887
Office: MS3-035

Department of Mining and Materials Engineering

Kevin, I don’t think my department is affected by the proposed changes so we have no concerns or objections. George

George P. Demopoulos, Ph.D., Eng., FCIM
Gerald G. Hatch Chair Professor
and Department Chair
Department of Mining and Materials Engineering
McGill University
Wong Building, Office 2120
3610 University Street
Montreal, QC H3A 0C5
phone: 514-398-2046
Fax: 514-398-4492
george.demopoulos@mcgill.ca
https://www.mcgill.ca/materials/people/faculty/george-p-demo

BIOLOGY

Dear all,

The Biology Curriculum Committee has reviewed the ENVR program revision and we have no objections. Kevin, do you have a consultation form for me to sign on Melania’s behalf, of is this email sufficient?

Best regards,
Nancy

Nancy Nelson | Undergraduate Advisor | Dept. of Biology | McGill University | 1205 Dr. Penfield Ave, Rm W3/25 | Montréal (Québec) H3A 1B1 | 514.398-4109 | nancy.nelson@mcgill.ca
Dear Kevin,

I referred this to our Curriculum Committee Chair Melania Cristescu. Your proposal is under consultation, and I understand, it should be possible to give you a response today.

Best,
Gregor

Economics

Hi, Kevin. Our Undergrad Director says we’re fine with these changes. Will this e-mail do as approval or do I have to struggle through the forms?

Bill

On Nov 15, 2016, at 11:42 AM, William Watson <william.watson@mcgill.ca> wrote:

Thanks for this. I’ve asked our Undergrad Director to have a look.

Bill

William Watson
Acting Chair
Department of Economics
McGill University

Geography

This is fine with Geography.
<table>
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