This proposed program would address a number of requests from undergraduates to create an advanced joint degree between Physics and Computer Science (currently, only a joint Major is available). Two surveys have been conducted by undergraduates in Physics and Computer Science (one in 2013, another in 2016). Both surveys showed support for such a program. The goal of this program is to provide a set of required courses that would give essential background in physics and computer science, at a level sufficient to pursue courses at the 400- and 500-level in either discipline. The program is intended to be sufficiently flexible to allow students to take either more physics or more computer science courses at the advanced level. 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.
8.0 Program Description (Maximum 150 words)

Students entering this joint Honours program should have high standing in mathematics, physics, and computer science. A student who has not completed the equivalent of MATH 222 on entering the program must take MATH 222 in the first semester, increasing the total number of required credits from 78 to 81. In addition, a student who has not completed the equivalent of COMP 202 must take this course (or an equivalent course) in the first term in addition to the 78 or 81 required credits.

To continue in this Honours program, an average GPA of 3.00 in the required and complementary courses is required. For Honours standing, the CGPA at graduation must be at least 3.00 and for First-Class Honours, the CGPA must be above 3.50.

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: Sub Code/Crse Num, Title, Credit weight under the headings of: Required Courses, Complementary Courses, Elective Courses)

<table>
<thead>
<tr>
<th>Required Courses (63 credits)</th>
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<tbody>
<tr>
<td>MATH 240 Discrete Structures   (3 cr.)</td>
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<tr>
<td>MATH 247 Honours Applied Linear Algebra (3 cr.)</td>
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<tr>
<td>MATH 248 Honours Advanced Calculus (3 cr.)</td>
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<td>(note: MATH 314 may be substituted for MATH 248 if MATH 222 had to be taken in the first semester)</td>
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<tr>
<td>MATH 249 Honours Complex Variables (3 cr.)</td>
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<td>MATH 325 Honours Ordinary Differential Equations (3 cr.)</td>
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<td>PHYS 241 Signal Processing (3 cr.)</td>
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<td>PHYS 251 Honours Classical Mechanics 1 (3 cr.)</td>
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<td>PHYS 253 Thermal Physics (3 cr.)</td>
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<td>PHYS 257 Experimental Methods 1 (3 cr.)</td>
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<tr>
<td>PHYS 258 Experimental Methods 2 (3 cr.)</td>
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<tr>
<td>PHYS 350 Honours Electricity and Magnetism (3 cr.)</td>
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<td>PHYS 352 Honours Electromagnetic Waves (3 cr.)</td>
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<td>PHYS 357 Honours Quantum Physics 1 (3 cr.)</td>
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<tr>
<td>PHYS 362 Statistical Mechanics (3 cr.)</td>
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<td>PHYS 457 Honours Quantum Physics 2 (3 cr.)</td>
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<tr>
<td>COMP 206 Introduction to Software Systems (3 cr.)</td>
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<td>COMP 250 Introduction to Computer Science (3 cr.)</td>
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<td>COMP 252 Honours Algorithms and Data Structures (3 cr.)</td>
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<td>COMP 273 Introduction to Computer Systems (3 cr.)</td>
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<td>COMP 302 Programming Languages and Paradigms (3 cr.)</td>
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<td>COMP 350 Numerical Computing (3 cr.)</td>
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<tr>
<th>Complementary Courses (15 credits)</th>
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<tr>
<td>At least 6 of the 15 complementary credits must come from a course at the 400- or 500-level (excluding COMP 400 and PHYS 479), and of these at least 3 must be from a COMP course.</td>
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</tbody>
</table>

3 or 4 credits selected from:
- PHYS 479 Honours Research Project (3 cr.)
- COMP 400 Project in Computer Science (4 cr.)

6 or 7 credits selected from:
- COMP 303 Software Design (3 cr.)
- COMP 310 Operating Systems (3 cr.)
- COMP 330 Theory of Computation (3 cr.)
- COMP 362 Honours Algorithm Design (3 cr.)
- Any COMP course at the 400- or 500-level (excluding COMP 400) (3 or 4 cr.)

At least 4 credits selected from:
- MATH 323 Probability (3 cr.)
- MATH 340 Discrete Structures 2 (3 cr.)
- PHYS 351 Honours Classical Mechanics 2 (3 cr.)
- PHYS 359 Honours Laboratory in Modern Physics 1 (3 cr.)
- PHYS 432 Physics of Fluids (3 cr.)
- PHYS 434 Optics (3 cr.)
- Any number of PHYS courses at the 500 level (3 cr. each)
- Any number of COMP courses at the 400- or 500-level (excluding COMP 400) (3 or 4 cr. each)

Attach extra page(s) as needed
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Submitted by

Name: 
Phone: 
Email: 
Submission Date: 

To be completed by ARR:

CIP Code: 

New Program/Major or Minor/Concentration Proposal Form P1-3
Major Physics and Computer Science (66 credits)
Offered by: Physics    Degree: Bachelor of Science

Program Requirements
The Major Physics and Computer Science is designed to give motivated students the opportunity to combine the two fields in a way that will distinguish them from the graduates of either field by itself. The two disciplines complement each other, with physics providing an analytic problem-solving outlook and basic understanding of nature, while computer science enhances the ability to make practical and marketable applications, in addition to having its own theoretical interest. Graduates of this program may be able to present themselves as being more immediately useful than a pure physics major, but with more breadth than just a programmer. They will be able to demonstrate their combined expertise in the Special Project course which is the centrepiece of the final year of the program.

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)
- CHEM 120 General Chemistry 2 (4 credits)
- PHYS 131 Mechanics and Waves (4 credits)
- PHYS 142 Electromagnetism and Optics (4 credits)

One of:
- BIOL 111 Principles: Organismal Biology (3 credits)
- BIOL 112 Cell and Molecular Biology (3 credits)
- MATH 133 and either MATH 140/141 or MATH 150/151.
- MATH 133 Linear Algebra and Geometry (3 credits)
- MATH 140 Calculus 1 (3 credits)
- MATH 141 Calculus 2 (4 credits)
- MATH 150 Calculus A (4 credits)
- MATH 151 Calculus B (4 credits)

U1 Required Courses (21 credits)
- COMP 250 Introduction to Computer Science (3 credits)
- MATH 222 Calculus 3 (3 credits)
- MATH 223 Linear Algebra (3 credits)
- MATH 240 Discrete Structures 1 (3 credits)
- PHYS 230 Dynamics of Simple Systems (3 credits)
- PHYS 257 Experimental Methods 1 (3 credits)
- PHYS 258 Experimental Methods 2 (3 credits)

U2 Required Courses (24 credits)
- COMP 206 Introduction to Software Systems (3 credits)
- COMP 251 Algorithms and Data Structures (3 credits)
- COMP 302 Programming Languages and Paradigms (3 credits)
- COMP 350 Numerical Computing (3 credits)
- MATH 314 Advanced Calculus (3 credits)
- MATH 315 Ordinary Differential Equations (3 credits)
- PHYS 232 Heat and Waves (3 credits)
- PHYS 241 Signal Processing (3 credits)

U3 Required Courses (21 credits)
- COMP 360 Algorithm Design (3 credits)
  - MATH 323 Probability (3 credits)
  - PHYS 331 Topics in Classical Mechanics (3 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)
  - PHYS 489 Special Project (3 credits)
Hi Josie,

We suspect the suspected enrollment is 5 to 10 in a steady state (which might take a few years).

We don't have a consultation report from Math and Stats, although I guess we could get one (the question has simply never come up). But the math courses are not appreciably different from our Honours and Joint Honours, so is this really necessary?

Ken

On Mon, 23 Oct 2017, Josie D'Amico wrote:

> Hi Ken,
> > (1) Re the Math courses included in the new Honours Program in Physics & Computer Science, could you please let me have a consultation report from the Department of Mathematics & Statistics.
> >
> > (2) What is the projected enrolment?
> >
> > Thank you.
> >
> Josie
APPENDIX 1

CONSULTATION REPORT FORM
RE PROGRAM PROPOSAL

DATE: OCT 26, 2017

TO: Johanna Neslehova, Math & Stats

FROM: Ken Ragan, Physics

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

Complete Program Title: Joint Honours in Physics and Computer Science

Would you be good 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. Specifically, a course [or courses] taught by your department that has [have] been included in the program’s list of courses.

[ ] NO OBJECTIONS [ ] SOME OBJECTIONS

COMMENTS:

In case you would like to add 10 courses as program prerequisites, these should include MATH 133, 140, 141

Signature: [Signature]

Date: 27.10.2017