

Physics

Graduate and Undergraduate Programs

Year 1 (2023) - FAR Implementation Report (reviewed 2021/22)

Recommendation #1

The department should consider opening the MSMP program to domestic students.

ARC Disposition of the Recommendation

ARC considers the recommendation to expand the MSMP program to allow for domestic students be accepted and in the process of implementation. The Committee expects that the Department will proceed through normal channels of advocacy for any associated space requirements.

Implementation Plan (1st Priority)

Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Extend offers for MSMP to all qualified MSc applicants.	GPD	T		
Action #2 Survey applicants and alumni on perceptions and outcomes of MSMP.	Chair	T		
Action #3 Open MSMP for domestic students in Fall 2024, subject to departmental approval.	Chair/GPD	T		

Comments 2023:

The Department has carefully considered the recommendation and strongly feels that there would be negligible interest in a course-based MSc among domestic students and have delayed any recruitment to that effect. Nevertheless, the Graduate Program Director now extends offers of acceptance to the MSMP program to all qualified applicants, of the thesis-based MSc program who were not matched with a research supervisor. However, this has not generated interest from domestic applicants, but we will continue to survey all applicants and alumni on their perceptions and outcomes of the program. In year two, the Department commits itself to investigate the possibility of opening the program to domestic students (the program may have received Provincial approval as an ISP only), investigate the

*On Target (T), Delayed (D), Complete (C), Complete and Ongoing (O)

possibility of graduate stipends for students taking the option of a Major Research Project, and review the workload placed on laboratory facilities due to the program. In consideration of these factors, the Department will seek to open the MSMP to domestic students in the Fall of 2024, subject to Department approval.

Recommendation #2

The department should evaluate the viability of the combined majors programs.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee expects that the Department will consider the viability of the combined major programs as part of a larger curriculum review.

Implementation Plan (1st Priority)
 Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Identify issues and trends in combined majors and minors.	Chair	T		
Action #2 Recruit among students taking year-1 Physics courses.	Chair	T		

Comments 2023:

The Department strongly feels that the zero-cost of combined major programs is a strong incentive to keep them, even as a recruiting tool. The Chair has begun to gather data on student perceptions on such programs including workload, alignment with student’s future goals, and departmental culture to better inform recruiting efforts. The Chair is also reviewing the program’s visibility in the University’s recruitment efforts.

In 2021, the Chair introduced a policy of email campaign at the end of each term targeting students finishing their year-1 Physics courses. This past year, we invited non-Physics students to consider switching majors, adding a Minor in Physics, or joining a combined major program. In 2022, this yielded one switched major and two new minors. We will continue to monitor the success of these recruitment to all programs.

Recommendation #3

We recommend that a thesis be required in the Honours program.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted for consideration. The Committee believes that the Department is best placed to determine the feasibility of a thesis being required.

Implementation Plan (1st Priority)

Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Establish learning outcomes related to science writing and communication.	Chair/Senior Lab Supervisor	T		
Action #2 Introduce scientific writing skills in PHYS 4F90.	Senior Lab Supervisor	T		
Action #3 Extend thesis requirement to all Honours students.	Chair	D		

Comments 2023:

There is broad consensus on the need for targeted learning outcomes in scientific writing and communication. In 2022, we began creating a four-year framework for writing for research, touching every aspect of professional scientific communication from lab reports in Y1-Y4, to literature reviews, poster presentations, and seminars in undergraduate and graduate courses.

This past year we began improving explicit writing instruction in research project course PHYS 4F90. The Senior Laboratory Supervisor now provides extensive writing and presentation rubrics and reviews student progress in these areas. Currently there are no plans for a thesis for all Honours students. Nevertheless, these new learning outcomes are being extended to other upper-year courses in the form of an increased number of reports and in-class presentations.

Recommendation #4

The department should consider offering both an algebra-based and a calculus-based stream to students in first year.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee encourages the Department to continue working with the Yousef Haj-Ahmad Department of Engineering as they undertake these curriculum changes.

Implementation Plan (1st Priority)
 Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Departmental Action Team (DAT) on first-year courses formed.	Year 1 DAT	T		
Action #2 Adjusted lab schedule to accommodate enrollment increase.	Lab Supervisor	T		

Comments 2023:

The Department is on track to create a calculus-based stream in year-1, targeting Fall 2024-2025 to coincide with the first intake of Engineering students, which are necessary for sustainable enrollments. In Fall 2023, to accommodate increased enrollments, we will shorten the year-1 lab sections from 3-hour sessions weekly to 2-hours sessions weekly, which was an important request from those planning the Engineering program. To accomplish all of this, we have formed a [Departmental Action Team \(DAT\)](#) on first year courses, using the Effective Practices for Physics Programs (EP3) resources on [Introductory Courses for STEM Majors](#).

Recommendation #5

That the Major and Honours programs require COSC 1P02 [Introduction to Computer Science] and the [Introduction to] Scientific Computing course ([PHYS] 4P10).

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted for consideration. The Committee expects that the Department will consider requiring COSC 1P02-Introduction to Computer Science and PHYS 4P10-Introduction to Scientific Computing as part of a larger curriculum review.

Implementation Plan (1st Priority)	
Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Departmental Action Team (DAT) on Computation formed.	Computational DAT	T		

Comments 2023:

Currently there is no room in the program year 1 or 2 for an explicit course in computer programming. However, the Department recognizes a strong need to build up computational and computer skills in the program. In 2022, the Department created a Departmental Action Team of four faculty and staff who have developing learning goals for integrating computation into the curricula, following the [best practices of the EP3 guide](#). We have surveyed the faculty and students on current practices and needs, in-house expertise, the capabilities of different technologies and software, and are still early in the process of developing program-level student outcomes for computational skills. Consideration of how existing Computer Science courses might contribute is an important part of that process.

Recommendation #6

We recommend the use of key software: Matlab, LaTeX, MS, Python, and Mathematica / Maple.
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ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted for consideration. The Committee expects that the Department will consider the use of key software as part of a larger curriculum review.

Implementation Plan (1st Priority)	
Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Departmental Action Team (DAT) on Computation formed.	Computational DAT	T		

Comments 2023:

This Recommendation is strongly connected to Recommendation #5, and we refer the reader to our comments there.

Recommendation #7

That the department evaluate course offerings with an eye on streamlining courses.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee encourages the Department to continue working with the Department of Mathematics and Statistics and others as they evaluate their course offerings.

Implementation Plan (1st Priority)
 Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Math curricula review completed, and significant program changes recommended.	Math DAT	T		
Action #2 The Department will monitor course enrollments considering the changes to the Math curricula.	Chair	T		

Comments 2023:

The review of the mathematics content of the program (Recommendation #12 below) has led to the removal of MATH 3P09 as a required course and made PHYS 3P94 optional. This is expected to increase enrollment in electives and a shift in the enrollments in the courses mentioned by the reviewers. Based on a survey of students in 2023 and 2024, the Department will consider further streamlining as needed.

Recommendation #8

Remove courses not offered in the past six years from the calendar.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee again encourages the Department to continue working with the Department of Mathematics and Statistics and others as they evaluate their course offerings.

Implementation Plan (1st Priority)

Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Removed from the Calendar several courses no longer offered.	Chair/GPD	T		

Comments 2023:

In 2022, the Department undertook a review of older courses that have not run in several years, nor had the prospect of being held in the near future. We were able to identify and remove PHYS 4P62, 5P02, 5P62, 5P51, 5P76, 5P77, 5P78.

Recommendation #9

The review team strongly recommends that the department should avail themselves of the resources of the Brock Library to integrate library or information literacy skills into the curriculum.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee expects that the Department will work with the Library to utilize the resources of this unit to integrate information literacy skills into the curriculum.

Implementation Plan (1st Priority)

Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Continue to communicate with the Faculty Library Team on Digital Scholarship, acquisitions, and OER.	Chair	T		
Action #2 Incorporate explicit Information Literacy Instruction into courses.	Department	T		

Comments 2023:

In 2023, our newest faculty member has joined the new campus-wide Open Education Working Group. We have also had informal talks with the new Vice-Provost, Teaching and Learning, on what Open Education means to Physics in the context of WebWork and iOLab online. The Chair has brought to the department new developments in integration of library technology with Brightspace for use.

Recommendation #10

The department should work with the Centre for Pedagogical Innovation and Co-op / Experiential Education group to bolster communication and professional skills.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee again expects that the Department will work with CPI, CCEE, and the Library, to utilize the resources of these units to bolster communication and professional skills within the curriculum.

Implementation Plan (1st Priority)
 Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 , Careers skills development with CCEE and CPI.	Chair	D		

Comments 2023:

Action on careers skills development has been temporarily placed on hold as we focus on several other priority areas.

Recommendation #11

The department should work to develop a Strategic Plan which includes an analysis of faculty workload.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted. The Committee believes that the Department is best positioned to determine appropriate strategies to move forward with developing a Strategic Plan.

Implementation Plan (1st Priority)
 Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Department Action Team (DAT) formation in 2023.	Chair	T		
Action #2 Identify and monitor workload issues.	Chair	T		

Comments 2023:

Again, the Chair is bringing to bear EP3 [resources for the creation and use of a strategic plan](#). Since September 2022, the Chair and Senior Laboratory Supervisor have been taking part in the third cohort of the [Departmental Action Leadership Institute](#) of the American Physical Society, where they have been receiving training and mentorship in departmental leadership. They are bringing to the Department a developing vision of the successful Brock graduate and will lead the Department towards a strategic plan to achieve that vision. This will be a long-term project for the Department. The Chair and GPD have also identified workload issues from past practice that require updating in Departmental policies and procedures.

Recommendation #12

The department should conduct a thorough inventory of Mathematics courses required for degree completion and the topics therein.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee expects that the Department will conduct a thorough inventory of Mathematics courses required for degree completion as part of a larger discussion about curriculum.

Implementation Plan (1st Priority)
 Responsible for approving: Department
 Responsible for resources: Department
 Responsible for implementation: Department
 Timeline: Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Departmental Action Team review of math curricula.	Math DAT	C		
Action #2 Proposed changes submitted to UPC for 2023-2024.	Chair	T		

Comments 2023:

The Department created a [Departmental Action Team \(DAT\)](#) of four faculty and staff who have reviewed the math content of the program, following the [best practices of the EP3 guide](#). The DAT surveyed faculty and students, were provided with the exams and outlines of recent Math courses for review, and consulted extensively with the Applied Math Committee of the Department of Mathematics and Statistics. A set of proposals was approved by the Department in March and will be submitted to the Undergraduate Program Committee with the goal of inclusion in the 2023-2024 undergraduate Calendar.

Recommendation #13

The review team recommends that graduate students be trained explicitly in ethical norms.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted. The Committee believes that the Department is best positioned to determine appropriate strategies, consistent with Brock’s DLEs, to train graduate students explicitly in ethical norms.

Implementation Plan (1st Priority)	
Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Implementation for MSMP underway.	GPD	T		
Action #2 Implementation for MSc, PhD under review by Department.	Chair/GPD	D		

Comments 2023:

New learning outcomes related ethical norms are being developed and tested in the Graduate Science Preparation Program (GSPP). The GSPP is a requirement of the MSMP program to prepare international students for the academic demands of graduate programs at Brock University. Topics include the norms of the practice of science, the development of academic skills such as critical thinking and synthesizing arguments and ideas, referencing and plagiarism, academic presentations and discussions, and the development of specialized vocabulary in English. Learning outcomes related to the culture of scientific practice that are being developed in the GSPP will be applied to the MSc and PhD programs in due course.

Recommendation #14

Add [PHYS] 5N01 [Scientific Writing] as a required course in the thesis-based MSc program.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted for consideration. The Committee encourages the Department to work with the Faculty of Graduate Studies to explore adding PHYS 5N01-Scientific Writing as a required course within the context of the broader PhD and Masters’ program requirements.

Implementation Plan (1st Priority)	
Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Under review by the Department.	Chair/GPD	T		

Comments 2023:

The graduate calendar underwent significant revision in 2022. Writing and communication skills in MSc is now an important component of PHYS 5P91 Graduate Seminar I, through new assignments and learning outcomes involving writing, literature reading skills, and presentation preparation. In year two, the Department will review the outcomes of 5N91 to see if it meets our needs for science writing outcomes for MSc students, as well as the overall student course load, and will determine whether 5N01 is needed as a separate course.

Recommendation #15

The department should seek avenues to boost program enrolments.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee expects that the Department will work with the Faculty of Graduate Studies and the Office of Student Recruitment to determine appropriate strategies to boost program enrolments.

Implementation Plan (1st Priority)

Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics & Science to report by the end of academic year 2022/23.

Actions	Responsibility	Year One*	Year Two	Year Three
Action #1 Development of Brock Physics swag for recruitment at OUF, Open House, etc.	Chair	T		
Action #2 Engaging with Faculty of Education.	Chair	T		

Comments 2023:

The Department continues to be involved in all recruiting opportunities and in 2022, updated its free Brock gifts and information handouts. We continue to plan for new recruiting efforts such as a high-

school 'lab day' in the Spring, and renewed its prize sponsorship for the Niagara Regional Science Fair. The 2024 total eclipse in the Niagara region will provide another special recruiting event. We are also engaged with the Faculty of Education with the specific goal of capturing more Consecutive BEd students to do their BSc portion at Brock. We have not had much interaction with the Faculty of Education in many years prior.

Recommendation #16

The Faculty of Mathematics and Science should provide financial resources to the department to hire technical support for the MSMP program.

ARC Disposition of the Recommendation

ARC considers the recommendation to be not accepted as it lies outside of the Committee's jurisdiction. The Committee expects that the Department will proceed through normal channels of advocacy for increased resources.

Implementation Plan (1st Priority)

Recommendation not accepted as it lies outside of the Committee's jurisdiction.