FINAL ASSESSMENT REPORT

Institutional Quality Assurance Program (IQAP) Review

Physics: B.Sc., M.Sc. and Ph.D.

Date of Review: March 6th and 7th

In accordance with the University Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response and assessments of the undergraduate and graduate programs delivered by Physics. This report identifies the significant strengths of the program, together with opportunities for program improvement and enhancement, and it sets out and prioritizes the recommendations that have been selected for implementation.

The report includes an Implementation Plan that identifies who will be responsible for approving the recommendations set out in the Final Assessment Report; who will be responsible for providing any resources entailed by those recommendations; any changes in organization, policy or governance that will be necessary to meet the recommendations and who will be responsible for acting on those recommendations; and timelines for acting on and monitoring the implementation of those recommendations.

Executive Summary of the Review

In accordance with the Institutional Quality Assurance Process (IQAP), the Physics program submitted a self-study in January 2017 to the Vice-Provost and Dean of Graduate Studies and Associate Vice-President, Faculty to initiate the cyclical program review of its graduate and undergraduate programs. The approved self-study presented program descriptions, learning outcomes, and analyses of data provided by the Office of Institutional Research and Analysis. Appendices to the self-study contained the CVs for each full-time member in the department.

Two arm's length external reviewers and one internal reviewer were endorsed by the Dean, Faculty of Science, and selected by the Vice-Provost, Faculty and Vice-Provost and Dean of Graduate Studies. The review team reviewed the self-study documentation and then conducted a site visit to McMaster University on March 30 - 31, 2017. The visit included interviews with the Provost and Vice-President (Academic); ice-Provost, Faculty and Vice-Provost and Dean of Graduate Studies, Associate Dean, Grad Studies and Research, the Chair of the Department of Physics and meetings with groups of current undergraduate students, full-time faculty and support staff.

The Chair of the Department and the Dean of the Faculty of Science submitted responses to the Reviewers' Report. Specific recommendations were discussed and clarifications and corrections were presented. Follow-up actions and timelines were included.

- **Strengths**
  - high-quality, sustainable, research- intensive, student-centred programs at all levels
  - attention given to the large-enrolment service courses and other educational opportunities for students outside Physics & Astronomy.

- **Areas for Enhancement or Improvement**
    - new undergraduate Medical & Biological Physics program as a potential opportunity for growth
    - Coordination with the Associate Dean's office and the faculty of science around level I enrolment targets and student advising is suggested.
    - skills training at both the graduate and undergraduate levels, and suggest a mechanism to enhance communication with the department at the graduate level.
    - concern that the lack of faculty renewal is beginning to put limits on the graduate programs, particularly in areas of experimental and theoretical physics.

Summary of the Reviewers' Recommendations with the Department's and Dean's Responses

Recommendation	**Proposed Follow-Up**	**Responsibility for Leading Follow-Up**	**Timeline for Addressing Recommendation**
Continue to vigorously pursue bringing research into the Department undergraduate programs	Maintain current practices. In light of the intended increase of international students in the Faculty of Science, search for creative ways to fund summer research positions for non-NSERC eligible undergraduates.	All faculty	Ongoing
Coordinate with Associate Dean's office and the faculty of Science to provide support and advising for recruiting into level 1 and department programs.	Create level I advising information sheet. Work with advising team to communicate roles of all level I physics courses. Increase admission target into Chemical & Physical Sciences I while maintaining appropriate admission average.	Chair, Associate Chair (Undergraduate)	2017/18
Give departmental recruitment and outreach a high priority.	Explore possibilities to re-implement the activities of the former Outreach Coordinator, perhaps through reorganized duties of departmental staff. Seek external funding for outreach activities (e.g. PromoScience, fundraising).	Chair	Begin immediately.

Explore mechanisms to provide additional opportunities for students to strengthen aspects of data analysis, statistical analysis, and computational skills within the undergraduate programs.	Identify courses where skills could be included with minor modifications to curriculum (e.g. Inquiry, lab courses) and work with instructors to make those changes. Coordinate with Laboratory Review Group (see below) Identify non-course resources (e.g. online) that are appropriate for physics students and create repository.	Associate Chair (Undergraduate)	Begin implementation in 2018/19
Review scaffolding of learning outcomes of all undergraduate laboratory courses. Review the overall workload of 3H03, "Intermediate Laboratory", possibly change unit load to 6.	Undertake review of lab components of 1C03, 1CC3, 2B03, 2BB3, 2H04, and 3H03 by laboratory staff and faculty teaching those courses. Start review after 2B03 and 2BB3 have been taught in their revamped configuration.	Laboratory Review Group Established by Chair	Implement recommended changes in 2019/20.
Explore the possibility of increasing options for "general interest" courses for non-program students, through new courses and relaxed prerequisites on existing courses.	Solicit ideas from department; assess teaching capacity within department; consult with Dean/Associate Dean's offices concerning resources.	Chair, Associate Chair (Undergraduate)	Begin immediately, with numeracy course Physics 2NM3 on Dean's Permission in Winter 2018.

Dean's Response:

Graduate programs:

The Dean was pleased to receive a positive assessment of the graduate and undergraduate programs in the Department of Physics & Astronomy. The report highlights many strengths of both programs and the value and commitment placed in training students. The recommendations in the report have been reviewed by the Department and are included in a response letter along with plans to address them in an appropriate timeframe. They note that two specific items related to graduate programs have been appropriately addressed by the Department. The graduate courses are being reviewed in order to consider ways to offer a set number of courses each year some of which may involve collaboration with other programs both at McMaster and outside. The issue of communication gap between students and department is being addressed. A new Graduate Student Council is being established this fall, which will offer effective channel to address concerns that student might have.

Undergraduate Programs:

Recommendations: "*Coordinate with the Associate Dean's office and the Faculty of Science to provide support and advising for recruiting into the level 1 and department programs*." "*Give departmental recruitment and outreach a high priority".*
While they understand the foundation for these requests and are looking for sustainable ways for Departments in the Faculty of Science to support their current students and generate interest in future students, they are concerned that these comment paint an inaccurate picture of the current level of activity and coordination in the areas of advising, outreach and recruitment. For many years, the Department of Physics and Astronomy had a member of staff who was responsible for outreach and promotion. During the Academic review initiated by Dean Baker, data was presented to show that over a substantial time period during which the department had an outreach person, enrollment numbers had actually declined into both the Level 1 gateway and the Level 2 entry programs. Level 1 outreach is carried out centrally by the University and the Faculty of Science and its Departments have little control over centralized high school outreach. However, at all recruitment events, the office of the Associate Dean of Science gives equal priority to all its Level 1 Science programs. A number of steps were taken at the level of the office of the Associate Dean and formed part of the 5-year academic plan resulting from Dean Bakers review. Firstly, the Level 1 physics course offerings were completely reviewed and redesigned. Secondly, the Level 2 offerings were promoted through the new Science 1A03 course (Investigating Science: Experience and Opportunities). Thirdly, the minimum entry grade requirements for all Level 2 programs was lowered to a GPA of 5. Lastly, all programs including the Gateways were promoted on the McMaster Academic Planner (MAP). Since then the numbers are no longer in decline, in fact this year the Level 1 gateway program has exceeded its target of 100 for the first time. The Level 2 program numbers for the new Medical and Biological Physics program are high (much higher than previous numbers for the honours Medical Physics and Biophysics combined). Also, enrollment into the honours Physics program is higher this year than they have been for many years. All this improvement without a dedicated outreach person. The Faculty of Science is dedicated to funding centralized recruitment that is targeted to the needs and interests of different groups of students, however they current priority is to support this through the Office of the Associate Dean and through existing recruitment events and tools. The Dean was happy to work with Departments to look at alternative models of funding less centralized outreach activities in the future.

Recommendation: "*Monitor student preparation from 1A03/1AA3 for department programs including cross over paths".* This is a very important task. Although it would appear from many points of view that the level 1 physics offerings are a success, some research into the effectiveness is essential. They are happy to encourage the Department of Physics as a whole and the instructors of these courses in particular to partner with the McPherson Institute to build an effective and evidence based evaluation platform to monitor and assess the effectiveness of the redesigned courses.

Monitor student preparation from 1A03/1AA3 for department programs, including crossover paths (1A/1CC or 1C/1AA)	Data collection, both historical and going forward, to track program students with any 1A/1AA background. Interviews with those students, and level 2 instructors, as warranted. Provide report, with suggestions, to department curriculum committee.	Instructional Assistant	2019/20
Create a sustainable suite of graduate courses.	Discuss teaching credit for small graduate courses with Faculty of Science. Continue to seek out partnerships with other units on campus (e.g. CSE) and external institutions (e.g. PI)	Associate Chair (Graduate), Chair	Ongoing
Create elected Graduate Student Council	Work with current graduate Liaison Committee to identify gaps in communication. Elect first Graduate Student Council members during graduate orientation session in September 2017.	Associate Chair (Graduate)	2017/18
Bolster experimental physics and theoretical physics research groups, to maintain strengths in those graduate research areas.	Submit proposals to Faculty Academic Appointments Committee in these areas. Pursue CERC appointments through already authorized university submission.	Chair	Fall 2017

Quality Assurance Committee Recommendation

McMaster's Quality Assurance Committee (QAC) reviewed the above documentation and the committee recommends that the program should follow the regular course of action with an 18-month progress report and a subsequent full external cyclical review to be conducted no later than 8 years after the start of the last review.