REPORT OF THE ACADEMIC PLANNING COMMITTEE
TO THE REGULAR March 2016 SENATE

FOR INFORMATION

QUALITY ASSURANCE – CYCLICAL PROGRAM REVIEW OF LAURENTIAN UNIVERSITY'S PHYSICS DEPARTMENT
M.Sc. in Physics

Final Assessment Report and Implementation Plan, November 2015

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 graduate program delivered by the Department of 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.

Summary of the Cyclical Program Review of the Department of Physics Graduate Programs

On July 25, 2013, the Department of Physics submitted a self-study to the Office of the Vice-President Academic and Provost of Laurentian University. The Part I of the self-study consists in a brief introduction to the Physics Department, including objectives and mission statements, learning objectives and outcomes, review concerns expressed on previous appraisals and actions taken, and the list of faculty, staff and students who participated in the self-study. This is followed by the list of full time and adjunct faculty, their contributions to the different fields of research claimed by the department, their level of funding, their contribution to teaching and finally their involvement in graduate student supervision. The physical resources found in the department are then described. This is followed by data on student enrolment, graduation and employment status. Program regulation and courses are then detailed, followed by the strengths and weaknesses of the program and a statement on areas requiring improvement.

Five appendices are found in the self-study: Appendix 1 contains Graduate Physics Course Surveys; Appendix 2 details the space allocation for the Physics Department; Appendix 3 contains the minutes of the departmental IQAP committee meetings; Appendix 4 consists in the form "Report on Progress towards Master's Degree Completion"; and Appendix 5 includes the graduate course outlines. Part II of the self-

study contains the *Curriculum vitae* of the full and part time faculty, while Part III contains recommendations of possible reviewers.

On November 21 and 22, 2013 the review team conducted a site visit. The two arms-length external reviewers were Drs. David Hanna (Professor of Physics, McGill University) and Bruce Thomadsen (Professor of Medical Physics, University of Wisconsin-Madison). The internal reviewers consisted in Drs. Louis Mercier (Professor of Chemistry and Biochemistry) and Tammy Eger (Professor of Kinetics) and Physics graduate students Nancy McDonald and Zachariah Bernard.

The site visit included meetings with the Faculty of the Physics Department, Dr. Osman Abou-Rabia (Acting-Dean, Faculty of Science, Engineering and Architecture) and Dr. Robert Kerr (Vice-President, Academic and Provost). The review team visited laboratories and office facilities in the Physics Department, as well as the University Library.

In its report, the review team commented that the research-based Master's program "…has prepared (students) for employment in relevant fields or further graduate studies…" (page 12). They indicated that "the quality of the faculty in the department is impressive, and the faculty has been productive in research as well as teaching" (page 9). They stated "the faculty also puts great effort into teaching. Maintaining this quality program takes a toll on the faculty, who are overworked, and the students, who sometimes fall behind schedule due to the over-commitment of the faculty" (page 12).

The report highlighted many strengths of the program, including among others:

- the program requirements and learning outcomes are consistent with world-class programs;
- all the faculty members are very well qualified and heavily committed to the program;
- specialty courses make good use of faculty expertise;
- faculty members are involved in student engagement and outreach initiatives (e.g. Physics chat sessions, Physics Movie Night). These are greatly appreciated by the students.

The report also identified a number of program weaknesses, including:

- the small number of students in the program limits the variety and frequency of graduate course offerings.
- the periodical student evaluations are sometimes not performed as frequently as needed;
- the department is greatly understaffed for the courses they teach and the research they perform;
- of the three specialties offered by the department (Medical Physics, Condensed Matter and Particle Physics) the first two lack depth in their coverage.
- a difficulty in recruiting international students.

The report proposed a total of 13 recommendations. On February 24, 2014, the Department of Physics submitted a response to the Reviewers' Report. The Acting-Dean and the Director of Graduate Studies (Dr. David Lesbarrères) also commented on the Report. These recommendations, along with the Department's, Dean's and Director of Graduate Studies' responses are given below.

Note: It must be mentioned that the Physics Department chose to frame its response to the Reviewer's Report in an essay format. As a result, responses to some of the recommendations are buried in the text and hard to find, and some of the recommendations are left with no clear response from the Department. This is in contrast to both the Dean and the Director of Graduate studies, who systematically addressed each recommendation separately and clearly.

SUMMARY OF THE REVIEW TEAM'S RECOMMENDATIONS AND THE DEPARTMENT'S (P), DEAN'S (D) AND DIRECTOR OF GRADUATE STUDIES' (GS) RESPONSES.

Recommendation 1: The most important action for the department is to develop a plan.

(P): This is currently being discussed at the departmental level.
(D): The Dean agrees with this suggestion.

Recommendation 2: The number of Faculty needs to increase, according to the goals of the departmental plan.

(P): The Department needs a new faculty position in Medical Physics. The Department has renewed initiatives in terms of integrating and utilizing expertise from adjunct faculty members. Some of these individuals have co-taught graduate courses in the past. This trend is expected to continue given the number of students interested in medical physics. One cross-appointee from the Mathematics and Computer Science Department is contributing to the Condensed Matter group.
(D): The department should pursue more collaborative research in the field of nuclear medicine with regional stakeholders.

Recommendation 3: The program needs to grow, not only in the number of faculty members but in the number of students. This may entail increasing the scope of the medical physics specialty to become accredited by CAMPEP (Commission on Accreditation of Medical Physics Education Programs) or increasing the depths of the particle astrophysics program.

(P): Continued growth in Medical Physics would allow the Department to establish one of the few CAMPEP-accredited graduate programs. This requires hiring a full-time faculty member in Medical Physics. The Department also argues that the development of

a Computational Physics Program would have a beneficial effect on its graduate programs, much like the Biomedical Physics program.
(D): The Dean agrees with this recommendation.
(GS): The recent hiring of a Canada Research Chair in Particle Astrophysics should allow the Department to improve its research capacity and should thus increase its enrolment in the very near future.

Recommendation 4: The department should also work toward other creative ways of dealing with the small size of the program.

(P): The Department did not comment on this recommendation.
(D): The Dean agrees with this recommendation. One way for implementing this is through sharing with other institutions.
(GS): The Department should consider cross-listing their courses in order to foster multi-disciplinary exchange between students.

Recommendation 5: The department should develop a course in Computational Physics and Numerical Methods.

(P): The Department is considering alternative ways of offering the Computational Physics content that would foster interdisciplinary research, attract more students, and allow the Department to offer a graduate course in Computational Physics on a regular basis.
(D): The Department must first show that this option is viable at the undergraduate level.
(GS): Agrees with the Dean.

Recommendation 6: The department should perform the student progress evaluations as described in the Self-study document and present the results to the students in a timely manner. Topics for theses should be determined and agreed upon at the end of the student's first year.

(P): Regarding the evaluation of student performance indicators, the Department understands and recognizes the importance of up to date and complete information.
(D): Agrees with this recommendation.

Recommendation 7: The department should develop metrics to assess the success of graduated students.

(P): The Department did not comment on this recommendation.
(D): Agrees with this recommendation.
(GS): The benefits of an internal survey are tremendous and will help the program to adjust academic exigencies and student expectations.

Recommendation 8: The University needs to establish methods to give faculty credit for teaching classes with small number of students.

(P): The Department did not comment on this recommendation.
(D): Faculty members do receive credits for teaching small classes. The department should consider cycling courses or offering some of them as a directed study course.
(GS): This is the purview of the Dean.

Recommendation 9: In addition, the Graduate Coordinator should receive teaching dispensation for the time spent working with students equivalent to three credits.

(P): The Department did not comment on this recommendation.
(D): Credit relief is given to Graduate Coordinators if the number of students in the program justifies it.
(GS): This is the purview of the Dean.

Recommendation 10: Additional teaching technicians and a research technician should be allocated to the department.

(P): It is critical that the Department could offer more technical support to the researchers by hiring a research technician. At least a second full-time technician would be extremely important to have on our team, as that would allow more support to be offered to undergraduate and graduate students.
(D): The Dean recognizes the need for a second technician. Such a position has been requested form the Budget committee.
(GS): Students whose research takes place at the SNOLAB have access to the research technician dedicated to this facility, The rest of the program would benefit from the addition of a technician.

Recommendation 11: The University should try to provide funding to better balance the resources available to the students working in the other specialties.

(P): The Department acknowledges the disparity in funding among the different groups. This is attributed in part to changes in financing rules by the Federal Government. The Department welcomes the suggestion that the University assumes part of this financing role.
(GS): The Graduate Teaching Assistantship (GTA) was recently increased, and NSERC-funded faculty can access an extra incentive through the Research Office.

Recommendation 12: The number of fee waivers for international students should be increased to assist in increasing the number of students in this department and access to the University clinic should be extended to the dependents of international students.

(P): The Department did not comment on this recommendation.
(D): The Vice-president, Research is presently considering these options.
(GS): One additional differential fee-waiver is available to the program but the CRC chair can make a request for an extra allocation.

Recommendation 13: An orientation to the department and to Sudbury, and for international students, an orientation to Canada would be useful to the students, as well as some additional teaching to improve computer skills.

(P): Sessions on specific computer skills have been organized in recent years.
(D): The Liaison office, Laurentian International and the Center for Academic Excellence are working together to improve these services.
(GS): The Faculty of Graduate Studies offers an annual orientation to new students and will add a scholarship writing workshop starting in the fall of 2015.

LAURENTIAN QUALITY ASSURANCE IMPLEMENTATION PLAN FOR THE DEPARTMENT OF PHYSICS

Recommendations requiring follow-up	Laurentian Follow-up	Responsibility	Time-line
1.Departmental plan	That the Physics Department elaborates a clear plan detailing 1) the direction of the department is taking in the next 5 years, 2) required changes to its programs to achieve these goals 3) the human and physical resources required.	Chair[1]	May 2017
2. Increase in the number of faculty	Consider expanding the involvement of faculty from other LU departments in contributing to the graduate program (research and/or teaching).	Chair	May 2017
	Explore avenues to increase the contribution of researchers from other regional institutions to the program.	Chair	May 2017
3. Increase in the number of students.			

[1] When "Chair" is indicated, it is understood that they will work in consultation with the members of the Physics Department.

Recommendations requiring follow-up	Laurentian Follow-up	Responsibility	Time-line
3.1. Future of the Medical Physics Specialty	Decide whether this graduate specialty is to be expanded or not.	Chair	May 2017
	If Medical Physics is to be expanded, elaborate a clear plan leading to CAMPEP accreditation.	Chair	May 2017
	If Medical Physics is to be expanded, hire 1 faculty in this field.	Chair / Dean, S, E & A. / Vice-President Academic / Budget Committee	May 2017
	If Medical Physics is not to be expanded, revise curriculum to reduce course offering in this specialty.	Chair	May 2017
3.2. Increase the number of graduate students in Particle Physics	Increase efforts in the recruitment of graduate students, for example by making better use of social media.	Chair	May 2017
3.3. Future of the Condensed Matter Specialty	Decide whether this graduate specialty is to be expanded or not.	Chair	May 2017
	If Condensed Matter is to be expanded, work with other departments to bolster the number of students in this field.	Chair	May 2017
	If Condensed Matter is not to be expanded, eliminate it as one of the three specialties in the graduate program.	Chair	May 2017
4. Dealing with the small size of the program.	Consider alternative methods of course offering.	Chair	May 2017
	Consider establishing a partnership with other universities to increase the variety of course	Chair	May 2017

Recommendations requiring follow-up	Laurentian Follow-up	Responsibility	Time-line
	offering.		
5. Course in Computational Physics and Numerical Methods	Explore non-traditional ways to teach this course.	Chair	May 2017
6. Student Progress Evaluations	Ensure that students and their supervisory committee meet regularly (at least once a year, and twice during the first year).	Chair and Graduate Coordinator, Physics program	January 2016
	Ensure that students receive feedback from their supervisory committee immediately after their regular meeting.	Chair and Graduate Coordinator, Physics program	January 2016
	Ensure that a set of core Physics graduate courses are offered every year.	Chair	May 2017
	Review the course requirements to ensure that students can finish their course work during their first year into the program.	Chair	May 2017
	Come up with a strategy to make it easier for students to complete their degree within 2 years.	Chair	May 2017
7. Metrics to assess the success of graduated students	Keep track of student performance through clearly defined outcome measures (e.g. time to completion, rate of graduation, awards received, etc).	Chair and Graduate Coordinator, Physics program	May 2016
	Follow-up on the success of recent graduates, e.g. through surveys or social media (e.g 6 and 24 months	Chair and Graduate Coordinator, Physics program	May 2016

Recommendations requiring follow-up	Laurentian Follow-up	Responsibility	Time-line
	after graduation).		
8. Faculty to receive credits for teaching small classes.	Consider cycling courses to limit low enrolment.	Chair	May 2017
9. Graduate coordinator to receive teaching dispensation.	Explore ways to reduce the teaching load to the graduate coordinator.	Chair and Dean, S, E & A.	May 2017
10. Additional technicians	Hire one additional Physics technician.	Chair / Dean, S, E & A. / Vice-President Academic / Budget Committee	September 2016
11. University to improve funding to better balance resources available to the students working in other specialties.	Explore ways to provide faculty with additional financial support to hire graduate students. This is especially important for faculty looking to renew competitive Federal research grants.	Dean, Faculty of Graduate studies.	May 2017
	Consider modifications to the Laurentian University Research Fund guidelines to help support faculty working in fields with limited funding possibilities.	Vice-President, Research	May 2017
	Provide support to faculty seeking alternative sources of funding.	Vice-President, Research	May 2017
12. Foreign student fee-waivers	Increase the number of foreign student fee-waivers available to competitive programs with low enrolments.	Dean, Faculty of Graduate studies.	May 2017
13. Student life.	Ensure that graduate students are made aware of the services provided by the	Chair	May 2017

Recommendations requiring follow-up	Laurentian Follow-up	Responsibility	Time-line
	Liaison office, Laurentian International, and the Center for Academic Excellence.		
	Ensure that graduate students are made aware of the Computer Skills workshops provided by the department.	Chair	May 2017

The dean of the faculty shall be responsible for monitoring the Implementation Plan. The details of progress made shall be presented in the Dean's Annual Report and filed with the Vice-President Academic and Provost. The executive summary and the monitoring reports will be posted on Laurentian University's web site.