Ryerson University Graduate Studies

Office of the Vice-Provost and Dean
Yeates School of Graduate Studies

Final Assessment Report and Implementation Plan

Periodic Program Review (PPR)

Biomedical Physics (MSc|PhD)

Last Updated: Dec 08, 2020

FINAL ASSESSMENT REPORT

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 in Biomedical Physics (MSc|PhD). This report identifies the peer review identified 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 also 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

The Biomedical Physics is full-time graduate program with M.Sc. (two years) and Ph.D. (four years) programs and a CAMPEP accredited add-on "Option in Medical Physics". The M.Sc. and Ph.D. programs were launched in 2006 and 2011, respectively, and the CAMPEP Option in 2013. The CAMPEP Option, accredited until December 31, 2022, is the only CAMPEP accredited program in the Greater Toronto Area. In addition, Ryerson University has the distinct advantage of being located in close proximity to world-class teaching hospitals and research institutions. The graduate program has 13 full time and 27 adjunct YSGS faculty members from Ryerson University, Sunnybrook Health Sciences Centre (SHSC), Princess Margaret Hospital (PMH) and St. Michael's Hospital (SMH), and inter-institutional agreements with Sunnybrook Health Sciences Centre (2015), Sunnybrook Research Institute (2016), and St. Michael's Hospital (2013 - Ryerson University partnered with St. Michael's hospital to form iBEST, the Institute for Biomedical Engineering, Science and Technology). The Biomedical Physics graduate program's focus is on physics-based concepts and methodologies such as medical imaging, radiation therapy, radiation protection and dosimetry with translatable potential applications in the medical and health fields. The Biomedical Physics graduate program specifically fits within Ryerson University's mission statement within the two major themes of Ryerson University's Strategic Plan: Technological & Industrial Innovation and Health & Well-Being, which continue to be part of the strategic plan for Ryerson University.

The Biomedical Physics Graduate Program offers four degrees: MSc and PhD in Biomedical Physics, and with CAMPEP Medical Physics Option. The curriculum consists of core required and core elective graduate courses. The CAMPEP Option has additional milestones based on the CAMPEP accreditation. The program successfully delivers the Graduate Degree Level Expectations (GDLEs) associated with the following learning outcomes: (1) The depth and breadth of knowledge in biomedical physics foundation, specialized areas, interdisciplinary knowledge and safety; (2) Research and scholarship in critical evaluation, scientific inquiry, research, data analysis, interpretation and initiative; (3) Application of knowledge in problem solving, practical application and clinical/health sense; (4) Professional capacity/autonomy in time management, cooperation and professional behaviour; (5) Levels of communication skills in written communication, oral communication, accurate inquiry and constructive response; and (6) Limits of knowledge. The program achieves the learning outcomes through coursework (lectures, labs, projects and tests), thesis research project (dissertation and defense),

experiential learning activities such as clinical shadowing, workshop and job shadow through the Industry Insights and Navigating Networks, and collaborations with industrial partners, scientific conferences, interaction with faculty members through supervision and supervisory committee meetings, colloquia, and commercialization activities at Biomedical Zone at iBEST. The Learning Outcomes are generally met at the proficient level. The graduate student and alumni surveys showed an agreement with achieving the learning outcomes. In addition, the alumni indicated an excellent satisfaction with their overall experience at Ryerson University.

The graduate program is well positioned to meet societal needs related to applications based on the principles of biomedical physics. The Biomedical Physics Graduate Program is the only CAMPEP accredited program in the Greater Toronto Area out of the 13 CAMPEP graduate programs in Canada; there are only two other CAMPEP accredited programs in Ontario. This accreditation has resulted in additional interest that would not otherwise exist and the CAMPEP Option has been popular among our graduate students and students from outside the University. In addition, Ryerson University is located within the vicinity of major cancer centres and teaching/research hospitals and the graduate program has successfully established inter-institutional agreements with Sunnybrook Health Sciences Centre and St. Michael's Hospital. The graduates from the program found employment within a few months within the biomedical physics field with high career satisfaction. In addition, the program has high demand both nationally and internationally.

The Biomedical Physics graduate program is well supported by the Department of Physics, three technical officers, a Graduate Program Administrator, and laboratory and computer resources. The graduate students are provided with office space and personal computers. The main research facilities of faculty members, located at Kerr Hall in the main campus of Ryerson University and iBEST (Institute for Biomedical Engineering Science and Technology) at St. Michael's Hospital, are: Advanced Biomedical Ultrasound Imaging and Therapy Laboratory; Optical Spectroscopy Laboratory; Biomicroscopy and Cellular Imaging Laboratory; Biological Systems and Cell Culture Laboratory; Photo-acoustics Laboratory; Biomedical Optics Laboratory; X-ray Fluorescence Laboratory; Innovative Nuclear Medicine and Radiation Metrology Laboratory; Radiochemistry & Nanotechnology Laboratory; Ultrasound Contrast Agent Laboratory; Quantitative Advanced Image Analysis Laboratory; and X-ray Imaging Laboratory. In addition, the program is financially supported by YSGS and the Department of Physics. The graduate program and faculty members has published ~400 papers and achieved ~4500 citations over the eight

years; ~50 papers and ~30 conference proceedings per year. The total funding awarded to the 13 core faculty members is ~$10.5 million.

This is the first Periodic Program Review of the Biomedical Physics Graduate Program. The program has undergone a rapid growth over the last eight years. Based on the SWOT analysis, the program's strengths include the high quality of faculty members and their research programs, graduate student life and sense of community, the quality of the courses and curriculum, the employment opportunities and career satisfaction, and overall support by the program and faculty members. A main weakness within the program is the balance of course work and thesis project specifically students in the MSc CAMPEP Option. The main opportunity identified is the development of a new program in the Physics of Complex Systems; this will strengthen the existing program and expand the research scope and expertise within the graduate program. As such, the graduate program degree names will be proposed to change to MSc and PhD in Physics with three fields (Biomedical Physics, Biomedical Physics with CAMPEP and Complex Systems). The only threat to the graduate program is the cost of living in the Greater Toronto Area.

The priorities of the graduate program recommendations and implementation plan is to develop a new field in Complex Systems, and change the program name from "Biomedical Physics" to "Physics" with the fields of Biomedical Physics, Biomedical Physics with CAMPEP Option, and Complex Systems. In addition, the course requirements for each of the fields will be reviewed especially for students aiming to complete the CAMPEP Option. The topic of artificial intelligence and its applications within the Biomedical Physics field will be implemented within the graduate program. Furthermore, the program will initiate activities to improve applicant quality, and implement an online Graduate Student Tracking System to track student progress. Lastly, the program will identify ways to enhance the financial situation of graduate students in the program based on cost of living in the Greater Toronto Area.

PERIODIC PROGRAM REVIEW AND PEER REVIEW TEAM

Biomedical Physics (MSc|PhD)

The graduate program in Biomedical Physics (MSc|PhD), Faculty of Science (FOS), submitted a Self-Study Report to the Yeates School of Graduate Studies that outlined program descriptions and learning outcomes, an analytical assessment of the program, program data including data from student surveys and the standard data packages. Course outlines and CVs for full-time faculty members were also appended.

The appraisal committee had a 2-day virtual site visit and included interviews with the University and Faculty Administration including the Provost and Vice-President Academic, Faculty Dean and Associate Dean, Vice-Provost and Dean Yeates School of Graduate Studies (YSGS); Associate Dean YSGS, Graduate Program Director of the Graduate Program, and meetings with Faculty, a group of current students, and support staff.

The Peer Review Team (PRT) for the Periodic Program Review (PPR) consisted of Dr. Anne Martel (University of Toronto), Dr. Rowan Thomson (Carleton University) and Dr. Dimitri Androutsos (Ryerson).

The PRT site visit was conducted on June 2nd-3rd, 2020. The PRT report was communicated to the Associate Dean, YSGS on July 13, 2020, and the response to the report from the graduate program and Faculty was submitted on Oct 1, 2020.

PROGRAM STRENGTHS, WEAKNESSES, AND OPPORTUNITIES

The Peer Review Team identified program strengths, weaknesses and opportunities for program improvement and enhancement, outlined below.

Strengths

- Feedback from the engaged students from the on-site visit as well the survey was positive.
- Faculty are active and engaged in relevant research areas
- Strong connections with research institutes across city exist
- Offers the only CAMPEP program in GTA which is advantageous for recruitment

Weaknesses

- Student funding is not competitive with other (competing) institutions, nor is it adequate for cost of living
- There are concerns with the quality of applicants to the program. The quality of the applicant pool has room for improvement; for example, some students have a limited background from previous (e.g. undergraduate) study or an inappropriate skill set for research project(s).

Opportunities

- The new “Complex Systems” programs offers opportunities to broaden department expertise, attract new funding, engage in new collaborations, and build bridges with other departments/units at Ryerson.

PRT RECOMMENDATIONS

The PRT made a total of 7 recommendations listed below. For clarity, the response in the following tables is provided using the same numbering.

1. Consider ways to reduce workload for the MSc with CAMPEP option.
2. Look for mechanism to increase stipends.
3. Consider how to collaborate and work with other units to fully realize the potential of the new Complex Systems area in Physics.
4. Consider coordination with other departments with common interests in order to offer courses in the area of Artificial Intelligence.
5. Consider changing restrictions on # of courses in degree that are in physics and modifying required courses to allow greater flexibility.
6. Consider methods to provide further guidance to graduate students (e.g. website, FAQ) on subjects such as expectations regarding candidacy exam and committee meetings, complaint-resolution process (who to direct complaints to).
7. Adopt additional EDI training/activities to support further development of EDI in Physics Dept amongst students, faculty and staff.

Summary of PRT Recommendations with Graduate Program, Faculty Dean, and YSGS Responses + Implementation Plan

ACADEMIC RECOMMENDATIONS

PRT Recommendation	BP Program Response	FOS Faculty Dean Response	Action Items	Timeline & Responsibility/Lead	YSGS Response
Recommendation 1: Consider ways to reduce workload for the MSc with CAMPEP option.	The program has reduced the course workload for the CAMPEP Option through a major curriculum modification proposal.	The reduction of the course workload as part of the curriculum modifications have resulted in adequate changes.	No action	Approved by the Senate in May 2020.	YSGS commends the program for initiating changes to its curriculum in anticipation of this recommendation.
Recommendation 3: Consider how to collaborate and work with other units to fully realize the potential of the new Complex Systems area in Physics.	Through existing and potential collaborations within Ryerson and with St. Michael and Sunnybrook hospitals, the program will expand the potential of the new Complex Systems area in Physics.	The Dean's office and the Associate Dean Research and Graduate studies will assist the Graduate Program and Department in developing the relevant links to ensure productive collaboration.	Invite speakers to our graduate seminar colloquia; and expand on adjunct memberships.	Develop a list of topics/researchers and invite during 2020-2021 academic year.	YSGS fully supports the plans and is happy to assist in these, in necessary. The program should also look into ways to collaboratively deliver the courses related to Complex Systems by offering the courses to students in other programs and/or involving faculty members from other programs in the delivery of these courses. Doing this could also increase the efficiency in delivering these courses.
Recommendation 4: Consider coordination with other departments with common interests in order to offer courses in the area of Artificial Intelligence.	The Curriculum Committee is tasked with identifying the topics of Artificial Intelligence to be incorporated into the program.	The Dean's office and the Associate Dean Research and Graduate studies will assist the Graduate Program and Department in identifying opportunities in other Departments (e.g. Computer Science) at the GPD meetings, and other faculties (e.g. FEAS) through discussions with Associate Deans Graduate studies of other faculties.	Task the committee with assessing and developing a plan for incorporating AI into the graduate program through a course.	2020-2021 academic year.	YSGS fully supports the plan by the program and the Dean's office. This plan could be broadened to help address recommendation 3 above.

PRT Recommendation	BP Program Response	FOS Faculty Dean Response	Action Items	Timeline & Responsibility/Lead	YSGS Response
Recommendation 5: Consider changing restrictions on # of courses in degree that are in physics and modifying required courses to allow greater flexibility.	The program will maintain the requirement that the students are allowed to take at most one elective course outside the department, and address cases of students wishing to take two courses from outside the program on a one-on-one basis.	The graduate program has recently had a thorough and careful look at the curriculum, and will address cases where greater flexibility is required on an individual graduate student basis.	No action		YSGS is generally in support of greater electivity for students but agrees that the current ability for a student to take one course from outside the program adequately addresses this concern. This concern could be further addressed by collaborative delivery of courses with other programs.

ADMINISTRATIVE AND FINANCIAL RECOMMENDATIONS

PRT Recommendation	BP Program Response	FOS Faculty Dean Response	Action Items	Timeline & Responsibility/Lead	YSGS Response
Recommendation 2: Look for mechanism to increase stipends.	The aim of the program is to increase and maintain the minimum funding from $22,000 and $26,000, to $26,000 and $30,000 for the MSc and PhD students, respectively. This will be done by increasing the supervisor stipend, and obtain financial support from the Department and Faculty.	The Dean / Associate Dean have been actively advocating for funding for graduate students and will continue to do so. This advocacy has resulted in recent changes, such as 4th year funding for Ph.D. students. Moreover, the Dean introduced FOS funding specifically for graduate studies support in 2016/7 to help the graduate programs to support their students. In 2021, a faculty-wide initiative will revisit the funding formula for all FOS graduate programs, where further strategies and approaches will be explored.	Discuss the funding formula with the Department Chair and the FoS Dean/Associate Dean and assess feasibility in implementing the new minimum funding.	2020-2021 academic year	YSGS continues to advocate for increased student funding and reduced graduate program tuition. Noting that graduate student funding from the University is currently significant, it encourages the program to look into ways to increase contributions from other sources and further support supervisors in competing for external research funding.
Recommendation 6: Consider methods to provide further guidance to graduate	Procedures and tasks associated with completion requirements including plan of study, progress reports, supervisory committee	The tracking system developed by the Department, combined with recent changes in Policy and	Develop a “Graduate Roadmap” incorporating training on time-	2020-2021 academic year	The new online graduate progress tracking system is an excellent initiative from the program. YSGS also encourages the program to continue to educate students on the program’s

PRT Recommendation	BP Program Response	FOS Faculty Dean Response	Action Items	Timeline & Responsibility/Lead	YSGS Response
students (e.g. website, FAQ) on subjects such as expectations regarding candidacy exam and committee meetings, complaint-resolution process (who to direct complaints to).	meetings, candidacy examinations and thesis defenses are provided to the students within the first week of their degree. A new online graduate tracking system has been developed and implemented within our graduate program where each of these tasks and processes are implemented for every student and their supervisor. In regards to procedures such as complaint-resolution, the "Graduate Supervision Guidelines" document is posted on the YSGS website.	Procedures (Policies 164), will allow the graduate program to better focus on procedures and tasks associated with monitoring the progress and completion requirements. The graduate program is encouraged to examine these Policy changes (effective on September 1, 2020) and harmonize their processes, as well as terminology, with these changes. The development of the "Graduate Roadmap" will assist students in navigating the processes, including complaint-resolution.	management, meeting-preparation and conflict resolution.		expectations and on all available options for complaint resolution.
Recommendation 7: Adopt additional EDI training/activities to support further development of EDI in Physics Dept amongst students, faculty and staff.	Ryerson University provides training on EDI; https://www.ryerson.ca/equity/. Faculty members who were part of the Departmental Hiring Committee (DHC) were required to complete some EDI training. Currently, the program is incorporating EDI training as part of the "Graduate Roadmap" platform.	The Graduate program is also encouraged to incorporate training sessions for students, and work with the Dimensions Faculty Chair (DFC) for the Faculty of Science (FoS) in supporting the relevant initiatives. As part of a larger Faculty of Science initiative, the Graduate program will be encouraged to engage with EDI related events.	Incorporate EDI training into the "Graduate Roadmap". Consultations are in process to incorporate EDI training, such as grant writing with EDI lens, by the ECI Office.	2020-2021 academic year	The benefits of diversity in research and education are tremendous. Therefore YSGS is eager to help in any way it can to create an promote, recruit and retain diverse student, faculty members and staff. The program can encourage its students to apply for internal and external scholarships/awards that are aimed at increasing diversity, such as the recently launched YSGS awards aimed at Black and Indigenous graduate students.

A report on the progress of these initiatives will be provided in the Follow-up Report which will be due in one year from the date of Senate approval.