

Implementation Plan: Department of Mathematics and Statistics

The Department of Mathematics and Statistics offers undergraduate (Minor in Mathematics and Statistics, BA or BSc Major in Mathematics and Statistics, BA or BSc Joint Major in Mathematics and Statistics and Computer Applications, BA or BSc Specializations in Actuarial Mathematics/Finance, and Mathematical and Computational Finance and BA or BSc Specializations and Honours in Actuarial Mathematics, Pure and Applied Mathematics, and Statistics) programs including Co-op options in the BA or BSc honours or specialization programs. The Department also offers graduate programs (MA or MSc and PhD and a Master of the Teaching of Mathematics) and fosters research across a wide-range of areas including actuarial mathematics and mathematical finance, analysis, partial differential equations and applied mathematics, dynamical systems, mathematical physics and differential geometry, number theory and computational algebra, statistics and probability and mathematics education. Moreover, the Department provides instruction in mathematics and statistics to students in the Faculty of Engineering and Computer Science and the John Molson School of Business in addition to its important role in the Faculty of Arts and Science.

When this appraisal was initiated, the complement of faculty and staff responsible for delivering these academic and research programs included 34 tenure-track faculty members (including one Canada Research Chair and one Concordia University Research Chair), four faculty holding Limited Term Appointments (LTAs), 17 part-time faculty, five professors emeriti, six affiliate professors, three administrative program assistants, an assistant to the Chair, a computer consultant, and a department administrator. In addition to two computer labs dedicated to undergraduate and graduate teaching, many researchers in the Department are affiliated with the Centre de recherches mathématiques (CRM), a centre of excellence supported by federal and provincial research agencies, with the head office at the Université de Montréal. The Department is recognized as a Centre of Actuarial Excellence and its actuarial programs are accredited by the Society of Actuaries, the Casualty Actuarial Society and the Canadian Institute of Actuaries. The Department also is a partner (one out of eight institutions in the world and the

only one in North America) in the ALGANT graduate program established by the European Union.

Within its Objectives, the Department of Mathematics and Statistics expresses its desire to provide “*the general mathematical culture necessary for training those who will either be using the tools of mathematics or statistics in their work or who will become future mathematicians or statisticians*”. To achieve these goals, the Department uses a combination of classroom teaching and experiential learning approaches including practical training for students in actuarial mathematics, work study experiences through their extensive Co-op offerings and research opportunities in areas as diverse as applied probability, computational algebra, differential geometry, dynamical systems, mathematical physics, mathematics education, number theory and statistics. The Department also offers instruction at introductory levels to reach out to students with limited mathematical background. Given the importance of mathematics and statistics “*in many different areas including business, computer science, engineering, medicine, social and natural sciences*” these offerings enable students to pursue other University level programs.

Research success within the Department of Mathematics and Statistics is evidenced by funding from provincial and federal sources and national and international awards presented to faculty members and students. The quality of the research is apparent in the success of faculty and students in publishing their research in quality international peer-reviewed journals. In order to maintain and advance the Department of Mathematics and Statistics a number of suggestions have been presented as a part of this appraisal process. These suggestions can be grouped into broad but interrelated areas: undergraduate education, graduate education, and the direction of the department. The Faculty of Arts and Science has reviewed the Department Appraisal Committee’s, External Examiners’ and University Appraisal Committee’s reports and provides the following recommendations based on these reports.

Undergraduate Education

Recommendation 1: As suggested by the Department Appraisal Committee and echoed in the External Examiners’ and the University Appraisal Committee’s reports, the Department needs to

complete a curriculum review to more clearly define program learning objectives and expected outcomes. This process is particularly relevant for some programs, *e.g.*, the Major in Mathematics and Statistics, but all programs would benefit from a thorough review. As a part of this process, the Department could explore the reorganization of programs to allow modifications to incorporate courses stressing more emphasis on applied mathematics in the context of the 21st century or those expanding the computing component. This reorganization should include the streamlining of existing programs and the idea of orientations within programs rather than the development of additional new programs. All of these processes can be initiated immediately in the context of the current University Strategic Planning exercise and a draft proposal prepared by the Fall of 2016. These discussions should include the Chair, the Associate Chair, the Departmental Curriculum Committee, the undergraduate and actuarial program directors, and the Associate Dean, Academic Programs.

Recommendation 2: The Department must work toward enhancing the student experience for undergraduate students. This should include continued efforts to improve student advising, registration and the coordination and scheduling of courses. Combined with the curriculum review in recommendation one, this will allow for a smoother flow of students through their programs and should help increase retention. Departmental advisors can contact Student Academic Services to explore best practices for academic advising. They also should explore what other options are available to assist the students and aid retention. For example, the Department may be able to work with student services to develop new student orientation sessions. The existing Teaching Committee should be encouraged to address issues of consistency among multi-sectional courses and course delivery methods (including on-line delivery). Faculty members should continue to be encouraged to work with the Centre for Teaching and Learning (CTL) to improve the quality of their course delivery. Finally, Career and Placement Services can help in organizing career fairs for students to help highlight career options. As suggested by the External Evaluators, offering a full summer program would help Co-op students in scheduling and moving through their programs. This also may help to expand the Co-op program. Developing on-line versions of some multi-section (*e.g.*, service) courses and courses which serve as bottlenecks in specific programs (*e.g.*, MAST 217) would provide students with increased opportunities to take these courses in an orderly manner such that they

could progress efficiently through their programs and take courses in the required sequence. This process should be initiated immediately so that the effectiveness of any changes can be assessed at the Biennial Progress Report.

Recommendation 3: Student consultation should be included more directly in the processes of curriculum planning and course delivery. This should include adding undergraduate student representation to the curriculum committee and surveying graduates to determine what career paths they have followed and how their programs prepared them for these. This can be initiated immediately. An appropriate survey can be developed with the assistance of Advancement and Alumni Relations and should be released by September of 2016.

Graduate Education

Recommendation 4: The Department must promote existing funding opportunities and continue to work with the Associate Dean, Research and Graduate Studies in the Faculty and with the School of Graduate Studies to improve funding packages for graduate students, *e.g.*, by increasing tuition remissions for international students, or by increasing the number of teaching assistantships for students. In addition, researchers in the Department must continue to pursue all available research funding opportunities as support from research grants remains an essential part of student funding. Taken together this will enhance the Department's external research profile and will allow the Department to develop improved funding packages for students containing more research funds. Increasing the number of on-line courses would provide additional opportunities for teaching assistantships. More funding opportunities will both optimize the potential for student recruitment and benefit current students. In terms of recruitment, the Department also should place an increased emphasis on trying to recruit local students. This should be initiated immediately for assessment in the Biennial Progress Report.

Recommendation 5: A graduate student representative must be added to the Department Curriculum Committee to bring the concerns of the graduate students to curriculum planning at the graduate level. This can be initiated immediately.

Recommendation 6: The Department must assess whether an MA/MSc program with and without thesis options is appropriate. Both options are rather course-intensive and fewer courses should reduce time to completion and allow students to invest more time advancing the research goals of the Department. These discussions could be initiated immediately with the Chair and the Graduate Program Director and the Department Curriculum Committee and involve the Associate Dean, Academic Programs in the School of Graduate Studies. A proposal based on these discussions, should be made available in November 2016.

Direction of the Department

In the context of this departmental appraisal exercise there is an opportunity to reflect on the Department in the on-going University Strategic Planning process.

Recommendation 7: The Department must define a strategic plan that sharpens its identity and plan for the future. This will impact student recruitment, faculty hiring and course offerings. These discussions should begin in the Department and could be part of the University Strategic Planning exercise. The Department can consult with the Associate Dean, Academic Programs, and the Associate Dean, Research and Graduate Studies in the Faculty and with the School of Graduate Studies as necessary. This can be initiated immediately within the University Strategic Planning Exercise and be completed by November 2016.

Recommendation 8: The Department must develop and update a Department Hiring Plan to highlight areas of need and the future direction of the Department. This plan should include the place and role of Tenure Track and Extended Term Appointment positions in the research and teaching goals of the Department. This can be integrated into the Department's strategic vision. Given the time-line of the on-going University Strategic Planning exercise this could be produced by November 2016.

Recommendation 9: The Department requires a Space Plan. This plan should include aspects of graduate student space, classrooms, computer facilities, the organization of existing space and space constraints associated with expanding the department (*e.g.*, for housing new hires and

additional graduate students). Again this can be developed in concert with the Department's strategic plan (recommendation 7). The development of this plan can be carried out by the Chair, the Associate Chair and the Associate Dean, Planning and Academic Facilities for November 2016.