**Undergraduate Program in
Applied Mathematics
Final Assessment Report**

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| **Faculty / Affiliated University College** | Science |
| **Degrees Offered** | Bachelor of Science (BSc) |
| **Modules Reviewed** | Honors Specialization – Applied Mathematics<br>– Mathematical Sciences<br><br>Specialization – Applied Mathematics<br><br>Major – Applied Mathematics<br>– Applied Mathematical Methods<br>– Scientific Computing and Numerical Methods<br>– Theoretical Physics<br><br>Minor – Applied Mathematics<br>– Applied Mathematical Methods |
| **External Consultants** | Dr. Bartosz Protas, Professor, Professor and Associate Chair (Graduate), Department of Mathematics & Statistics, McMaster University<br><br>Dr. Raymond Spiteri, Professor, Department of Computer Science and Department of Mathematics & Statistics, University of Saskatchewan |
| **Internal Reviewers** | Dr. Michael Bartlett, Associate Dean (Undergraduate Studies), Faculty of Engineering |
| **Date of Site Visit** | 07 March 2017 |
| **Evaluation** | Good Quality |
| **Approval Dates** | SUPR-U: May 24, 2017<br>SCAPA: May 31, 2017<br>Senate: June 9, 2017 |

**Executive Summary**

The visitors met with: (1) the Vice Provost (Academic Programs and Students) and the Vice-Provost (Academic Planning, Policy and Faculty); (2) the Chair of the Applied Mathematics Department; (3) the Associate Dean (Academic) of the Science Faculty; (4) five undergraduate students; (5) the current and immediate past Associate Chairs (Undergraduate); (6) the Applied Mathematics Office Staff; (7) the Undergraduate Affairs Committee; and, (8) informally with faculty.

The core undergraduate mission of the Applied Mathematics Department is to provide service teaching to the Engineering, Medical Science and other undergraduate programs. This accounts for roughly 90% of the teaching provided by the Department – the effort devoted to the Undergraduate Program in Applied Mathematics is only the remaining 10%. The consultants heard that the various external stakeholders are generally very satisfied with the quality of the service courses. They noted, however, that “there is little room left for curriculum development and innovation in the Applied Math program” and reported “a sense in the Department that… … it does not receive a commensurate proportion of resources, recognition, and visibility, and this hampers its ability to attract top student talent already at Western in the first years of study”. They further observed that “a slow attrition of the number of faculty available for teaching and the ensuing increased workloads have decreased morale.” The response from the Department, while expressing “agreement with the findings of the external reviewers about our undergraduate programs”,

does not specifically express these issues. The response from the Faculty is that "faculty renewal is essential to the long-term viability of a department, and since the Department has one of the higher teaching loads per faculty member in the Faculty of Science, this will be taken into account in future planning."

The Applied Mathematics program is recognized to offer a "truly interdisciplinary environment" that "despite problems with low visibility, does attract very high-calibre students" who the consultants observe "have a high level of computational literacy", "are successful in international modelling competitions", and "do well in pursuing admission to graduate programs at Western and elsewhere". The consultants recognized "the Department has a culture of involving upper-level undergraduate students in research, and this is reflected in a relatively large number of NSERC Undergraduate Summer Research Assistantship (URSA) awards it offers to its students". The success of the Undergraduate Society of Applied Math (USAM) in organizing the Undergraduate Conference of Mathematical Sciences on 04 March 2017 was also favourably noted.

The consultants identified a number of minor revisions to the program content, including combining Applied Mathematics and Applied Mathematics Methods modules, merging calculus courses, rebranding modules to convey the excitement and marketability of Applied Mathematics training, re-assessing the designation of F/G designations to courses, and building on the Department's participation in the Western Integrated Science program. The Department and Faculty (where appropriate) are generally in agreement with these suggestions.

The students described their experiences in Applied Math very positively, expressing confidence in their level of academic preparation. They suggested that more exposure could be given to the internship opportunities available, and conveyed frustrations about timetable conflicts involving two core courses in one module. Four of the five students we met have plans to pursue graduate studies, and the other, actively seeking employment, felt that the Applied Mathematics degree provided an edge.

Finally, the consultants heard of the plan to merge the Departments of Applied Mathematics, Mathematics and Statistics & Actuarial Science. The staff are strongly in favour but are currently challenged by decentralized office space in the three existing departments. The Faculty has recognized that "creating a centralized space for these staff will be helpful".

**Significant Strengths of the Program**

1. Truly interdisciplinary environment with a number of prominent researchers
2. Very high-quality students, despite problems with low visibility
3. Students are a well-organized and cohesive cohort, as demonstrated by the recent student conference organized by USAM.
4. Graduating students often possess strong computational skills.
5. High degree of student satisfaction with both academic and social aspects of the program.

**Suggestions for Improvement & Enhancement**

1. Raise the visibility and appeal of the Applied Mathematics program by rebranding courses and modules.
2. Carry out minor curriculum revisions including: merging the Applied Mathematics and Applied Mathematics Methods modules; eliminating courses with largely overlapping content (e.g., Calc 2303A/B and Calc 2503A/B); review "essay" courses designated "F/G" to ensure their deliverables involve independent essays; introduce "harder-core" programming at an earlier stage.
3. Create opportunities for students to acquire professional ("soft") skills and better advertise the internship program offered by the Faculty of Science.
4. Play an active role in the Western Integrated Science program.
5. Centralize the staff office space.

**Recommendations Required for Program Sustainability**

| Recommendation | Responsibility |
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| Plan and develop procedures to increase the scope of course offerings and numbers of students in the Applied Math program | Department/Faculty |