



FINAL ASSESSMENT REPORT

Executive Summary

February 2017

Master of Science and Doctor of Philosophy in Modelling and Computational Science

Program Review

Dean: Dr. Greg Crawford

Dean of Graduate Studies: Dr. Langis Roy

Under UOIT's Quality Assurance Framework, all degree programs are subject to a comprehensive review every eight years to ensure that they continue to meet provincial quality assurance requirements and to support their ongoing rigour and coherence.

On the completion of the initial stages of the program review, the self-study brief together with the reviewers' report and the assessment team's response are reviewed by the appropriate standing committee of Academic Council, and are subsequently reported to Academic Council, the Board of Governors and the Quality Council.

In 2014-15 a program review was scheduled for the Master of Science and Doctor of Philosophy in Modelling and Computational Science program.

This is the first program review for this program and the internal assessment team is to be commended for undertaking this assignment in addition to an already challenging workload and within very tight deadlines. The following pages provide the outcomes and action plans resulting from the review, identifying the strengths of the program as well as the opportunities for program improvement and enhancement. A report from the program outlining the progress that has been made implementing the recommendations will also be put forward in eighteen months' time.

External Reviewers: Dr. Jeff Chen (University of Waterloo), Dr. Nicholas Kevlahan (McMaster University), and Dr. Jianhong Wu (York University)

Site Visit Dates: October 29-30, 2015

The Modelling and Computational Science (MCSC) graduate program was developed early in UOIT's history in a collaborative effort of applied mathematicians, computer scientists, physicists, chemists, and engineers. The first cohort for the M.Sc. program started in 2007; the first Ph.D. student enrolled in 2011 and graduated in the summer of 2015.

Significant Strengths of the Program

- The Modelling and Computational Science program is relatively unique in North America offering graduate education that encourages interdisciplinary collaboration among students as well as faculty

- The bi-weekly Modelling and Computational Science seminar is quite successful and is interlaced with the SHARCNet Scientific Computing Seminar
- Graduate faculty maintain active research collaborations with numerous partners nationally and internationally, exposing the students to a broad spectrum of researchers
- Graduates of the Modelling and Computational Science program are succeeding. Some M.Sc. graduates have gone onto doctoral programs in Physics or Applied Mathematics, but most have found employment in industry

Opportunities for Program Improvement and Enhancement

- The program would benefit from a data science position to develop and deliver core courses in statistical and computational competencies.
- Issues with core courses requires revisiting the core courses thoroughly both in terms of the order in which topics are delivered and the topics offered within those courses.
- Promotion of the Modelling and Computational Science program. To date, a number of the best students have heard through word of mouth or blind chance
- Implicit competition between graduate programs for subsidized graduate student spots
- The stress of delivering a quality program with scarce time and resources can lead to faculty burn-out and attrition

The External Review

The program began its first regular program review in the fall of 2014 and an external review was conducted on October 29-30, 2015. The reviewers were asked to provide feedback in two key areas: the assessment of resources, including teaching staff, support staff and laboratory facilities; the assessment of the curriculum. Overall, the reviewers indicated they were “extremely impressed by the high quality and innovative aspects of this graduate program” and recognized in some detail many positive elements of the program that, the faculty, and program supports.

Summary of Recommendations and Responses

Reviewer Recommendation 1:

As a matter of urgency, the Faculty must increase minimum funding to graduate students to a level that allows them to focus on their academic studies without distraction.

Faculty Response

TA-ships cover approximately \$10K for graduate students and faculty members are expected to make up the difference. Funding from NSERC Discovery Grants for faculty in this graduate program is such that faculty struggle to be able to support more than one student at a time. (The fact that several of the faculty have more than two students concurrently is due to the success rate of our students in OGS and NSERC scholarship applications.) The faculty identified a few current students who were getting funded at a level close to the University minimum (\$16K for Masters students, \$18K for PhD students). This was changed so that all students are receiving approximately \$1500 above the minimum or more.

The Office of Graduate Studies is about to introduce a new graduate scholarship program which will provide some matching funds, which will allow for the recruitment of more high quality students. Graduate student scholarships was identified as the highest Faculty of Science funding priority for the Advancement Office.

The challenge for funding for international students is more difficult. A new program is being established whereby, on a competitive basis, one student per Faculty will receive a Graduate International Tuition Scholarship, valued at \$12,000 per year for a maximum of four years. In a few limited cases, external funding (e.g., targeted grants and scholarships) may be available to support international students. Under these circumstances, however, the Faculty will only sporadically be able to attract international students.

Reviewer Recommendation 2:

Students and faculty all strongly supported the non-departmental organization of the Faculty of Science as being beneficial to the Program. This unique structure gives this interdisciplinary program a competitive advantage compared with other comparable programs. We recommend that this structure be retained.

Faculty Response

The Faculty intends to retain this structure for the foreseeable future.

Reviewer Recommendation 3:

The number of required courses (currently 8) for the PhD students should be reduced.

Faculty Response

The faculty presented a proposal through governance to bring down the number of required courses from eight to five to include the three core courses plus the two mandatory PhD level courses. They will further examine how to handle students coming in after having taken one of the core courses already, or equivalent courses in different MSc programs. A number of non-core courses are run as reading courses (including the core PhD courses). The Dean is committed to reviewing with the program faculty the course requirements for the program, class sizes, and workload credit.

Reviewer Recommendation 4:

The course list [should] be shortened to sharpen the focus on priority areas and provide students with a more realistic picture of available courses.

Faculty Response

The Faculty will critically examine the course offerings, and determine which currently listed courses are appropriate and regularly offered. Any required changes will be put through governance for approval.

The reviewers had also suggested the inclusion of stochastic and/or agent-based modelling techniques. One such course has been developed and taught once. The faculty are engaged in a discussion on if, and how, this might fit into the core of the program.

Reviewer Recommendation 5:

The University and this Program would benefit from a minimal presence of faculty in statistics/data science on campus.

Faculty Response

The program could benefit from the presence of a faculty member in the area of statistics (particularly biostatistics) and data science. Funding challenges within the Faculty and the institution suggest it will be at least a few years before that position is filled, but this has been identified as a high priority for when a new hire becomes available.

Reviewer Recommendation 6:

There should be central support for students in this Program who wish to pursue Co-op and Internship possibilities. This is aligned with the University's mission "to provide career-oriented university programs".

Faculty Response

Some students in the program work with industry through funding sources such as MITACS, however there is no formal co-op and internship program options for graduate students. It would certainly align with the University mission. The Faculty will investigate the prospective of offering formal co-op and internship opportunities to students.

Plan of Action

Proposed Action	Timeline	Person/Area Responsible
Review curriculum to: (1) Reduce the number of courses required for PhD; (2) shorten course list; (3) Determine if and how training in stochastic/agent-based modelling techniques might be included; (4) review workload credit	Submission of curriculum revisions, consultation with the Dean: by January 1, 2017	Program faculty/Dean
Review graduate co-op and internship options at other institutions, interpret the market and resource implications, and determine if we should pursue such a program	Completion of review, with recommendations to the Dean by June 1, 2017	Program faculty (in consultation with the Dean)

Due Date for 18-Month Follow-up on Plan of Action: July 2017

Date of Next Cyclical Review: 2022-2023