

Final Assessment Report

Mathematics and Statistics

Graduate and Undergraduate Programs

(reviewed 2017-19)

A. Summary

1. The Department's Self Study was considered and approved by the Senate Academic Review Committee on June 19, 2019.
2. The Review Committee consisted of two external reviewers: Javad Mashreghi (University of Laval) and Grace Yi (University of Western Ontario) and one internal reviewer, Jason Liu (Brock University).
3. The site visit occurred on February 23-25, 2020.
4. The Reviewers' Report was received on March 11, 2020.
5. The Senate Graduate Studies Committee response was received on March 26, 2020.
6. The Senate Undergraduate Program Committee response was received on April 8, 2020.
7. The Department response was received on May 14, 2020.
8. The Dean of Mathematics and Science response was received on May 25, 2020.
9. The Dean of Graduate Studies response was received on May 26, 2020.

This review was conducted under the terms and conditions of the IQAP approved by Senate on May 25, 2016.

Program Outcome Categories:

Based on their knowledge of the discipline, the content of the Self-Study and the interviews conducted during the site visit, the Review Committee gave the programs the following Outcome Categories:

| Program(s) | Excellent Quality | Good Quality | Good Quality with Concerns | Non-Viable |
|------------------------------|-------------------|--------------|----------------------------|------------|
| MSc | X | | | |
| BSc (Honours and Pass) | | X | | |
| BSc (Honours) Co-op | X | | | |
| BSc (Honours) combined major | X | | | |
| BSc (Honours)/BEd | X | | | |
| Minor | | X | | |

Executive Summary:

The Reviewers wrote:

The Department of Mathematics and Statistics shows a good level of involvement in research, supported by the number of publications produced, awards and honours obtained, presentations or participation of national and international conferences, and research funding received by its faculty members. The department has strength in several research areas, including but not limited to, Statistics, Applied Mathematics, and MICA. The co-op program has been very successful; the Statistics program regularly attracts a large number of talented students and creates very successful candidates for higher education and for the job market; students profoundly appreciate the training they receive from MICA. However, despite being a very successful graduate program, the number of enrolment has slightly decreased in the last year or two.

... A central theme, or a common and unified focus, we feel, seems missing in the department as a whole. Finding a viable strategy for the department members to share their views and reach a common ground is crucial for the long term development of the department.

The department is at a critical point in its development, as envisioned by some department members, not only for the lack of three faculty positions to fill, but also in identifying the direction for the program to focus. Any artificial and ultra visionary plan can be counter productive and will not help the advancement of the department. It is important for the department to make the best use of its available resources and showcase its existing strengths. The long term focus of the department should be compatible with the available resources and the department capacity. A strong leadership, implemented by the department chair and the front runners in each stream, should be in place to ensure that the department members work together in a friendly and constructive environment. As a by-product, establishing and articulating a clear long term research vision, which is vital for the future of the department, can be carried out effectively.

B. Strengths of the Program

The reviewers noted the following strengths:

For the bachelor streams, there is a good cycle of courses with a great diversity. Students very much appreciate MICA and the co-op program as well as the Statistics program. Students have many opportunities to collaborate with the faculty members to do research and publish joint papers. Besides those students who were secured in the job market after graduation, a good number of students continued their next level academic studies in other universities in North America. Impressively, one co-op student won the prestigious national award for her outstanding performance in 2019. The Master`s program has been very successful. For a long period, a good number of talented students joined the program and built a successful academic life. Despite the success, there is a slight concern that the enrolment might decline in coming years.

C. Opportunities for Improvement and Enhancement

Recommendation #1

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| Solidify the current Master's program and possibly create a new Master's program |
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The Department stated:

There are two weaknesses in the current MSc program.

One is the loss of a faculty member ... in mathematics, which has had the effect of decreasing the number of students admitted to the mathematics side of the MSc in the past two years because all of the other mathematics faculty are at full capacity with respect to supervision. This problem should be resolved with the hiring of two tenure-track faculty in mathematics this year.

The other is that the three current statistics faculty are overwhelmed in terms of teaching and supervision, because of the resignation of a faculty member... a few years ago and the unexpected retirement of the senior member... this year. Thanks to the successful hiring of a new tenure-track faculty in Data Science and Statistics last year, and the current hiring of another new tenure-track faculty in Statistics, as well as the fact that one of the tenure-track faculty being hired in Mathematics will contribute to Data Science, the pressure on the statistics side of the MSc should lighten considerably.

We expect the number of students admitted to the MSc to increase once these three new hires join the Department.

In addition, two of the new hires this year will contribute to Data Science, which will provide a good foundation for the Department to develop a new MSc program in that area. As soon as the new hires are in place, the Department will proceed with the first stage of planning.

The Dean of Mathematics and Science responded:

I am pleased to see recommendation for a new Master's program, which I discussed with the committee during the site visit. I discussed this program with a faculty member a few months ago, and my understanding is some preliminary work toward the Master's has begun. More progress will be possible when the two new hires in the department and one new hire in the computer science department arrive. I recommend a joint program between these two departments by implementing two streams, one emphasizing on statistical learning and other on artificial intelligence. The course descriptions can be developed soon. This program will compliment the undergrad data science program which I suggested a few years ago and is now awaiting external review.

The Dean's Office agrees with the department that the new hires in the department will solidify the Master's program, and help them accept more students.

The Dean of Graduate Studies responded:

I support the recommendation that the department solidify the current Master's program with the means at its disposal and the support of the Faculty Dean. In planning for any new programs, a Department is encouraged to look at both available resources and claims on those resources, as well as potential demand and implications for existing programs that are the responsibility of the Department.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation.

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| Implementation Plan (1st Priority) | |
| Responsible for approving: | Department |
| Responsible for resources: | Department |
| Responsible for implementation: | Department |
| Timeline: | Dean of Mathematics and Science to report by the end of academic year 2020/21 |

Recommendation #2

Find a strategy to keep track of students' employment information after their graduation.

The Department stated:

This idea has been raised previously in discussions among the current interim Chair, the previous interim Chair, and the incoming Chair. We will move forward with it in the coming academic year.

The Dean of Mathematics and Science responded:

The Dean's Office expects the department to carry out this recommendation as one of its normal duties.

The Dean of Graduate Studies responded:

I support this recommendation and encourage the department to leverage available University resources for assistance.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation.

Implementation Plan (1st Priority)

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| Responsible for approving: | Department |
| Responsible for resources: | Department |
| Responsible for implementation: | Department |
| Timeline: | Dean of Mathematics and Science to report by the end of academic year 2020/21 |

Recommendation #3

Create a collegial environment and adopt a common long term vision for the department.

The Department stated:

We agree that the Department needs to work on these two items. Overall, there is a good level of teamwork in the Department and among the faculty members in each stream.

The Department will continue to improve its Rules of Procedure and recognizes the pressing requirement to improve collegiality. All faculty and staff will be able to provide input to the Rules Committee regarding changes. BUFA and the Office of Human Rights and Equity will be consulted as appropriate.

The Department commits to complete the following concrete actions by April 30, 2021:

- 1) Add and improve some rules so that governance is more transparent, consultative, inclusive and accountable.
- 2) The Department commits to promote and support the University policies for a respectful workplace and collegial behaviour.
- 3) All committees, including the Department Assembly, will keep minutes that will be posted to a Sharepoint folder. All committees will submit to the Department Assembly a report every term on their activities.

The Department over the past year has discussed some important future directions: development of the joint PhD with Computer Science; plans for hiring three new faculty, which is underway now; creation of an MSc in Data Science. We will continue to work towards creating a strong, unified vision for the whole department.

The Senate Graduate Studies Committee stated:

SGSC agrees with R#3 (to create a collegial environment and adopt a common long-term vision for the Department) and R#4 (to create a series of weekly or biweekly seminars) as both can improve the experience of their graduate students.

The Dean of Mathematics and Science responded:

The Dean's Office recognizes that the department has had some problems in maintaining collegiality and a sense of fairness in its operation among the faculty members and staff, but also acknowledges the recent efforts made by the Chair and the members to improve the situations via several meetings. This has resulted in new and improved policies and procedures, as indicated in the department's response above. The Dean's office will monitor the situation closely, and if needed, will provide specific steps and measures to maintain and improve collegial environment within the department.

The Dean's Office expects that once the new hirings are completed, the department will be able to develop a long-term vision. The Dean's Office will work with the department in this regard.

The Dean of Graduate Studies responded:

I support this recommendation since it will assist graduate students to have an enriching graduate experience.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted for consideration. The Committee expects that the Department is best-positioned to determine strategies to improve collegiality and a common vision.

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| Implementation Plan (1st Priority) | |
| Responsible for approving: | Department |
| Responsible for resources: | Department |
| Responsible for implementation: | Department |
| Timeline: | Dean of Mathematics and Science to report by the end of academic year 2020/21 |

Recommendation #4

Create a series of weekly (or biweekly) seminars.

The Department stated:

The Department has discussed this item numerous times in recent years. One main obstacle has been a lack of funds that could be used to bring a diverse range of speakers into the Department, especially under the university-wide budget cuts that took place in the past three years.

Individual faculty members who are hosting research visitors will typically have the visitor give a seminar. These seminars are fairly frequent as the Department has many visitors. We will try to make at least some of these seminars be more at the general level of a colloquium talk rather than at the level of a research seminar.

We will also revisit the Department budget and try to set aside some funding to bring good speakers for colloquium talks.

The Senate Graduate Studies Committee stated:

SGSC agrees with R#3 (to create a collegial environment and adopt a common long-term vision for the Department) and R#4 (to create a series of weekly or biweekly seminars) as both can improve the experience of their graduate students.

The Dean of Mathematics and Science responded:

The Dean's Office fully expects the department to carry out this recommendation. Seminars by invited speakers as well as department members are an important instrument of providing the intellectual environment and development needed for students in both graduate and undergraduate programs. The Department severely lacks [in] this area since its inception, I would guess.

The Dean of Graduate Studies responded:

A seminar series is always helpful to graduate students. I support this recommendation. Perhaps, a remote series might be investigated if matters of cost are paramount.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation.

Implementation Plan (1st Priority)

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| Responsible for approving: | Department |
| Responsible for resources: | Department |
| Responsible for implementation: | Department |
| Timeline: | Dean of Mathematics and Science to report by the end of academic year 2020/21 |

Recommendation #5

Increase the visibility of department at the provincial and national level.

The Department stated:

The Department successfully hosted the Statistical Society of Canada meeting in 2016.

Two international conferences in areas of Mathematics have also been hosted at the Department in the past five years.

We will look for opportunities for faculty members to be nominated for external awards. The success of such nominations will be fostered by continuing the strong record of nominating our members for Brock teaching, research, and service awards. We have received a large number of these awards in the past five years.

The Senate Graduate Studies Committee stated:

R#5 (increase the visibility of department at the provincial and national level) can improve employability of graduate students.

The Dean of Mathematics and Science responded:

The Dean's Office is satisfied with the departmental efforts to maintain a provincial and national level visibility, and expects such efforts to continue. The Dean hosted the International Conference on Management Science and Engineering Management in August 2019, which was highly successful and brought international researchers in mathematics, computer science, and engineering to Brock, serving to enhance Brock's visibility.

The Dean of Graduate Studies responded:

I support this recommendation since it will assist graduate students to have an enriching graduate experience.

ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee expects that the Department is best-placed to determine strategies to increase the visibility of the Department.

Implementation Plan (1st Priority)

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| Responsible for approving: | Department |
| Responsible for resources: | Department |
| Responsible for implementation: | Department |
| Timeline: | Dean of Mathematics and Science to report by the end of academic year 2020/21 |

Recommendation #6

Engage a Canada Research Chair, Tier II, in Data Science

The Department stated:

This kind of initiative requires approval from the Dean and the VP and takes place in a competitive FMS-wide context. In the last rounds of CRC hirings at Brock, the VP Research played a large role in selecting areas in which CRC positions would be considered.

Nevertheless, if the Department decides for future hiring and growth to move further into the area of Data Science, then a CRC position would be a natural element in an overall strategic plan.

The Senate Graduate Studies Committee stated:

R#6 (engage a Canada Research Chair, Tier II, in Data Science) may also strengthen the MSc program; however, SGSC cannot comment on resources such as CRC allocation.

The Dean of Mathematics and Science responded:

The Dean's Office will keep this matter under active consideration, and as well as considering a CRC Chair Tier I, in Data Science.

The Dean of Graduate Studies responded:

This is not within the purview of the Dean of Graduate Studies, however, the presence of a CRC is of great benefit to graduate students.

ARC Disposition of the Recommendation

ARC considers the recommendation to be not accepted as it lies outside the jurisdiction of the Committee. However, the Committee recognizes that the Department is open to the possibility and encourages any efforts to advocate through normal channels for such a position.

Implementation Plan

Recommendation not accepted.

D. Summary of Recommendations:

First Priority:

Recommendations 1,2,3,4,5

Not Accepted:

Recommendation 6