

Final Assessment Report

Mathematics/Business Administration, Mathematics/Chartered Professional Accountancy, Mathematics/Financial Analysis and Risk Management (BMath)

May 2019

Summary of the Program Review:

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 Bachelor of Mathematics in Mathematics/Business Administration, Mathematics/Chartered Professional Accountancy (CPA), and Mathematics/Financial Analysis and Risk Management (FARM) delivered by the Faculty of Mathematics. Together, these programs are commonly referred to as Math Business and Accounting Programs (MBAP). A self-study (Volume I) for the programs was submitted to the Associate Vice-President, Academic on July 1, 2016. This self-study presented the program descriptions and learning outcomes, an analytical assessment of the programs, including the standard data package prepared by the Office of Institutional Analysis & Planning (IAP). The CVs for full-time faculty members associated with each program were included in Volume II of the self-study.

Two arm's-length external reviewers were selected from Volume III of the self-study. Dr. Mohammad Ahsanullah, Professor of Information Systems and Supply Chain Management, Rider University, and Dr. Mahmoud Zarepour, Professor of Mathematics and Statistics, University of Ottawa were ranked and selected by the selected by the Associate Vice-President, Academic, as well as, one internal reviewer, Dr. Anna Esselment, an Associate Professor in Political Science.

Reviewers appraised the self-study documentation and conducted a site visit to the University on December 1st and 2nd, 2016. The visit included interviews with the Associate Vice-President, Academic; Dean of Mathematics; Associate Dean of Mathematics; Chairs and Directors of the Departments supporting the programs being reviewed; faculty members; staff, and meetings with a group of current undergraduate students. The reviewers also met with a representative from the library, and Co-operative Education.

This final assessment report is based on information extracted, in many cases verbatim, from the self-study, the external reviewers' report and the program response.

Program characteristics:

Bachelor of Mathematics in Business Administration (BMath)

The Math/Business Administration program is offered by the Faculty of Mathematics, in co-operation with various academic units from other faculties at the University of Waterloo (Waterloo) and the School of Business and Economics at Wilfrid Laurier University (Laurier). This program provides an opportunity to combine courses in actuarial science, computer science, optimization, and statistics with courses in accounting, business, economics, human resource management, and management sciences. Graduates are well prepared to use sophisticated analytical techniques in the solution of business-related problems and adapt to the rapidly changing modern business environment.

Bachelor of Mathematics in Chartered Professional Accountancy (CPA)

The Math/CPA program is offered by the Faculty of Mathematics, in co-operation with the School of Accounting and Finance. This program combines mathematics with accounting and business-related disciplines while giving students the opportunity to gain up to 16 months of CPA-approved work-experience through co-op work terms.

The Honours Mathematics/CPA plan provides an opportunity for studies in areas of mathematics including actuarial science, computer science, optimization, and statistics combined with an extensive professionally oriented sequence of accounting courses. Graduates are well prepared to play a leading role in the increasingly important development and utilization of computer-based accounting information systems, the analysis of the information provided by such systems and the subsequent decision-making processes, and allocation of resources so crucial to an organization's success in the modern business world.

Bachelor of Mathematics in Financial Analysis and Risk Management (FARM)

The Math/FARM program offered by the Faculty of Mathematics, with required business courses being taught by professors in the School of Business and Economics at Wilfrid Laurier University. It is designed for students who are interested in working in finance, banking, insurance, or industrial firms in financial analysis or risk management. The two specializations available, Chartered Financial Analyst (CFA) and Professional Risk Management (PRM), provide excellent preparation for the required professional examinations necessary for those designations.

Summary of strengths, challenges and weaknesses based on self-study:

Bachelor of Mathematics in Business Administration (BMath)

Strengths

- **Program Success:** The program has a long history with many successful graduates. It continues to be in high demand, drawing a consistent number of high quality applicants from around the world.
- **Uniqueness of Employability:** The combination of math and business is a program that is unique to Waterloo, from a North American perspective. The program is well received by employers, with high co-op placement and employment rates; it provides great flexibility for students' job applicability, with employment capacity in all areas of business (finance, marketing, HR, IT, etc.).

Challenges

- **Perception:** There is a perception that the program is for academically challenged students; it is seen as second-tier behind other programs offered by the Faculty of Mathematics.

Weaknesses

- **Community:** There are no social programs nor a student association for students enrolled in the program.

Bachelor of Mathematics in Chartered Professional Accountancy (CPA)

Strengths

- **Employability:** Students gain up to 16 months of quality work experience and are provided a direct pathway to CPA designation, resulting in a mathematical and quantitative background that is highly desired by employers.
- **Quality of Students:** Math/CPA has the reputation of an elite program, and continues to attract a large number of exceptional students. It has one of the most competitive admission processes at Waterloo, requiring high school averages in the low- to mid-90's.

Challenges

- **Continuous Improvement:** Ensuring that Math/CPA continues to meet the evolving goals, objectives, and standards of the Faculty of Mathematics, the School of Accounting and Finance and the accreditation authority, CPA Canada.
- **Communication:** Maintaining constant open communication and co-operation between SAF and the Faculty of Mathematics to ensure consistency of CPA-related information, content, and opportunities provided to students in the AFM and Math/CPA programs.

Weaknesses

- **Rigidity:** The high number of required courses allows for no unrestricted electives and little flexibility in students' schedules. Students may pursue most Faculty of Mathematics minors, but are not able to pursue minors or additional plans outside the Faculty without taking extra courses and/or additional academic terms.

Bachelor of Mathematics in Financial Analysis and Risk Management (FARM)

Strengths

- **Community:** Many students in the program are passionate about and are strong advocates for the program, since many are generally interested in a career in the field. Student clubs are well attended and supported by the student body. There is a strong connection between the faculty and the FARM Student Association (FARMSA); the Program Director is the sponsor for the club and regularly consults with the club's executive.
- **Co-operative Education:** There is a high proportion of students in the co-op program who are considered to be excellent or outstanding by their co-op employers, a figure that continues to increase since the program's inception.

Challenges

- **Perception:** The program has been almost too successful in building buzz amongst parents and influencers in the lives of applicants, such that many students apply without an interest in the subject matter. The pressure to make money supersedes the student's need to have a personally fulfilling career.

Summary of key findings from the external reviewers:

In general, these programs are distinctive in the sense that students graduate with a degree in Mathematics, but have also taken a heavy load of business courses. Students who graduate from this program appear to be well equipped to pursue employment in their field. It is therefore clear that these programs are not only well known to employers but also prepare their graduates through a rigorous and unique curriculum.

Program response to external reviewer recommendations:

Recommendations

1. It is highly recommended that the Faculty takes the matter pertaining to the Mathematics and Business administration programs into serious consideration. The Faculty must pursue formalizing the unit in some fashion. This could best be achieved by transforming it into its own academic unit or department, or perhaps as a division of another department. Considering the uniqueness of these multidisciplinary programs, the Department of Mathematics and Business Administration could have an integrated complement of faculty members, some of whom would be dedicated to teaching (or teaching tenure track stream) and others who would both teach and research in the field of math and business. Hiring research-based professors (even as cross-appointed faculty) would elevate the stature of the program within the Faculty, but would also open opportunities to introduce graduate-level programs. The cross-appointed faculty will also link the unit with research faculty members and magnify the role this unit plays in the Faculty.

Response

The prior undergraduate review also mentioned about an academic home of MBAP and recommended considering that it be placed under the auspices of an academic department. This hasn't taken place largely because the size of present MBAP makes this move problematic. It is larger than any department in the Faculty. Furthermore, Math Business and Accounting Programs (MBAP) currently doesn't have the research-oriented basis for it to be considered an academic department.

In order to provide the necessary structure for the Math Business group to effectively fulfill its mandate, the creation of a division for Mathematics in Business and Finance will be considered. To involve associated research faculty members, an initial phase could follow the model taken with the Centre for Computational Mathematics in Industry and Commerce. The best idea would be to develop a core group of associated faculty joint or cross appointments from Pure Mathematics, Applied Mathematics, Combinatorics and Optimization, Computer Science as well as Statistics and Actuarial Science that would build some strength in the research area and would enable MBAP to offer graduate programs further raising its already high profile.

There has been ongoing discussions about the future of Math Business. There are currently four possible directions proposed. Active consultation is taking place between the Dean, the senior administration within the Math Faculty, as well as faculty and staff in the current Math Business program. It is unclear at this time which proposal will be the direction the faculty takes, or the timeline involved.

2. If the Mathematics Business unit was more formalized, the opportunity to transform the definite-lecturer/continuing lecturer role into teaching tenure track appointments would present itself. This would provide employment security to those members of the Mathematics and Business programs, but in keeping with their primary roles as teaching faculty. This would also place more emphasis on the expectation that excellence in teaching is highly valued in the program.

Response

Most MBAP faculty members hold definite-term contracts. The MBAP program recognizes the value of these lecturers. Any changes to the employment status of these lecturers is governed and restricted by [Policies 76](#) and [77](#). Currently there is a university level policy review committee looking at these two policies. It is unknown when this review committee will propose changes.

3. The Mathematics and Business Accounting programs should expand its advisory capacity within the unit, perhaps with full-time staff advisors to share the load with faculty advisors. Given that the students raised the issue of long lines to see their faculty advisor, then creating more capacity to assist students within the degree would also address some of those concerns that were brought up to our attention during the review.

Response

As a result of this program review, the program has revised and discussed our academic advising activities. A full time staff member has been hired and the program has made adjustments to improve the service we provide. The new staff member provided point of contact with students for student engagement and student success initiatives as well as with external partnerships, events, and accreditation. As a result, the FARM program (Risk Management Specialization) has been fully accredited by the Professional Risk Manager's International Association (PRMIA), and FARM current and past students are exempt from PRM Exam I and PRM Exam II, which both shortens PRM designation period and offers significant savings for those seeking that designation. He also successfully completed University of Waterloo Global Markets Simulation Program with StockTrak which offers students unique exposure to practice their classroom knowledge in real time world of finance, investment, banking, and other industries by extensively using industry standard technology.

4. Departments with courses taught within the Mathematics Business and Accounting unit must be more flexible about slight modification of course content that better suits the pedagogical requirements of the students receiving that content, and of the instructor who is delivering the material.

Response

MBAP agrees that the programs would benefit from further participation by faculty members in other Math departments. The MBAP Director and the program committee will take the lead in developing a mechanism that would appropriately manage teaching contributions to the programs to ensure that all courses are taught in a more subject-oriented setting by faculty members.

5. Where other departments are intractable about the opportunity for tailoring content within their owned courses for the Mathematics Business stream, the Mathematics and Business programs should be permitted to develop more of its own courses where pedagogical reasons are compelling.

Response

MBAP cautiously endorses this recommendation. The unit currently offers six COMM and three MATBUS courses for Mathematics Business students. Starting the Fall 2017 term, a new tax course (COMM 433) will also be offered. One very fundamental philosophy of the Math Business programs has been the need to integrate business and mathematics in the classroom. However, there are very few opportunities to create unique course versions as the departments would not support the creation of the MATBUS courses, for example, Statistics or ACTSC to teach to Math Faculty students. The discussion came about because there are many students who want to do Statistics or Actuarial Science majors as part of Math Business programs. As Statistics or Actuarial Science majors, these students should be exposed to the same courses as other students doing the majors. By doing the major, they are indicating an interest that goes beyond other Math Business students. There are also problems with substitutions that create packages of courses that are not true to either degree. It is definitely worth to discuss these courses in the near future with the eventual goal of enabling MBAP to create those courses and possibility offer above mentioned majors.

Over the next year the MBAP program committee will investigate this recommendation to determine if or how it can be implemented.

6. Where possible, the Mathematics and Business programs should identify courses that could be offered online. This could provide assistance for scheduling purposes, and it would also provide an opportunity for students on co-op to more easily take one academic course (co-op students are permitted to take one academic course per work term without Faculty permission; more than one course requires the permission of employer). The online course offerings may also help to have a conflict-free schedules in future for a possible error in scheduling. Moreover, some related financial glossaries can be considered in their communication courses which students are required to take in this unit.

Response

MBAP strongly endorses the reviewers' recommendation. The Faculty of Mathematics is currently working on the introduction of a fully online degree program for Math/FARM students, which complements and advances the reviewers' recommendation. The program will look into the number of students taking online classes but in general though, online enrolments are really climbing. With respect to pedagogical efficacy, dashboards will be built that measure the relative online versus in-class performance by students. Click level data will be examined to observe actual (versus self-reported) student behaviour and will correlate that with performance. It is expected that a research group will also be bringing forward specific proposals in the not so distant future.

7. The Faculty of Mathematics should review how it markets and/or informs incoming international students about the co-op program so that all students who enter into Mathematics are fully apprised of the co-op opportunity.

Response

The MBAP Director meets regularly with the Undergraduate Recruitment and International teams of the Faculty. The Programs are strongly committed to continuing these efforts. They will work with the team to review the activities of the team and address any perceived needs. Co-operative and Experiential Education will also be contacted to identify skills that Math Business students need so that to ensure that international students are aware of them.

8. The Faculty should review how it communicates to students (especially international students) regarding the required minimum academic averages to stay in their respective programs and plans.

Response

The University of Waterloo's Undergraduate Studies Academic Calendar specifies the rules that determine a student's academic standing. A student's standing determines whether a student is able to proceed in the Faculty or in their chosen plan, how many courses they are able to take in the next term, etc. However, the Faculty of Mathematics computes several averages (CAV, TAV, MAV, SMAV) that are used to determine a student's standing within the Faculty. MBAP usually informs new students about those averages during students' orientation programs to help ensure a successful transition into university. The Programs will make sure that students (especially international) who missed orientation programs for some reason are sent the required information via their program advisors.

Implementation Plan:

	Recommendations	Proposed Actions	Responsibility for Leading and Resourcing (if applicable) the Actions	Timeline for addressing Recommendations
1.	The Faculty must pursue formalizing the unit in some fashion.	The issue is currently under discussion with the Dean, the senior administration within the Math Faculty, as well as faculty and staff in the current Math Business program.	Dean's Office, MBAP Director, Unit Heads in the Faculty of Mathematics	December 2019 –In progress
2.	Transforming the definite-lecturer/continuing lecturer role into teaching tenure track appointments.	The issue is currently under discussion with the Dean.	MPAP Director, Dean, Vice President Academic	December 2018-DONE
3.	The Mathematics Business and Accounting programs should expand its advisory capacity within the unit.	Review academic advising activities with faculty members and student representatives.	MBAP director leads the efforts, Associate Dean allocates resources	Spring/Fall 2017 -DONE
4.	Departments with courses taught within the Mathematics Business and Accounting unit must be more flexible about slight modification of course content that better suits the pedagogical requirements of the students receiving that content, and of the instructor who is delivering the material.	MBAP and program committee to follow up and create a mechanism for such modifications	MBAP Director	December 2018-DONE

5.	Where other departments are intractable about the opportunity for tailoring content within their owned courses for the Mathematics Business stream, the Mathematics and Business programs should be permitted to develop more of its own courses where pedagogical reasons are compelling.	MBAP has and continues to discuss this matter internally. The issue has been discussed with the Program Committees of STATS and ACTSC	MBAP Director, MBAP Program Committee members, SAS Chair, SAS Program Committee Chairs	2018-2019
6.	Where possible, the Mathematics and Business programs should identify courses that could be offered online.	Developing online version of courses for FARM program	Assistant Dean Online Instruction	2018/2019 –All Math core courses are available in online mode and more courses are under development
7.	The Faculty of Mathematics should review how it markets and/or informs incoming international students about the co-op program so that all students who enter into Mathematics are fully apprised of the co-op opportunity.	The issue will be discussed with Associated Dean Admissions and Outreach.	MBAP Director, Associate Dean Admissions and Outreach Undergraduate Recruitment and International Office	2018/2019
8.	The Faculty should review how it communicates to students (especially international students) regarding the required minimum academic averages to stay in their respective programs and plans.	The issue will be discussed with Associated Dean for Co-op.	MBAP Director, Associate Dean for Co-op, Co-op Office	2018/2019

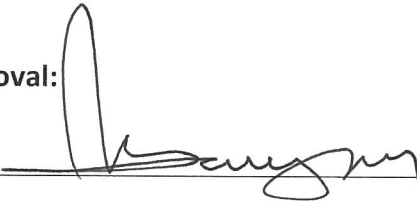
The Department Chair/Director, in consultation with the Dean of the Faculty shall be responsible for monitoring the Implementation Plan.



Date of next program review: _____ **2022-2023**
Date

Signatures of Approval:


Chair/Director



Date

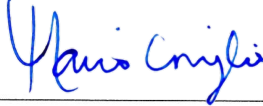
August 02, 2018

AFIW Administrative Dean/Head (For AFIW programs only) Date


Faculty Dean

Date

2018-08-09


Associate Vice-President, Academic
(For undergraduate and augmented programs)

Date

June 5, 2019

Associate Vice-President, Graduate Studies and Postdoctoral Affairs
(For graduate and augmented programs) Date