1. Minutes of the Faculty Council meeting held April 21, 2020 (attached)
2. Report from the Dean – M. Giesbrecht
3. Report from the Associate Dean, Undergraduate Studies - B. Charbonneau (attached)
Motions to be voted upon:

Motion group 1. Course changes
  1.1 Combinatorics and Optimization (catalog report #90)
  1.2 Computer Science (catalog report #91)
  1.3 Pure Mathematics (catalog report #91)
  1.4 Statistics (catalog report #90)

Motion group 2. Regulation Changes
  2.1. Readmission Process to upgrade General Degree to Honours Degree
  2.2. List 2 of Communication Skills requirement

Motion group 3. Plan Changes
  3.1 Computer Science
  3.2 Pure Mathematics
  3.3 Mathematics/Chartered Professional Accountancy
  3.4 Mathematics/Chartered Professional Accountancy – Finance Specialization
  3.5 Mathematics/Business Administration
  3.6 Mathematics/Financial Analysis and Risk Management
  3.7 Software Engineering

4. Report from the Associate Dean, Graduate Studies - A. Kolkiewicz (attached)
Motions to be voted upon:

Motion 1. Applied Mathematics
  - Master of Mathematics (MMath) in Applied Mathematics - Quantum Information
  - Master of Mathematics (MMath) in Applied Mathematics
  - Master of Mathematics (MMath) in Applied Mathematics - Co-operative Program
  - Master of Mathematics (MMath) in Applied Mathematics – Water
  - Doctor of Philosophy (PhD) in Applied Mathematics
  - Doctor of Philosophy (PhD) in Applied Mathematics - Quantum Information
  - Doctor of Philosophy (PhD) in Applied Mathematics - Water
Motion 2. Computer Science
  • New course activation CS 747: Software Verification Using Proof Assistants - Effective Winter 2021
  • New course activation CS 679: Neural Networks – Effective Fall 2020
  • A calendar change in order to add the two new grad courses.

5. Mathematics Faculty Performance Guidelines – D. McKinnon (attached)
  • Proposed Faculty Performance Guidelines for 2021-22 evaluation period to be voted upon.

6. Report from the Associate Dean, Undergraduate Admissions and Outreach - T. Vasiga
  • Fall 2020 Admissions
  • Fall Recruiting plans
  • Outreach update

7. Future meetings:
  • Tuesday November 17, 2020 – 3:30 PM
  • Tuesday February 23, 2021 – 3:30 PM
  • Tuesday April 20, 2021 – 3:30 PM

8. Other business
MATHEMATICS FACULTY COUNCIL -- Faculty Council Minutes

Tuesday, April 21, 2020  3:30 – 5:00 PM  Location: WEBEX

1. Minutes of the Faculty Council meeting held February 11, 2020

The minutes were approved as presented.

2. Report from the Associate Dean, Undergraduate Studies – B. Charbonneau

Benoit Charbonneau presented and discussed the motions below and answered the related questions that came from the participants.

David Harmsworth, who was Acting Associate Dean Undergrad Studies, for a few weeks during March-April, gave an update for his acting period of time. Mainly, David clarified issues presented on pages 25-27 of this meeting’s Agenda and answered questions from participants related to this section of the Agenda.

For ease of voting, the motions related to Course Changes and Plan Changes were grouped under one larger motion: “Motions re: course changes and plan changes (1.1.1. through 1.6.4 and 2.1 through 2.6)”.

The motion was carried with 63 votes in favour, zero against and zero abstains.

Motions to be voted upon:

1. Course Changes.

All course changes have an effective date of September 1, 2021

1.1 CS (catalog report #93)

1.1.1 Update course description for CS 245.
1.1.2 Add TUT component for CS 341.
1.1.3 Remove MTE 241 antirequisite for CS 343.
1.1.4 Update prerequisite for CS 456.
1.1.5 Update prerequisites for CS 484.
1.1.6 New course activation- CS 479 (catalog report #92).
1.2 ACTSC (catalog report #5)
   1.2.1 Change the title, description, prerequisites and corequisites for ACTSC 291/AFM 272.
   1.2.2 Change the title, course description and antirequisites for ACTSC 391/AFM 372.
   1.2.3 Change the title, course description and prerequisites for ACTSC 471/AFM 476.

1.3 CFM (catalog report #6)
   1.3.1 New course activation – CFM 101.
   1.3.2 New course activation- CFM 301.
   1.3.3 New course activation- CFM 401.

1.4 AMATH (catalog report #92)
   1.4.1 Update prerequisite and add a cross-listing (PHYS 484) for AMATH 474.

1.5 MATH (catalog report #92)
   1.5.1 Update prerequisite for MATH 128.

1.6 STAT (catalog report #92)
   1.6.1 Change description and prerequisites for STAT 440.
   1.6.2 Change description and prerequisites for STAT 441.
   1.6.3 Change description and prerequisites for STAT 442.
   1.6.4 Change title, description, prerequisites and add TUT component for STAT 444.

2. Plan Changes

2.1 Actuarial Science minor
Update minor by removing ACTSC 371 (Introduction to Investments) from the “all of” list and creating a new “two of” list by adding ACTSC 372 (Corporate Finance). Move ACTSC 331 and ACTSC 363 from the “all of” list to the “two of” list. Add one additional 400-level ACTSC course as a degree requirement.

Effective date: September 1, 2021

For details, please see attached ADUG report

2.2 Actuarial Science/Finance Specialization
Update the ACTSC/Finance Specialization to reflect the course title change for ACTSC 471/AFM 476.

Effective date: September 1, 2021

For details, please see attached ADUG report
2.3 Computing and Financial Management (CFM)
To update the CFM plan by adding new CFM courses and removing various AFM courses.

Effective date: September 1, 2021

Motion 2.3.1: Replacement of AFM 101 with AFM 191
Rationale/background: AFM 191 is a new course that SAF students will take in place of AFM 101.

Motion 2.3.2: Removal of requirement to take AFM 102
Rationale/background: AFM 102 focuses on accounting within the company for management decision making. This is not a route that CFM students take, nor are they required to take courses with AFM 102 as a prerequisite.

Motion 2.3.3: Replacement of AFM 121 with CFM 101
Rationale/background: Both are introductory finance courses however CFM 101 is designed specifically to recognize the needs and skills of CFM students.

Motion 2.3.4: Replacement of AFM 131 with AFM 132
Rationale/background: AFM 132 is the course that SAF students now take in place of AFM 131.

Motion 2.3.5: Removal of requirement to take AFM 231
Rationale/background: A program review determined that this course is no longer necessary to meet program objectives. The newly created AFM 334 – Business Law for Financial Managers, may be taken as an elective.

Motion 2.3.6: Replacement of AFM 372/ACTSC 391 with AFM 275/ACTSC 391
Rationale/background: AFM 372 has been re-numbered by SAF to reflect when the course will be taken and has been taking for 4 years by students in the CFM and Math/CPA programs. The title of the course has been changed to reflect the name change of AFM 272.

Motion 2.3.7: Additional AFM courses (1.0 unit or 1.5 units)
Rationale/background: A new set is being added which will allow students to select which “set” of courses they want to take to complete the additional 1.5 AFM units, including taking CFM 401.

For details, please see attached ADUG report

2.4 Computational Mathematics
To add an additional CS course (CS 431) to the “Four additional” courses list and move CS 451 to make it an “or” option with CS 431

Effective date: September 1, 2021
2.5 Mathematics/Business Administration
To remove AMATH 350 as a required course from the “all of” list in the Mathematics/Business Administration plan and add one more additional math course as a requirement.

Effective date: September 1, 2021

2.6 Mathematics/Financial Analysis and Risk Management
To update the Notes section by adding two notes which includes information about co-op and mode of delivery

Effective date: September 1, 2021

3. Calendar changes
A few last minute motions were added after the Agenda was sent out. These were forwarded for review to the Faculty Council members in separate email correspondence. These motions were marked as Additional Emergency motions: Motion 1 (Additional Motion A1), Motion 2 (Additional Motion A2), Motion A3 (Additional Motion A3).

Additional Emergency motions from UAC submitted to Faculty Council’s approval on 21 April 2020.

UAC was consulted as to whether a meeting should be held in short order or if the group preferred to vote electronically. An electronic vote was deemed appropriate. Motions carried unanimously by emergency electronic vote of UAC held on April 18 to 20. UAC has 13 voting members, and received 12 votes, all for the motions. UAC has also an additional 6 non-voting members, and all have provided their support for the motions.

Motion 1 (Additional Motion A1): this motion was passed with 59 votes in favour, zero against and zero abstains.

Motion A1: To introduce a new standing: PROM (defined as "promoted; may proceed"). The implication of PROM standing will be similar to DEF (deferred) standing, except that deferred standings need eventually to be resolved. The intent with PROM standing, in contrast, is that it will be applied permanently to the Winter 2020 term, for all students in Business Administration/Math or CS double degree plans.
Rationale: When AP runs for the Winter 2020 term, we anticipate that we will have no grade information for WLU courses. Further, we anticipate that when the WLU grades do become official, there should be no failing grades (since any student with a failing grade will have the option of changing it to WD). Since we will not have sufficient information to determine appropriate standings, but we have agreed that we will not remove any student from a double degree plan following the Winter 2020 term, the intent is to defer the next meaningful standing decision until after the Spring 2020 term. Promoted standing is already in use in the Faculty of Engineering.

Motion 2 (Additional Motion A2): this motion was passed with 52 votes in favour, 2 votes against and zero abstains.

**Motion A2: To create, effective Fall 2020, a new course.**

MTHEL 199 (0.25) LEC Special Topics
Special topics course as announced by the Faculty.
Rationale: The Math Faculty is exploring ways to provide remedial mathematics to our incoming high school class whose senior mathematics courses were disrupted by the COVID crisis. One option is to provide a remedial course covering key high school topics. To effect this, we need to create a 0.25 credit course that can be offered on-line in the fall term. There is still a lot of discussions that must take place before using this course is chosen as a way to solve that problem, but we will not be able to create that course later so must create it now in case we need it.

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*Note that an additional motion submitted with the regular agenda on page 28 was not labelled in the Faculty Council Agenda. For ease of reference, it is added here and labelled*

COVID-19 CR/NCR impact mitigation – Temporary change in calendar text needed:

Motion A3 (Additional Motion A3): this motion was passed with 47 votes in favour, 3 votes against and zero abstains.

**Motion A3: In recognition that**

- some instructors will use CR/NCR for courses that initially were (numeric or letter graded)-based, some students that would otherwise be eligible for TDHL had their instructor made a different choice would no longer be eligible under the current calendar definition,

- the University Senate has recognized that W2020 grading schemes have been affected significantly by the crisis and has thus allowed students who feel their grades do not represent accurately their performance to elect to convert numerical grades to CR/NCR,
it would be inappropriate for the Faculty to have a lenient TDHL policy for winter, followed by a strong TDHL policy in spring, following by a lenient Term Distinction policy for fall,

it is proposed that, effective Winter 2020 and Spring 2020:

1. the sentence “normally enrolled in at least 2.5 units of courses with numeric or letter grades” in the TDHL definition be replaced by “normally enrolled in at least 2.5 units of courses, of which 1.0 unit must have numeric or letter grades”

2. any student that would satisfy the conditions for “Term distinction” as per the 2020-2021 calendar be given that honour if they do not have the TDHL honour.

Motion carried: UAC on 6 April 2020.

At the time this package is released, it is unclear whether this motion needs to be accepted by Faculty Council or if it will bypass FC to be presented at Senate on 20 April 2020.

3. Report from the Associate Dean, Graduate Studies - Adam Kolkiewicz

Adam Kolkiewicz presented his report and answered questions related to the motions to be voted upon.

Motions to be voted upon:

3.1. Course Changes:

3.1.1. APPLIED MATH

The motion 3.1.1. APPLIED MATH - Course changes (covering motions 3.1.1.1 and 3.1.1.2) was passed with 44 votes in favour, zero against and zero abstains.

3.1.1.1. New course activation AMATH 840: Advanced Numerical Methods for Computational and Data Sciences – Effective Fall 2020

3.1.1.2. New course activation AMATH 841: Finite Element Methods – Effective Fall 2020

3.1.2. PURE MATH:
The motion 3.1.2. PURE MATH: Course changes (covering motions 3.1.2.1 and 3.1.2.2) was passed with 45 votes in favour, zero against and zero abstains.

3.1.2.1. Changes to title and description for PMATH 665: Smooth Manifolds – Effective Fall 2020

3.1.2.2. New course activation PMATH 868: Connections and Riemannian Geometry – Effective Fall 2020

4. Report from the Interim Dean – Kevin Hare

Interim Dean Kevin Hare gave an oral update in regards to where the Faculty is standing in the context of the COVID-19 situation. Kevin also answered questions initiated by various Faculty members.

5. Other Business

No other business was discussed.

Meeting was adjourned.

Next meeting will be scheduled for September 2020 – date to be determined.
Report of Undergraduate Affairs Committee to Mathematics Faculty Council  
September 2020

This report contains several motions from the Mathematics Undergraduate Affairs Committee (UAC) to be voted on at this Faculty Council meeting. These motions were adopted by UAC during its meetings of 22 June 2020 and 4 August 2020.

1. Course Changes
   
   1.1 Combinatorics and Optimization (CO)
   1.2 Computer Science (CS)
   1.3 Pure Mathematics (PMATH)
   1.4 Statistics (STAT)

2. Regulation changes
   
   2.1 Readmission Process to Upgrade General Degree to Honours Degree
   2.2 List 2 of Communication Skills Requirement

3. Plan Changes
   
   3.1 Computer Science
   3.2 Pure Mathematics
   3.3 Mathematics/Chartered Professional Accountancy
   3.4 Mathematics/Chartered Professional Accountancy – Finance Specialization
   3.5 Mathematics.Business Administration
   3.6 Mathematics/Financial Analysis and Risk Management
   3.7 Software Engineering
1. Course Changes.

All course changes have an effective date of September 1, 2021

1.1 CO (catalog report #90)
   1.1.1 Add TUT to CO 250.

1.2 CS (catalog report #91)
   1.2.1 New course activation CS 114.
   1.2.2 Update requisites for CS 338.
   1.2.3 Update requisites for CS 450.

1.3 PMATH (catalog report #91)
   1.3.1 Add TST to PMATH 330
   1.3.2 Update requisites for PMATH 370
   1.3.3 Inactivate PMATH 360

1.4 STAT (catalog report #90)
   1.4.1 Change title, description, and requisites for STAT 333
   1.4.2 Change title, and description for STAT 433
Motion 2.1
FACULTY OF MATHEMATICS Readmission Process to Upgrade General Degree to Honours Degree.
Motion: to update Note 1 with the following text:

1. Graduates who were previously awarded a general degree may apply for readmission to upgrade to an honours degree. These applications will be considered on a case-by-case basis. Students wishing an upgrade are required to return the earlier degree in order to be granted the upgraded degree. Courses and grades from the general degree would be used towards the upgraded degree if applicable, but students would otherwise need to meet current calendar requirements.

Calendar text: [http://ugradcalendar.uwaterloo.ca/page/MATH-Degree-Requirements-for-Math-students](http://ugradcalendar.uwaterloo.ca/page/MATH-Degree-Requirements-for-Math-students)

Notes

1. Students are not normally awarded an Honours BMath degree if they already hold a General BMath degree. Petitions for exceptions to this rule will normally be considered only after an absence from the Faculty of several terms.

Rationale/Background: Under the current process, students graduating with a general degree in Mathematics must declare their intent to return for a four-year Honours degree before graduating, and then also apply for readmission later. This change removes the need to declare their intent ahead of time, and clarifies the process for readmission.

CURRENT PROCESS
1. Students graduating with a general degree must file a petition with the Math S&P committee prior to graduation requesting the option to return at a later date.
2. The Math S&P committee reviews these applications, but in practice, always approves them.
3. At a later date, if the student wishes to return, they must file a readmission application through the Registrar's Office. The readmission application is sent to Math S&P for review.
4. Math S&P reviews the readmission application, and after consultation with the appropriate academic advisors, determines if and under what conditions the student will be allowed to return.

PROPOSED PROCESS
We propose to eliminate the first two steps and provide all students who graduate with general degrees the option to return at a later date to upgrade to an honours degree. The revised process would be:
1. The student graduates with a general degree. No steps are required at this time.
2. At a later date, if the student wishes to return, they must file a readmission application through the Registrar's Office. The readmission application is sent to Math S&P for review.
3. Math S&P reviews the readmission application, and after consultation with the appropriate academic advisors, determines if and under what conditions the student will be allowed to return.

Motion 2.2 To add ENGL 101B (Introduction to Rhetorical Studies) to the Communication Skills List 2.

Rationale/Background: Chair of the English Department has recommended we re-add this course to List 2 as there is demand from Math students. This course was removed from this list in 2017. There is now an EL offering of this course which will be able to support demand. This request was also approved in the English department.

Data: Math students enrolled in Engl 101B (Introduction to Rhetorical Studies)
- Fall 2018: 8 (of 72 total students)
- Winter 2019: 17 (of 77 total students)
- Spring 2019: 10 (of 32 total students)
- Fall 2019: 14 (of 97 total students)
- Winter 2020: 18 (of 68 total students)
- Spring 2020: 11 (of 32 total students)
Motion 3: Plan Changes

3.1 Computer Science

3.1.1 To update the Digital Hardware Specialization to include ECE 320 in one of the “one of” lists.

Effective Date: September 1, 2021

Rationale/Background: ECE has renumbered ECE 429: Computer Architecture to ECE 320: Computer Architecture.

Calendar text:
Bold= new

[...]

One of

ECE 320 Computer Architecture
ECE 429 Computer Architecture
CS 450 Computer Architecture

Note: Students taking ECE 429 or ECE 320 instead of CS 450 will count this as a 0.5 math unit in the range CS 440-CS 498, and not a 0.5 non-math unit.

[...]

3.1.2 To remove text in the Computer Science Overview page

Effective date: September 1, 2021

Rationale/Background: Computer Science has not been accredited with the Canadian Information Processing Society (CIPS) since 2018.

Calendar text:
Strikeout= delete

[...]

The following regular and co-operative plans are accredited by the Computer Science Accreditation Council, which is sponsored by the Canadian Information Processing Society.

- Bachelor of Mathematics (BMath) Honours Computer Science
- Bachelor of Mathematics (BMath) Honours Computer Science- Business Specialization
- Bachelor of Mathematics (BMath) Honours Computer Science- Digital Hardware Specialization
- Honours Bachelor of Computer Science
- Honours Bachelor of Computer Science- Business Specialization
- Honours Bachelor of Computer Science- Digital Hardware Specialization
- Honours Bachelor of Computer Science- Software Engineering Specialization
- Any double Honours plan involving an accredited Computer Science plan
- Any accredited Computer Science plan with a minor

[...]

3.1.3 To update the plan combinations table on the Bachelor of Computer Science and Bachelor of Mathematics Academic Plan Combinations page by adding FARM as an invalid combination with BCS or BMATH (CS)- Business Option or Specialization
Rationale/Background: The Business Option/Specialization requires students to take six courses from a list of business courses. These six courses are required courses in FARM. If a student chooses to double major in FARM and CS business option/specialization, then they will be able to automatically earn the designation with any real additional work.

Calendar text:

<table>
<thead>
<tr>
<th>Plan</th>
<th>Cannot be Combined With</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics - Biology Specialization</td>
<td>Any plan offered by the Biology Department</td>
</tr>
<tr>
<td>Applied Mathematics - Economics Specialization</td>
<td>Any plan offered by the Economics Department</td>
</tr>
<tr>
<td>Applied Mathematics - Physics Specialization</td>
<td>Any plan offered by the Physics and Astronomy Department</td>
</tr>
<tr>
<td>Applied Mathematics with Scientific Computation</td>
<td>Any plan offered in Computational Mathematics</td>
</tr>
<tr>
<td>BCS or BMath (CS) - Bioinformatics Option or Specialization</td>
<td>Any plan offered by the Biology Department</td>
</tr>
<tr>
<td>BCS or BMath (CS) - Business Option or Specialization</td>
<td>Mathematics/Financial Analysis and Risk Management, or a minor in Economics, Human Resources Management, or Management Studies</td>
</tr>
<tr>
<td>BCS (Data Science)</td>
<td>Artificial Intelligence Option or Specialization</td>
</tr>
<tr>
<td>Business Administration and BCS/BMath Double Degree plans</td>
<td>Any plan similar to one appearing on the student's Laurier academic record transcript</td>
</tr>
<tr>
<td>Computer Science Joint (BCS or BMath)</td>
<td>Joint Statistics</td>
</tr>
<tr>
<td>Computational Fine Arts Option or Specialization</td>
<td>Any plan offered by the Fine Arts Department</td>
</tr>
<tr>
<td>Computing Option or Minor</td>
<td>Computer Science Minor or Information Technology Management</td>
</tr>
<tr>
<td>Mathematical Economics</td>
<td>Any plan offered by the Economics Department</td>
</tr>
<tr>
<td>Mathematical Physics</td>
<td>Any plan offered by the Physics and Astronomy Department</td>
</tr>
<tr>
<td>Mathematical Studies (with or without a Business Specialization)</td>
<td>Any other stand-alone or Mathematics Joint plan</td>
</tr>
<tr>
<td>Mathematical Studies - Business Specialization</td>
<td>Management Studies Option or Minor</td>
</tr>
</tbody>
</table>

3.2 Pure Mathematics

3.2.1 To inactivate the Pure Mathematics/Teaching plan

Effective date: September 1, 2021

Rationale/Background: In recent years, there has been on average only one student graduating from this plan per year. Students desiring a teaching credential are largely choosing the Mathematics/Teaching plan. There will still remain multiple paths for students desiring a teaching credential combined with Pure Mathematics courses, such as adding the Teaching Option to the full Honours Pure Mathematics plan, or adding a Pure Mathematics minor to the Mathematics/Teaching plan.

3.3 Mathematics/Chartered Professional Accountancy

3.3.1 To make changes to the Math/CPA plan to follow changes made in the Accounting and Financial Management (AFM) curriculum.

Effective date: September 1, 2021
Rationale/Background:

1. Changes to the required AFM courses for Math/CPA reflect parallel changes made by the School of Accounting and Finance (SAF) to these courses for the AFM program. These changes are approved by CPA Ontario and are necessary to maintain CPA accreditation and Masters of Accounting (MAcc) eligibility.

2. A reduction in the number of CPA accreditation–required AFM courses allows for the addition of MATH 237 to the math core for Math/CPA, and a subsequent increase to the minimum math requirement from 18 to 19 courses.

3. A reduction in the number of CPA accreditation–required AFM courses allows for an increase in the number of AFM, COMM, ECON, MSCI, or math electives from 1 to 2.

Calendar text:

*AFM 131 may be substituted with consent of the department.

Students in this plan must fulfill all the requirements in Table I. This must include at least 19 math courses, and the following specific requirements:

One of
- CS 115 Introduction to Computer Science 1
- CS 135 Designing Functional Programs
- CS 145 Designing Functional Programs (Advanced Level)

One of
- CS 116 Introduction to Computer Science 2
- CS 136 Elementary Algorithm Design and Data Abstraction
- CS 146 Elementary Algorithm Design and Data Abstraction (Advanced Level)

One of
- MATH 127 Calculus 1 for the Sciences
- MATH 137 Calculus 1 for Honours Mathematics
- MATH 147 Calculus 1 (Advanced Level)

One of
- MATH 128 Calculus 2 for the Sciences
- MATH 138 Calculus 2 for Honours Mathematics
- MATH 148 Calculus 2 (Advanced Level)

One of
- MATH 135 Algebra for Honours Mathematics
- MATH 145 Algebra (Advanced Level)

One of
- MATH 136 Linear Algebra 1 for Honours Mathematics
- MATH 146 Linear Algebra 1 (Advanced Level)

One of
- MATH 237 Calculus 3 for Honours Mathematics
- MATH 247 Calculus 3 (Advanced Level)
One of
STAT 230 Probability
STAT 240 Probability (Advanced Level)

One of
STAT 231 Statistics
STAT 241 Statistics (Advanced Level)

All of
AFM 272/ACTSC 291 Corporate Finance Global Capital Markets
AFM 372/275/ACTSC 391 Corporate Finance 2
AFM 476/ACTSC 471 Advanced Corporate Finance Corporate Financial Decision Making
STAT 373 Regression and Forecasting Methods in Finance

One of
AFM 231 LS 283 AFM 335 Business Law for Financial Managers
COMM 231 Commercial and Business Law for Mathematics Students

All of
AFM 101 Introduction to Financial Accounting
AFM 102 Introduction to Managerial Accounting
AFM 111 Professional Pathways and Problem-solving
AFM 132 Introduction to Business Stages*
AFM 182 Foundations for Management Accounting
AFM 191 Foundations for Financial Reporting
AFM 206 Introduction to Tax and AFM 208 Introduction to Assurance (0.25 units each)
AFM 212 Financial Analysis and Planning
AFM 291 Intermediate Financial Accounting 1
AFM 311 Connections to Ethical Context
AFM 321 Personal Financial Planning
AFM 341 Accounting Information Systems
AFM 362 Taxation 1 – Foundations Corporate Taxation
AFM 363 Taxation 2 – Integration
AFM 481 AFM 382 Cost Management Systems
AFM 391 Intermediate Financial Accounting 2
AFM 401 Accounting Theory
AFM 433 Business Strategy
AFM 351 AFM 451 Audit Strategy
AFM 462 Taxation 3 – Tax Planning Topics Specialized Topics in Taxation
AFM 479 Cases and Applications in Finance II
AFM 482 Performance Measurement and Organization Control
AFM 491 Advanced Financial Accounting
COMM 103/ECON 100 Principles of Economics or (ECON 101 Introduction to Microeconomics and ECON 102 Introduction to Macroeconomics)
SPCOM 111 Leadership, Communication, and Collaboration

Two of
AFM 205 Introduction to Financial Services
AFM 206 Introduction to Tax
AFM 207 Introduction to Analytics
AFM 208 Introduction to Assurance

Six additional math courses (3.0 units).
One Two additional AFM, COMM, ECON, MSCI, or math courses (0.5–1.0 units).

Notes

1. AFM 363, AFM 401, One or more of AFM 462, AFM 482, AFM 491 may each be substituted with an acceptable 300-/400-level AFM elective, with the understanding that any such substitution would forfeit Master of Accounting (MAcc) admission eligibility and will impact the path to a CPA designation pursued through CPA Ontario.

2. Students may take AFM 322 and AFM 424 to replace the AFM 479 and the "One additional AFM, COMM, ECON, MSCI, or math course" degree requirements.

3.3.2 To update Faculty of Math communication skills requirements for Math/CPA by replacing AFM 211 with AFM 111 (Professional Pathways and Problem-solving)

Effective date: September 1, 2021

Rationale/Background: The current second communications course for Math/CPA, AFM 211, is no longer being offered. AFM 111 and SPCOM 111 comprise the communications requirement for AFM students.

3.3.3 To update the Math/CPA Admissions page to reflect new first-year provisional requirements

Effective date: September 1, 2021

Rationale/Background: To reflect changes to communication skills and first-year course requirements.

Calendar text:

bold= new, strikeout= delete

Admissions

Students normally apply for direct admission from high school into the first year of the Mathematics/CPA plan. Upon successful completion of a provisional first year, students will formally proceed into the Mathematics/CPA plan in second year. Successful completion of the provisional year requires all of the following:

- Successful completion of at least 5.0 units including the following courses: AFM 101, AFM 102, AFM 111; AFM 182; AFM 191; AFM 134; COMM 103/ECON 100 (or one of ECON 101, ECON 102); one of CS 115, CS 135, CS 145; one of MATH 135, or MATH 145; one of MATH 136, or MATH 146; one of MATH 127, MATH 137, or MATH 147; one of MATH 128, MATH 138, or MATH 148; SPCOM 111. These courses must be completed within 12 months of admission into the provisional year.

3.4 Mathematics/Chartered Professional Accountancy – Finance Specialization
3.4.1 To make changes to the Math/CPA-Finance Specialization plan by decreasing the total number of courses required (42 to 41) and providing more flexibility and selection with finance courses.

Effective date: September 1, 2021

Rationale/Background:

1. **MATH 237** to be included in Math/CPA core math requirement.
2. An increase in the number of finance-related math courses from 2 (‘Two of’) to 3 (‘Three of’) reflects the increase in the minimum math course requirement for Math/CPA from 18 to 19.
3. Expansion of ‘Three of’ list of math courses to include courses deemed to be of relevance to finance and to provide students with more scheduling flexibility.
4. Inclusion in the ‘Two of’ AFM list of several recently developed courses gives the student more scheduling flexibility and a broader selection of finance-related AFM courses.
5. A reduction in the Math/CPA-required AFM courses allows for a decrease in the number of required courses for Math/CPA – Finance Specialization from 42 to 41.

Calendar text:

**bold= new, strikeout= delete**

[...]

One of

**MATH 237 Calculus 3 for Honours Mathematics**

**MATH 247 Calculus 3 (Advanced Level)**

All of

**ACTSC 231 Introductory Financial Mathematics**

**AFM 205 Introduction to Financial Services**

Two Three of

**ACTSC 371 Introduction to Investments**

**AMATH 350 Differential Equations for Business and Economics**

**CS 335 Computational Methods in Business and Finance**

**CO 372 Portfolio Optimization Models**

**MATBUS 470 Derivatives**

**MATBUS 471 Fixed Income Securities**

**MATBUS 472 Risk Management**

**STAT 334 Probability Models for Business and Accounting**

**STAT 341 Computational Statistics and Data Analysis**

(*additional CO course may be required to meet CO 372 pre-req)

Two of

**AFM 321 Personal Financial Planning**

**AFM 322 Derivative Securities**

**AFM 328 and AFM 329, or AFM 328 and AFM 428, or AFM 329 and AFM 429 Invstmt. Mgmt. (0.25 unit each)**

**AFM 324 Wealth Management**

**AFM 334 International Study Experience**

**AFM 377 Private Equity and Venture Capital**
AFM 415 Special Topics or AFM 416 Special Topics in Finance or **AFM 417 Special Topics in Accounting**
AFM 423 Topics in Financial Econometrics
**AFM 424 Equity Investments**
AFM 434 Governance and Enterprise Risk Management for Global Organizations
**AFM 470 Financial Mgmt. of High Growth Companies**
AFM 477 Mergers and Acquisitions
AFM 478 International Financial Management
AFM 492 Financial Statement Analysis

Two additional math courses (1.0 unit).

**Notes**

1. Students in this Specialization may take AFM 322 and AFM 424 to replace the AFM 479 Math/CPA requirement. If so, students need only take one of the remaining AFM courses in the above "Two of" list of AFM courses.

1. In order to meet the requirements of both the Faculty of Mathematics and the School of Accounting and Finance, the Mathematics/CPA - Finance Specialization requires the successful completion of **42** courses.
Memorandum

To: Stephanie Massel, Administrative Manager, Engineering Undergraduate Office  
Aziza Chaudhry, Administrative Assistant for the Faculty of Mathematics

From: Derek Rayside, Director of Software Engineering

Date: Tuesday June 2, 2020

Re: SE Calendar Revisions

The following proposed calendar revisions were approved at the Software Engineering Curriculum Committee meetings on November 25, 2019, April 28th, 2020, and by email vote on May 7th, 2020.

Tracking Number: SE-2122-01

1. **Change**: Update the Software Engineering Awards section.

   Revise the text to say:

   Students in the Bachelor of Software Engineering plan are eligible for Awards of Excellence in the Faculty of Mathematics.

   Students in the Bachelor of Software Engineering plan are eligible for Awards of Excellence in the Faculty of Engineering.

   **Rationale for change:**
   This is a change of phrasing, but not a change of intent. The intent remains the same as it has always been. The previous phrasing duplicated the award criteria from each Faculty. Now the university is going through a process of revising the award criteria. It is better calendar design to not duplicate the criteria here but, rather, to just refer to the original definitions of the award criteria. This is an amendment to 2020-2021 calendar, and has been approved by the Registrar’s Office.

2. **Change**: Remove the sentence "The plan is accredited by both the Canadian Engineering Accreditation Board and the Computer Science Accreditation Council."

   **Rationale for change:**
   Both SE and CS have let the Canadian Information Processing Society (CIPS) accreditation lapse. It is not clear that CIPS is still a functioning organization. The point of this sentence was to say that the program is accredited from both sides. Since that is no longer true, there is no point in keeping this sentence. It would be redundant to say that SE is CEAB accredited – no other Engineering programs say that.

3. **Change**: Strike the sentence "Complex software systems have become critical to the operation of many systems in areas such as banking, communications, manufacturing, power generation, and transportation."

   **Rationale for change:**
   The Calendar Editor is recommending to remove text like this that does not actually describe how the university functions. Also, relatively few SE graduates actually end up working in the industry segments mentioned.
4. **Change:** Add five more advanced communications electives to the approved list. English Undergrad Chair Victoria Lamont was notified of this change by email on April 29, 2020. This change is retroactive to the 2017/2018 calendar. Students following 2017/2018, 2018/2019, 2019/2020, or 2020/2021 Calendar requirements can access these new courses via course substitutions, to be recorded in Quest.

- ENGL 119 Communications in Mathematics & Computer Science
- ENGL 209 Advanced Academic Writing
- ENGL 210E Technical Writing

**Rationale for change:**
Students requested to have more choices, and specifically some more challenging choices, for their communications elective. The SE Director worked with English to identify courses that would be appropriate. This is unlikely to affect the total number of English courses that SE students take, and we will not schedule special sections of these courses.

5. **Change:** Add the following courses to the SE-ECE Technical Electives that SE students are permitted to take. This change is retroactive to the 2017/2018 calendar. Students following 2017/2018, 2018/2019, 2019/2020, or 2020/2021 Calendar requirements can access these new courses via course substitutions, to be recorded in Quest.

- ECE313 Digital Signal Processing
- ECE320 Computer Architecture
- ECE327 Digital Hardware Systems
- ECE340 Electronic Circuits 2
- ECE 457C Reinforcement Learning
- ECE 493 Special Topics in Electrical and Computer Engineering
- ECE495 Autonomous Vehicles

**Rationale for change:**
Tracking the ECE curriculum. ECE has created new courses and renumbered old courses, and clarified that some 3xx courses count as technical electives for ECE students.

6. **Change:** Add the following courses to the SE-CS Technical Electives that SE students are permitted to take. This change is retroactive to the 2017/2018 calendar. Students following 2017/2018, 2018/2019, 2019/2020, or 2020/2021 Calendar requirements can access these new courses via course substitutions, to be recorded in Quest.

- CS 360 Introduction to the Theory of Computing
- CS 365 Models of Computation
- CS 370 Numerical Computation
- CS 371 Introduction to Computational Mathematics
- CS479 Neural Networks
- CS 498 Advanced Topics in Computer Science

**Rationale for change:**
Tracking the CS curriculum. Some of these are new courses, and some are courses that used to be on the SE technical elective lists.

7. **Change:** Amend "One additional course from the CS and ECE lists above" to "One additional course from the CS and ECE lists above, or the extended list below."
Rationale for change:
Connected to the next change, which introduces the new technical elective list.

8. Change: Add the following courses to the list of CS Technical Electives that SE students are permitted to take. All appropriate people were contacted by email on April 29, 2020 and notified that courses from their department would be added to the SE extended list of ATEs. This change is retroactive to the 2017/2018 calendar. Students following 2017/2018, 2018/2019, 2019/2020, or 2020/2021 Calendar requirements can access these new courses via course substitutions, to be recorded in Quest.

- CO 331 Coding Theory
- CO 342 Introduction to Graph Theory
- CO 351 Network Flow Theory
- CO 353 Computational Discrete Optimization
- CO 367 Nonlinear Optimization
- CO 456 Introduction to Game Theory
- CO 481 Introduction to Quantum Information Processing
- CO 485 The Mathematics of Public-Key Cryptography
- CO487 Applied Cryptography
- MSCI 343 Human-Computer Interaction
- MSCI 446 Data Warehousing and Mining
- MSCI 543 Analytics and User Experience
- MTE 544 Autonomous Mobile Robots
- MTE 546 Multi-Sensor Data Fusion
- SE 498 Advanced Topics in Software Engineering
- STAT440 Computational Inference
- STAT441 Statistical Learning - Classification
- STAT442 Data Visualization
- STAT444 Statistical Learning - Advanced Regression
- SYDE 533 Conflict Resolution
- SYDE 543 Cognitive Ergonomics
- SYDE 548 User-Centred Design Methods
- SYDE 552 Computational Neuroscience
- SYDE 556 Simulating Neurobiological Systems
- SYDE 575 Image Processing

Rationale for change:
These are technical courses that are relevant to SE students.

9. Change: Increase the number of courses on the SE science elective list to include the courses on the ECE science elective list. This change is retroactive to the 2017/2018 calendar. Students following 2017/2018, 2018/2019, 2019/2020, or 2020/2021 Calendar requirements can access these new courses via course substitutions, to be recorded in Quest.

- BIOL 211 Introductory Vertebrate Zoology
- BIOL 240 and BIOL 240L Fundamentals of Microbiology/Microbiology Laboratory
- BIOL 241 Introduction to Applied Microbiology
- BIOL 373 and BIOL 373L Principles of Human Physiology 2/Human Physiology Laboratory
- CHEM 123 and CHEM 123L General Chemistry 2/General Chemistry Laboratory 2
- CHEM 209 Introductory Spectroscopy and Structure
- CHEM 237 and CHEM 237L Introductory Biochemistry/Introductory Biochemistry Laboratory
- CHEM 254 Introductory Chemical Thermodynamics
- CHEM 266 Basic Organic Chemistry 1
- CHEM 356 Introductory Quantum Mechanics
- CHEM 404 Physicochemical Aspects of Natural Waters
- EARTH 123 Introductory Hydrology
- EARTH 221 Geochemistry 1
- EARTH 270 Disasters and Natural Hazards
- EARTH 281 Geological Impacts on Human Health
- ECE 231 Semiconductor Physics and Devices
- ECE 403 Thermal Physics
- ECE 404 Geometrical and Physical Optics
- ECE 405 Introduction to Quantum Mechanics
- ENVE 275 Environmental Chemistry
- ENVS 200 Field Ecology
- NE 222 Organic Chemistry for Nanotechnology Engineers
- PHYS 280 Introduction to Biophysics
- PHYS 335 Condensed Matter Physics
- PHYS 380 Molecular and Cellular Biophysics

**Rationale for change:**
Tracking the ECE curriculum. To a first order approximation, the SE curriculum should follow the ECE and CS curricula. We should deviate from their leads when it makes sense to do so, but otherwise follow them.

These changes do not alter the minimum path value for CEAB accreditation.
**COURSE CHANGES**  (for approval)

### Combinatorics & Optimization

#### Current Catalog Information

**CO** 250 (0.50) LEC, TST  
Introduction to Optimization

A broad introduction to the field of optimization, discussing applications, and solution techniques. Mathematical models for real life applications; algorithms; aspects of computational complexity; geometry; linear programming duality, focusing on the development of algorithms. [Offered: F,W,S]

No Special Consent Required

**Effective 01-SEP-2021**

Component Change: LEC, TST, TUT

**Rationale:**
To add a one hour tutorial component. CO 250 is a large course that accommodates students from many different areas, including Laurier Double Degree students. For a number of reasons including academic integrity, many course co-ordinators are moving towards an assessment model where assignments are given zero credit weight and more emphasis is placed on midterms and quizzes. For quizzes to be meaningful requires concurrent scheduling of tutorial slots for each section. The intention of this motion is to alleviate the difficulty of doing this scheduling manually, and to provide more certainty for students when they plan their own schedule.

### Statistics & Actuarial Science

#### Current Catalog Information

**STAT** 333 (0.50) LEC, TUT  
Applied Probability


No Special Consent Required

**Effective 01-SEP-2021**

Title Change: Stochastic Processes 1

**Description Change:** This course provides an introduction to stochastic processes, with an emphasis on regenerative phenomena. Topics cover generating functions, conditional probability distributions and conditional expectation, discrete-time Markov chains with a countable state space, limit distributions for ergodic and absorbing chains, applications including the
random walk, the gambler's ruin problem, and the Galton-Watson branching
process, an introduction to counting processes, connections between the
exponential distribution and Poisson process, and non-homogeneous and
compound Poisson processes. [Offered: F,W,S]

Requisite Change:
Prereq: STAT 230 with a grade of at least 60% or STAT 240; MATH 237 or 247.
Antireq: STAT 334

Rationale:
To update course title, description and prerequisites. Title change was
made to better reflect the material in the course. The descriptions were
updated to provide more details on the topics being covered. The new topics
more accurately reflect the teaching material currently being taught.
Furthermore, the department wants to make it very clear what is covered in
STAT 333 and 433. The 3A requirement was removed because it is an opaque
prerequisite that no other third year STAT course has. MATH 237 will serve
as a more useful prerequisite for this course.

Current Catalog Information

STAT 433 (0.50) LEC Stochastic Processes
Point processes. Renewal theory. Stationary processes. Selected topics. [Offered: F]
No Special Consent Required
Prereq: STAT 333

Effective 01-SEP-2021

Title Change:
Stochastic Processes 2

Description Change:
This course provides further ideas and methods in stochastic modelling,
with an emphasis on continuous-time stochastic processes. Topics cover time
to absorption based quantities and discrete phase-type distributions of
discrete-time Markov chains, continuous-time Markov chains with a countable
state space, limit distributions for ergodic and absorbing chains, and
applications including birth and death processes and queueing models of
practical interest. Other topics may include continuous phase-type
distributions, renewal theory and limit theorems for regenerative
processes, and phase-type renewal processes. [Offered: F]

Rationale:
To update course title and description. Title change was made to better
reflect the material in the course. The descriptions were updated to
provide more details on the topics being covered. The new topics more
accurately reflect the teaching material currently being taught.
Furthermore, the department wants to make it very clear what is covered in
STAT 333 and 433.
NEW COURSES  (for approval)

Computer Science - David R. Cheriton School of

Effective 01-SEP-2021

CS 114 (0.50) LAB, LEC, TST, TUT Principles of Computing for Science
Introduction to basic imperative programming principles; programming concepts
including functions, flow control, lists, arrays; numerical accuracy and efficiency;
data analysis
and general-purpose algorithms. Introduction to object-oriented programming concepts.

Requisites :
Prereq: Not open to Faculty of Math Students
Antireqs: CS 116, CS 135, CS 136, CS 137, CS 138, CS 145, CS 146, BME 121,
CHE 120, CIVE 121, ECE 150, GENE 121/MTE 121, ME 101, MSCI 121, NE 111,
PHYS 236, SYDE 121

Rationale :
This new first year course is being proposed so that students in Physics
(and more broadly) are provided with a strong foundation in computing and
programming. It will form a core part of the Physics curriculum, and we
expect it to be of broader interest. The course has been developed in
consultation with the Physics department and at their request.

COURSE CHANGES  (for approval)

Current Catalog Information

CS 338 (0.50) LAB, LEC Computer Applications in Business: Databases
A user-oriented approach to the management of large collections of data. Methods used
for the storage, selection and presentation of data. Common database management
systems. [Note: Lab is not scheduled and students are expected to find time in open
hours to complete their work. Offered: F,W,S]
No Special Consent Required
Requisites :
Prereq: One of CS 230, 231, 234, 246, 330; Not open to Computer Science
students. Antireq: CS 348, 448, MSCI 346

Effective 01-SEP-2021

Requisite Change :
Prereq: One of CS 230, 231, 234, 246, 330; or (AFM 341 and (CS 116 or CS
136 or CS 146)); Not open to Computer Science students. Antireq: CS 348,
448, MSCI 346

Rationale :
Math/CPA would like their students to take CS338 without taking CS330. So
AFM341 (and a computing course) is proposed to be added as a prerequisite
to allow Math/CPA students to take CS338. AFM341 (and a computing course)
and CS330 contains similar course content that students will be
sufficiently prepared for CS338.
Current Catalog Information
CS 450 (0.50) LAB, LEC, TST Computer Architecture
The course is intended to provide the student with an appreciation of modern computer
design and its relation to system architecture, compiler technology and operating
system functionality. The course places an emphasis on design based on the
measurement of performance and its dependency on parallelism, efficiency, latency and
resource utilization. [Note: Lab is not scheduled and students are expected to find
time in open hours to complete their work. Offered: W]
No Special Consent Required
Requisites: Prereq: (CS 245 or SE 212) and (CS 350 or SE 350); Computer Science
students only. Antireq: ECE 429
Effective 01-SEP-2021
Requisite Change: Prereq: (CS 245 or SE 212) and (CS 350 or SE 350); Computer Science
students only. Antireq: ECE 320, ECE 429
Rationale: To update antirequisites. ENG is inactivating ECE 429 in 2022. ECE 320
(Computer Architecture) is currently an antirequisite to ECE 429, therefore
a suitable antirequisite for CS 450.

Pure Mathematics

Current Catalog Information
PMATH 330 (0.50) LEC Introduction to Mathematical Logic
A broad introduction to Mathematical Logic. The notions of logical consequence and
derivation are introduced in the settings of propositional and first order logic,
with discussions of the completeness theorem and satisfiability. [Note: PMATH 432 may
be substituted for PMATH 330 whenever the latter is a requirement in an Honours
plan.]
No Special Consent Required
Requisites: Prereq: (MATH 135 or 145) and (MATH 225 or 235 or 245); Not open to
Effective 01-SEP-2021
Component Change: LEC, TST
Rationale: In the past, this minor-level course has been taught with an in-class
midterm test during on-campus offerings, and no midterm test during online
offerings. Due to the increasing prevalence of cheating on assignments,
the instructors would like to reduce the weight that assignments contribute
to students final grades. To mitigate the stress of a very-high-stakes
final exam, the department and instructors want to incorporate a more
robust midterm test, and in particular to introduce a midterm test to
online offerings. (This was successfully trialed in the Winter 2020 term
with the help of CEL.) This TST slot is to be added to both the on-campus
and online offerings.
PMATH 370  (0.50) LEC  Chaos and Fractals
The mathematics of iterated functions, properties of discrete dynamical systems, Mandelbrot and Julia sets. [Note: Programming experience on one computer language with graphical output is recommended.]
No Special Consent Required
Requisites: Prereq: (One of MATH 118, 119, 128, 138, 148) and (One of MATH 114, 115, 225, 235, 245)

Effective 01-SEP-2021
Requisite Change: Prereq: (One of MATH 118, 119, 128, 138, 148) and (One of MATH 114, 115, 136, 146, 225)
Rationale: This is a house-keeping measure, making the linear algebra requirements more internally consistent. The content of this minor-level course is unchanged. As the level of knowledge provided by MATH 114 (Science) or 115 (Engineering) has been deemed to be sufficient for success in this course, MATH 136 or 146 (Mathematics) should also be deemed to be sufficient. Note that students in the non-specialist track will still be required to take the second linear algebra course in that track (MATH 225). Over 90% of the students who have recently taken PMATH 370 came through the Mathematics track (MATH 136 and 235), so this motion gives these students the option of taking PMATH 370 earlier than they might otherwise have done.

COURSE INACTIVATIONS (for approval)
Effective 01-SEP-2021
PMATH 360  (0.50)  Geometry
Rationale: This minor-level course was last taught in 2017; subsequently, the department has replaced it with two new minor-level courses, PMATH 320 (Euclidean Geometry) and PMATH 321 (Non-Euclidean Geometry), which are being taught in alternate years since 2018. PMATH 360 has already been replaced by the two new courses in the plan requirements for the plans which required it (Mathematics/Teaching and Pure Mathematics/Teaching).

End of Report
Report from Associate Dean, Graduate Studies - Adam Kolkiewicz

Motions to be voted upon:

1. **Applied Mathematics** (attachments)
   
   a) Calendar changes to update the following programs’ course breadth requirements:
      
      Master of Mathematics (MMath) in Applied Mathematics - Quantum Information  
      Master of Mathematics (MMath) in Applied Mathematics  
      Master of Mathematics (MMath) in Applied Mathematics - Co-operative Program  
      Master of Mathematics (MMath) in Applied Mathematics – Water  
      Doctor of Philosophy (PhD) in Applied Mathematics  
      Doctor of Philosophy (PhD) in Applied Mathematics - Quantum Information  
      Doctor of Philosophy (PhD) in Applied Mathematics - Water  

2. **CS** (attachments)

   New course activation CS 747: *Software Verification Using Proof Assistants* – Effective Winter 2021  
   New course activation CS 679: *Neural Networks* – Effective Fall 2020  
   A calendar change in order to add the two new grad courses.
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Program: Master of Mathematics (MMath) in Applied Mathematics - Quantum Information

Program contact name(s): Michael Waite

Form completed by: Michael Waite

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

Updating the program’s course breadth requirements.

Is this a major modification to the program? No

Rationale for change(s):

Three changes are being made to the breadth requirement. (1) The courses in each category have been expanded, by including 600-level courses, to increase options for students. In some cases, the 600-level courses may be more appropriate for incoming graduate students than the 700-level counterparts; e.g. AMATH 642 covers different material than AMATH 741, because it follows a prerequisite chain. (2) In addition, an Applications category has been added to reflect the focus on applications in several research groups in the department, and to provide more options for breadth for all students. (3) AMATH 777 was moved from the Differential Equations to Techniques category to better balance the categories.

Proposed effective date: Term: Winter Year: 2021

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-applied-mathematics/master-mathematics-mmath-applied-mathematics-quantum-information

<table>
<thead>
<tr>
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<td>o Students must complete 4 one-term (0.50 unit) graduate courses, satisfying a breadth requirement and Quantum Information core course requirement. Candidates for the MMath (thesis) degree must maintain a grade point</td>
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<td>average of at least 70% in their coursework. Besides the breadth and Quantum Information requirements, there are no other constraints on course selection.</td>
<td>average of at least 70% in their coursework. o Breadth requirement: to satisfy the breadth requirement, students are required to complete 2 courses from the following lists, with no more than 1 course from each list:</td>
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<td>o Breadth requirement: students are required to take 1 Computation course and 1 Differential Equations or Techniques course, from the following list:</td>
<td></td>
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<tr>
<td>▪ Computation:</td>
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<tr>
<td>▪ AMATH 740 Numerical Analysis</td>
<td>▪ AMATH 663 Fluid Mechanics</td>
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<td>▪ AMATH 741 Numerical Solution of Partial Differential Equations</td>
<td>▪ AMATH 673 Quantum Theory 2</td>
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<tr>
<td>▪ Differential Equations:</td>
<td>▪ AMATH 674 Quantum Theory 3: Quantum Information and Foundations</td>
</tr>
<tr>
<td>▪ AMATH 751 Advanced Ordinary Differential Equations</td>
<td>▪ AMATH 675 Introduction to General Relativity</td>
</tr>
<tr>
<td>▪ AMATH 753 Advanced Partial Differential Equations</td>
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<td>▪ AMATH 777 Stochastic Processes in the Physical Sciences</td>
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</tr>
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<td>▪ Techniques:</td>
<td>▪ AMATH 642 Computational Methods for Partial Differential Equations</td>
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<td>▪ Quantum Information core course requirement: students are required to take the 2 Quantum Information core courses listed below. These interdisciplinary courses provide a strong foundation in quantum information science:</td>
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<tr>
<td>▪ QIC 710 Quantum Information Processing</td>
<td>▪ AMATH 651 Introduction to Dynamical Systems</td>
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<td>▪ QIC 750 Implementation of Quantum Information Processing</td>
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| knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering. | o Quantum Information core course requirement: students are required to take the 2 Quantum Information core courses listed below. These interdisciplinary courses provide a strong foundation in quantum information science:  
  - QIC 710 Quantum Information Processing  
  - QIC 750 Implementation of Quantum Information Processing  
  o Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments.  
  o Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering. |

**How will students currently registered in the program be impacted by these changes?**

_Students currently registered in the program will be allowed to satisfy either the existing or revised breadth requirement._

**Department/School approval date** (04/03/20):  
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 06/30/2020  
**Faculty approval date** (mm/dd/yy):  
**Senate Graduate & Research Council (SGRC) approval date** (mm/dd/yy):  
**Senate approval date** (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Programs: 1) Master of Mathematics (MMath) in Applied Mathematics

2) Master of Mathematics (MMath) in Applied Mathematics - Co-operative Program

Program contact name(s): Michael Waite

Form completed by: Michael Waite

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

Updating the program’s course breadth requirements.

Is this a major modification to the program? No

Rationale for change(s):

Three changes are being made to the breadth requirement. (1) The courses in each category have been expanded, by including 600-level courses, to increase options for students. In some cases, the 600-level courses may be more appropriate for incoming graduate students than the 700-level counterparts; e.g. AMATH 642 covers different material than AMATH 741, because it follows a prerequisite chain. (2) In addition, an Applications category has been added to reflect the focus on applications in several research groups in the department, and to provide more options for breadth for all students. (3) AMATH 777 was moved from the Differential Equations to Techniques category to better balance the categories.

Proposed effective date: Term: Winter Year: 2021

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-applied-mathematics/master-mathematics-mmath-applied-mathematics

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-applied-mathematics/master-mathematics-mmath-applied-mathematics-co-operative-program

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a breadth requirement. Candidates for the MMath (thesis) degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection.

  o Breadth requirement: students are required to take 1 Computation course and 1 Differential Equations or Techniques course, from the following list:
    • Computation:
      ▪ AMATH 740 Numerical Analysis
      ▪ AMATH 741 Numerical Solution of Partial Differential Equations
    • Differential Equations:
      ▪ AMATH 751 Advanced Ordinary Differential Equations
      ▪ AMATH 753 Advanced Partial Differential Equations
      ▪ AMATH 777 Stochastic Processes in the Physical Sciences
    • Techniques:
      ▪ AMATH 731 Applied Functional Analysis
      ▪ AMATH 732 Asymptotic Analysis and Perturbation Theory
  o Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments.
  o Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering.

Master's Research Paper option:
• Courses

Proposed Graduate Studies Academic Calendar content:
a breadth requirement. Candidates for the MMath (thesis) degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection.

  o Breadth requirement: to satisfy the breadth requirement, students are required to complete 2 courses from the following lists, with no more than 1 course from each list:
    • Applications:
      ▪ AMATH 663 Fluid Mechanics
      ▪ AMATH 673 Quantum Theory 2
      ▪ AMATH 674 Quantum Theory 3: Quantum Information and Foundations
      ▪ AMATH 675 Introduction to General Relativity
    • Computation:
      ▪ AMATH 642 Computational Methods for Partial Differential Equations
      ▪ AMATH 740 Numerical Analysis
      ▪ AMATH 741 Numerical Solution of Partial Differential Equations
    • Differential Equations:
      ▪ AMATH 651 Introduction to Dynamical Systems
      ▪ AMATH 653 Partial Differential Equations 2
      ▪ AMATH 655 Control Theory
      ▪ AMATH 751 Advanced Ordinary Differential Equations
      ▪ AMATH 753 Advanced Partial Differential Equations
    • Techniques:
      ▪ AMATH 656 Calculus of Variations
      ▪ AMATH 677 Stochastic Processes for Applied Mathematics
      ▪ AMATH 731 Applied Functional Analysis
<table>
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<tr>
<th>Current Graduate Studies Academic Calendar content:</th>
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</table>
| o Students must complete 7 one-term (0.50 unit) graduate courses, satisfying a breadth requirement. Candidates for the MMath (Research paper) degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection. | • AMATH 732 Asymptotic Analysis and Perturbation Theory  
• AMATH 777 Stochastic Processes in the Physical Sciences |
| o Breadth requirement: students are required to take 1 Computation course and 1 Differential Equations or Techniques course, from the following list:  
  - Computation:  
    - AMATH 740 Numerical Analysis  
    - AMATH 741 Numerical Solution of Partial Differential Equations  
  - Differential Equations:  
    - AMATH 751 Advanced Ordinary Differential Equations  
    - AMATH 753 Advanced Partial Differential Equations  
  - Techniques:  
    - AMATH 731 Applied Functional Analysis  
    - AMATH 732 Asymptotic Analysis and Perturbation Theory | o Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments.  
| o Students may not count more than 3 graduate courses that are cross-listed with undergraduate courses for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. | o Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering.  
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- Courses  
- Students must complete 7 one-term (0.50 unit) graduate courses, satisfying a breadth requirement. Candidates for the MMath (Research paper) degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection.  
| o Breadth requirement: to satisfy the breadth requirement, students are required to complete 2 courses from the following lists, with no more than 1 course from each list:  
  - Applications:  
    - AMATH 663 Fluid Mechanics  
    - AMATH 673 Quantum Theory 2  
    - AMATH 674 Quantum Theory 3: Quantum Information and Foundations  
    - AMATH 675 Introduction to General Relativity  
  - Computation:  
    - AMATH 642 Computational Methods |  
| o Breadth requirement: students are required to take 1 Computation course and 1 Differential Equations or Techniques course, from the following list:  
  - Computation:  
    - AMATH 740 Numerical Analysis  
    - AMATH 741 Numerical Solution of Partial Differential Equations  
  - Differential Equations:  
    - AMATH 751 Advanced Ordinary Differential Equations  
    - AMATH 753 Advanced Partial Differential Equations  
  - Techniques:  
    - AMATH 731 Applied Functional Analysis  
    - AMATH 732 Asymptotic Analysis and Perturbation Theory | |
Students may not count more than three graduate courses that are cross-listed with undergraduate courses for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments.

Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications; appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering.

How will students currently registered in the program be impacted by these changes?
Students currently registered in the program will be allowed to satisfy either the existing or revised breadth requirement.

Department/School approval date (04/03/20):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 07/06/2020
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Program: Master of Mathematics (MMath) in Applied Mathematics - Water

Program contact name(s): Mike Waite

Form completed by: Michael Waite

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

Updating the program’s course breadth requirements.

Is this a major modification to the program? No

Rationale for change(s):

Three changes are being made to the breadth requirement. (1) The courses in each category have been expanded, by including 600-level courses, to increase options for students. In some cases, the 600-level courses may be more appropriate for incoming graduate students than the 700-level counterparts; e.g. AMATH 642 covers different material than AMATH 741, because it follows a prerequisite chain. (2) In addition, an Applications category has been added to reflect the focus on applications in several research groups in the department, and to provide more options for breadth for all students. (3) AMATH 777 was moved from the Differential Equations to Techniques category to better balance the categories.

Proposed effective date: Term: Winter Year: 2021

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-applied-mathematics/master-mathematics-mmath-applied-mathematics-water

<table>
<thead>
<tr>
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<tr>
<td>- Courses</td>
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<tr>
<td>o Students must complete 4 one-term (0.50 unit) graduate courses, satisfying a breadth requirement and Water core course requirement. Candidates for the MMath (thesis) degree must maintain a grade point average of at least 70% in</td>
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<td>Current Graduate Studies Academic Calendar</td>
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<td>their coursework. Besides the breadth</td>
<td>grade point average of at least 70% in</td>
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<td>and Water requirements, there are no</td>
<td>their coursework.</td>
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<td>other constraints on course selection.</td>
<td>o Breadth requirement: to satisfy the</td>
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<td>o Breadth requirement: students are</td>
<td>breadth requirement, students are</td>
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<td>required to take 1 Computation course</td>
<td>required to complete 2 courses from the</td>
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<td>and 1 Differential Equations or</td>
<td>following lists, with no more than 1</td>
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<td>Techniques course, from the following</td>
<td>course from each list:</td>
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<td>list:</td>
<td>• <strong>Applications:</strong></td>
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<tr>
<td>• Computation:</td>
<td>- AMATH 663 Fluid Mechanics</td>
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<tr>
<td>- AMATH 740 Numerical Analysis</td>
<td>- AMATH 673 Quantum Theory 2</td>
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<td>- AMATH 741 Numerical Solution of</td>
<td>- AMATH 674 Quantum Theory 3: Quantum</td>
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<tr>
<td>Partial Differential Equations</td>
<td>Information and Foundations</td>
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<tr>
<td>• Differential Equations:</td>
<td>- AMATH 675 Introduction to General Relativity</td>
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<td>- AMATH 751 Advanced Ordinary</td>
<td>• <strong>Computation:</strong></td>
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<td>Differential Equations</td>
<td>- AMATH 642 Computational Methods</td>
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<td>for Partial Differential Equations</td>
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<td>Differential Equations</td>
<td>- AMATH 674 Fluid Mechanics</td>
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<td>- AMATH 777 Stochastic Processes in</td>
<td>- AMATH 740 Numerical Analysis</td>
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<td>the Physical Sciences</td>
<td>- AMATH 741 Numerical Solution of Partial Differential Equations</td>
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<td>• Techniques:</td>
<td>- AMATH 753 Advanced Partial Differential Equations</td>
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<td>- AMATH 731 Applied Functional Analysis</td>
<td>• <strong>Differential Equations:</strong></td>
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<td>- AMATH 732 Asymptotic Analysis and</td>
<td>- AMATH 651 Introduction to Dynamical</td>
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<tr>
<td>Perturbation Theory</td>
<td>Systems</td>
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<tr>
<td>o This degree is offered through the</td>
<td>- AMATH 653 Partial Differential Equations 2</td>
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<tr>
<td>Collaborative Water Program. This</td>
<td>- AMATH 655 Control Theory</td>
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<td>program, jointly offered by a range of</td>
<td>- AMATH 751 Advanced Ordinary Theory</td>
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<td>departments across several academic</td>
<td>- AMATH 753 Advanced Partial Differential</td>
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<td>faculties, promotes the development of</td>
<td>Equations</td>
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<td>interdisciplinary perspectives on water.</td>
<td>• <strong>Techniques:</strong></td>
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<tr>
<td>Collaborative Water Program students</td>
<td>- AMATH 656 Calculus of Variations</td>
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<tr>
<td>complete their specialist training in</td>
<td>- AMATH 677 Stochastic Processes for</td>
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<tr>
<td>their respective home departments, while</td>
<td>Applied Mathematics</td>
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<tr>
<td>working with colleagues from a variety</td>
<td>- AMATH 731 Applied Functional Analysis</td>
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<tr>
<td>of other departments in core</td>
<td>- AMATH 732 Asymptotic Analysis and</td>
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<tr>
<td>interdisciplinary courses (WATER 601 and</td>
<td>Perturbation Theory</td>
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<tr>
<td>WATER 602).</td>
<td>- AMATH 777 Stochastic Processes in the</td>
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<td>o Water core course requirement: students</td>
<td>Physical Sciences</td>
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<tr>
<td>are required to take the 2 Water core</td>
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<td>courses listed below:</td>
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<tr>
<td>- WATER 601 Integrated Water</td>
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<td>Management</td>
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<td>- WATER 602 Integrated Water</td>
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<td>Management Project</td>
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<td>o Students may not count more than 1</td>
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<td>graduate course that is cross-listed with</td>
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<td>an undergraduate course for credit</td>
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<td>towards their MMath (thesis) degree.</td>
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<td>This restriction applies to all 600-level</td>
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<td>Current Graduate Studies Academic Calendar content:</td>
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<tr>
<td>AMATH courses and any cross-listed courses offered by other departments.</td>
<td>o This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).</td>
</tr>
<tr>
<td>o Courses are selected in consultation with the student’s supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering.</td>
<td>o Water core course requirement: students are required to take the 2 Water core courses listed below:</td>
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<tr>
<td></td>
<td>▪ WATER 601 Integrated Water Management</td>
</tr>
<tr>
<td></td>
<td>▪ WATER 602 Integrated Water Management Project</td>
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<td></td>
<td>o Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments.</td>
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</table>

How will students currently registered in the program be impacted by these changes?

*Students currently registered in the program will be allowed to satisfy either the existing or revised breadth requirement.*

Department/School approval date (04/03/20):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 06/30/2020
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Program: Doctor of Philosophy (PhD) in Applied Mathematics

Program contact name(s): Michael Waite

Form completed by: Michael Waite

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

Updating the program’s course breadth requirements.

Is this a major modification to the program? No

Rationale for change(s):

Three changes are being made to the breadth requirement. (1) The courses in each category have been expanded, by including 600-level courses, to increase options for students. In some cases, the 600-level courses may be more appropriate for incoming graduate students than the 700-level counterparts; e.g. AMATH 642 covers different material than AMATH 741, because it follows a prerequisite chain. (2) In addition, an Applications category has been added to reflect the focus on applications in several research groups in the department, and to provide more options for breadth for all students. (3) AMATH 777 was moved from the Differential Equations to Techniques category to better balance the categories.

Proposed effective date: Term: Winter Year: 2021

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-applied-mathematics/doctor-philosophy-phd-applied-mathematics

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</tr>
</tbody>
</table>
Requirement. Candidates for the PhD degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection.

- **Breadth requirement:** all PhD students are required to take 1 Computation course, 1 Differential Equations course, and 1 Techniques course, from the following lists:
  - **Computation:**
    - AMATH 740 Numerical Analysis
    - AMATH 741 Numerical Solution of Partial Differential Equations
  - **Differential Equations:**
    - AMATH 751 Advanced Ordinary Differential Equations
    - AMATH 753 Advanced Partial Differential Equations
    - AMATH 777 Stochastic Processes in the Physical Sciences
  - **Techniques:**
    - AMATH 731 Applied Functional Analysis
    - AMATH 732 Asymptotic Analysis and Perturbation Theory

- Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their PhD degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to 2 cross-listed courses.

- If a PhD student has taken an equivalent course during a Master's program, this can be counted (upon approval from the Graduate Officer) towards completion of the breadth requirement but does not reduce the number of courses required.

- Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad
knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering.

- AMATH 732 Asymptotic Analysis and Perturbation Theory
- AMATH 777 Stochastic Processes in the Physical Sciences

- Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their PhD degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to 2 cross-listed courses.

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- Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering.

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How will students currently registered in the program be impacted by these changes?

Students currently registered in the program will be allowed to satisfy either the existing or revised breadth requirement.

Department/School approval date (04/03/20): Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 07/06/2020

Faculty approval date (mm/dd/yy):

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Program: Doctor of Philosophy (PhD) in Applied Mathematics - Quantum Information

Program contact name(s): Michael Waite

Form completed by: Michael Waite

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

Updating the program’s course breadth requirements.

Is this a major modification to the program? No

Rationale for change(s):

Three changes are being made to the breadth requirement. (1) The courses in each category have been expanded, by including 600-level courses, to increase options for students. In some cases, the 600-level courses may be more appropriate for incoming graduate students than the 700-level counterparts; e.g. AMATH 642 covers different material than AMATH 741, because it follows a prerequisite chain. (2) In addition, an Applications category has been added to reflect the focus on applications in several research groups in the department, and to provide more options for breadth for all students. (3) AMATH 777 was moved from the Differential Equations to Techniques category to better balance the categories.

Proposed effective date: Term: Winter Year: 2021

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-applied-mathematics/doctor-philosophy-phd-applied-mathematics-quantum-information

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<td>o Students must complete 4 one-term (0.50 unit) graduate courses after the Master's degree, satisfying a breadth requirement and Quantum Information core course requirement, or 8 one-term (0.50 unit) graduate courses after the</td>
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### Current Graduate Studies Academic Calendar Content:

Bachelor's degree, satisfying a breadth requirement and Quantum Information core course requirement. Candidates for the PhD degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth and Quantum Information requirements, there are no other constraints on course selection.

- **Breadth requirement:** All PhD students are required to take 1 Computation course, 1 Differential Equations course, and 1 Techniques course, from the following lists:
  - **Computation:**
    - AMATH 740 Numerical Analysis
    - AMATH 741 Numerical Solution of Partial Differential Equations
  - **Differential Equations:**
    - AMATH 751 Advanced Ordinary Differential Equations
    - AMATH 753 Advanced Partial Differential Equations
    - AMATH 777 Stochastic Processes in the Physical Sciences
  - **Techniques:**
    - AMATH 731 Applied Functional Analysis
    - AMATH 732 Asymptotic Analysis and Perturbation Theory

- **Quantum Information core course requirement:** Students are required to take the 2 Quantum Information core courses listed below. These interdisciplinary courses provide a strong foundation in quantum information science:
  - QIC 710 Quantum Information Processing
  - QIC 750 Implementation of Quantum Information Processing

- The completion of 2 graduate courses in Quantum Information (other than QIC 710 and QIC 750) is also required.
- Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their PhD degree. This

### Proposed Graduate Studies Academic Calendar Content:

Bachelor's degree, satisfying a breadth requirement and Quantum Information core course requirement. Candidates for the PhD degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth and Quantum Information requirements, there are no other constraints on course selection.

- **Breadth requirement:** To satisfy the breadth requirement, students are required to complete 3 courses from the following lists, with no more than 1 course from each list:
  - **Applications:**
    - AMATH 663 Fluid Mechanics
    - AMATH 673 Quantum Theory 2
    - AMATH 674 Quantum Theory 3: Quantum Information and Foundations
    - AMATH 675 Introduction to General Relativity
  - **Computation:**
    - AMATH 642 Computational Methods for Partial Differential Equations
    - AMATH 740 Numerical Analysis
    - AMATH 741 Numerical Solution of Partial Differential Equations
  - **Differential Equations:**
    - AMATH 651 Introduction to Dynamical Systems
    - AMATH 653 Partial Differential Equations 2
    - AMATH 655 Control Theory
    - AMATH 751 Advanced Ordinary Differential Equations
    - AMATH 753 Advanced Partial Differential Equations
  - **Techniques:**
    - AMATH 656 Calculus of Variations
    - AMATH 677 Stochastic Processes for Applied Mathematics
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</table>
| restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to 2 cross-listed courses.  
- If a PhD student has taken an equivalent course during a Master's program, this can be counted (upon approval from the Graduate Officer) towards completion of the breadth requirement but does not reduce the number of courses required.  
- Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering. | - AMATH 731 Applied Functional Analysis  
- AMATH 732 Asymptotic Analysis and Perturbation Theory  
- AMATH 777 Stochastic Processes in the Physical Sciences  
- Quantum Information core course requirement: students are required to take the 2 Quantum Information core courses listed below. These interdisciplinary courses provide a strong foundation in quantum information science:  
  - QIC 710 Quantum Information Processing  
  - QIC 750 Implementation of Quantum Information Processing  
- The completion of 2 graduate courses in Quantum Information (other than QIC 710 and QIC 750) is also required.  
- Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their PhD degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to 2 cross-listed courses.  
- If a PhD student has taken an equivalent course during a Master's program, this can be counted (upon approval from the Graduate Officer) towards completion of the breadth requirement but does not reduce the number of courses required.  
- Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering. |
Students currently registered in the program will be allowed to satisfy either the existing or revised breadth requirement.

Department/School approval date (04/03/20):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 07/06/2020
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Program: Doctor of Philosophy (PhD) in Applied Mathematics - Water

Program contact name(s): Michael Waite

Form completed by: Michael Waite

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

Updating the program’s course breadth requirements.

Is this a major modification to the program? No

Rationale for change(s):

Three changes are being made to the breadth requirement. (1) The courses in each category have been expanded, by including 600-level courses, to increase options for students. In some cases, the 600-level courses may be more appropriate for incoming graduate students than the 700-level counterparts; e.g. AMATH 642 covers different material than AMATH 741, because it follows a prerequisite chain. (2) In addition, an Applications category has been added to reflect the focus on applications in several research groups in the department, and to provide more options for breadth for all students. (3) AMATH 777 was moved from the Differential Equations to Techniques category to better balance the categories.

Proposed effective date: Term: Winter Year: 2021

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-applied-mathematics/doctor-philosophy-phd-applied-mathematics-water

<table>
<thead>
<tr>
<th>Current Graduate Studies Academic Calendar content:</th>
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<tbody>
<tr>
<td>Degree requirements</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Courses</td>
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</tr>
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<td>graduate courses after the Master's degree,</td>
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<tr>
<td>satisfying a breadth requirement and Water core</td>
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<tr>
<td>course requirement, or 8 one-term (0.50 unit)</td>
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<td>graduate courses after the Bachelor's</td>
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Candidates for the PhD degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth and Water requirements, there are no other constraints on course selection. The degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).

### Breadth Requirement

To satisfy the breadth requirement, students are required to complete 3 courses from the following lists, with no more than 1 course from each list:

#### Computation:
- AMATH 740 Numerical Analysis
- AMATH 741 Numerical Solution of Partial Differential Equations

#### Differential Equations:
- AMATH 751 Advanced Ordinary Differential Equations
- AMATH 753 Advanced Partial Differential Equations

#### Techniques:
- AMATH 731 Applied Functional Analysis
- AMATH 732 Asymptotic Analysis and Perturbation Theory

This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).
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<tr>
<td>Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement:</td>
<td>▪ AMATH 732 Asymptotic Analysis and Perturbation Theory</td>
</tr>
<tr>
<td>▪ 1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director.</td>
<td>▪ AMATH 777 Stochastic Processes in the Physical Sciences</td>
</tr>
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<td>Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their PhD degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to 2 cross-listed courses.</td>
<td></td>
</tr>
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<td>If a PhD student has taken an equivalent course during a Master's program, this can be counted (upon approval from the Graduate Officer) towards completion of the breadth requirement but does not reduce the number of courses required.</td>
<td></td>
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<td>Courses are selected in consultation with the student's supervisor. Students are encouraged to select courses that will help them develop a broad knowledge of Mathematics and its applications: appropriate courses are often offered by other departments in the Faculties of Mathematics, Science and Engineering.</td>
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This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).

Water core course requirement: students are required to complete the 2 Water core courses listed below:

▪ WATER 601 Integrated Water Management
▪ WATER 602 Integrated Water Management Project

Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement:

▪ 1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director.

Students may not count more than 1 graduate course that is cross-listed with an undergraduate course for credit towards their PhD degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to 2 cross-listed courses.

If a PhD student has taken an equivalent course during a Master's program, this can be counted (upon approval from the Graduate Officer) towards completion of the breadth requirement but does not reduce the number of courses required.
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**How will students currently registered in the program be impacted by these changes?**

*Students currently registered in the program will be allowed to satisfy either the existing or revised breadth requirement.*

**Department/School approval date (04/03/20):**

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 07/06/2020

**Faculty approval date (mm/dd/yy):**

**Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):**

**Senate approval date (mm/dd/yy) (if applicable):**
Faculty: Math
Effective term: Term/Year Winter 2021

Course ☑️ New ☐ Revision ☐ Inactivation ☐
Milestone ☐ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes:
(e.g. consent, description, title, requisites)

Course Subject code: CS
Course number: 747
Course Title (max. 100 characters incl. spaces): Software Verification Using Proof Assistants
Course Short Title (max. 30 characters incl. spaces): SW Verif Using Proof Asstnts
Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.

Course Description:
Dependent types and the Curry-Howard correspondence (proofs as programs); constructing inductive datatypes and proofs by induction; relations; equality; logical connectives and quantifiers; decision procedures; the simply-typed lambda calculus and theorems about it; intrinsically-typed representation; verification of elementary algorithms.

New course description (for revision only):

Meet Type(s): Lecture Choose an item. Choose an item.
Primary Meet Type: Lecture
Requisites: Antirequisites: CS 842 Topic 12, Dependent Types and Software

Special topics course: Yes ☐ No ☑
Cross-listed: Yes ☐ No ☑

Course Subject(s) to be cross-listed with and approval status:
Sections combined/heldwith:

Rationale for request:

A version of this course has been taught four times: three times as CS 798 "Software Foundations" using Coq, and once as CS 842, "Dependent Types and Software Verification" using Agda. The offerings had enrollments ranging from 25 to 36. The latest offering at 30, turned away 15 more, even though only a year had elapsed since the last offering. This demonstrates demand.

There is another course, CS 745, with "Verification" in the title. But that is a Software Engineering course, involving model-checking, and there is no overlap with this proposal.
The key distinction of the material in this course is a view of a proof as a program. For example, a proof of "If A, then B" can be viewed as a function that consumes a proof of A and produces a proof of B. The type of the function, A -> B, is the proposition being proved. Similarly, a proof of "For all x:A, P(x)" is a function that consumes a value v of type A and produces a proof of P(v). Since the type of the result P(v) depends on the argument v (usually not possible in conventional programming languages), this is a use of a "dependent type".

This has several immediate and important consequences. The languages in which code is developed, in which propositions are stated, and in which proofs are stated are one and the same. Proving is programming. Because satisfying the typechecker becomes more difficult, code is developed in an interactive environment. Due to the immediate feedback, this can be quite addictive.

Lectures in these courses largely consist of livecoding by the instructor, with assistance from students in attendance. Assignments involve completing code to specifications in the same fashion; the typechecker will not accept intermediate steps that violate the rules of logic, so a completed proof is correct by construction.

Prepared by: Denise Shantz          Date: 30-Apr-20
Faculty: Math
Effective term: Term/Year Fall 2020

Course □ New ☒ Revision ☐ Inactivation ☐
Milestone □ New ☐ Revision ☐ Inactivation ☐

New milestone title: Choose an item.

For course revisions, indicate the type(s) of changes:
(e.g. consent, description, title, requisites)

Course Subject code: CS Course number: 679
Course Title (max. 100 characters incl. spaces): Neural Networks
Course Short Title (max. 30 characters incl. spaces): Neural Networks
Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.


New course description (for revision only):

Meet Type(s): Lecture Choose an item. Choose an item. Choose an item.
Primary Meet Type: Lecture

Requisites:

Special topics course: Yes ☐ No ☒
Cross-listed: Yes ☐ No ☒
Course Subject(s) to be cross-listed with and approval status:
Sections combined/held with: Held with CS 479

Rationale for request: There is a large demand in the graduate-student community for a course on neural networks. Pilot versions of this course have been offered for the last 3 years (W18, W19, W20), and the graduate numbers have been growing steadily: 11 in W18, 19 in W19, 39 in W20. In each of those terms, we had to maintain a waiting list at the beginning of the term, and students are sometimes turned away because of a lack of spots.
The methods discussed in the course are not covered in any other CS grad course, at least not at this depth. It has about 25% overlap with CS 680 (Machine Learning), but the overlap between the partner courses (CS 480 and CS 479) was deemed small enough to warrant the creation of CS 479. CS 679 goes into more detail about the theory and implementation of neural learning methods such as backpropagation, and Hopfield energy minimization, as well as neural dynamics.

Prepared by: Denise Shantz  
Date: 27-Mar-20
Prior to form submission, review the content revision instructions and information regarding major/minor modifications. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs.

Faculty: Mathematics

Programs: 1. Doctor of Philosophy (PhD) in Computer Science
           2. Doctor of Philosophy (PhD) in Computer Science - Internship
           3. Doctor of Philosophy (PhD) in Computer Science - Quantum Information
           4. Master of Mathematics (MMath) in Computer Science
           5. Master of Mathematics (MMath) in Computer Science - Co-operative Program
           6. Master of Mathematics (MMath) in Computer Science - Quantum Information

Program contact name(s): Denise Shantz

Form completed by: Denise Shantz

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form (PC docx version or MAC docx version).

Adding CS 679 and CS 747 to the “Category and Area” (course requirements) table.

Is this a major modification to the program? No

Rationale for change(s):

CS 679 and CS 747 are new courses to be created. They need to be added to the Category and Area Table.

Proposed effective date: Term: Fall Year: 2020

Current Graduate Studies Academic Calendar (GSAC) page (include the link to the web page where the changes are to be made):

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/david-r-cheriton-school-computer-science/doctor-philosophy-phd-computer-science
https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/david-r-cheriton-school-computer-science/doctor-philosophy-phd-computer-science-internship
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https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/david-r-cheriton-school-computer-science/master-mathematics-mmath-computer-science
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## Current Graduate Studies Academic Calendar content:

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<td>Software Engineering</td>
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</tr>
<tr>
<td></td>
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<td>CS 642, CS 644, CS 744, CS 842</td>
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<td></td>
<td>Hardware and Software Systems</td>
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<td>Algorithms and Complexity</td>
<td>CS 662, CS 664, CS 666, CS 758, CS 761, CS 762, CS 763, CS 764, CS 765, CS 767, CS 840, CS 858**, CS 860</td>
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<tr>
<td></td>
<td>Scientific and Symbolic Computing</td>
<td>CS 670, CS 672, CS 675, CS 676, CS 687, CS 770, CS 774, CS 775, CS 778, CS 779, CS 780, CS 870, CS 887</td>
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<td>Quantum Information and Computation</td>
<td>CS 766, CS 768, CS 867</td>
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<td>Artificial Intelligence</td>
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<td>Databases</td>
<td>CS 640, CS 648, CS 740, CS 741, CS 742, CS 743, CS 848, CS 856*</td>
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<tbody>
<tr>
<td>Health Informatics</td>
<td>CS 792</td>
</tr>
</tbody>
</table>

### Proposed Graduate Studies Academic Calendar

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How will students currently registered in the program be impacted by these changes?

*CS 679 and CS 747 are both new courses to be created and therefore have no impact on current students.*

**Departmental approval date** (mm/dd/yy):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/30/2020

**Faculty approval date** (mm/dd/yy):

**Senate Graduate & Research Council (SGRC) approval date** (mm/dd/yy):

**Senate approval date** (mm/dd/yy) (if applicable):
Faculty of Mathematics
Guidelines for Faculty Performance Evaluation and Selective Salary Increases for 2021-22 Evaluation Period

1. PURPOSE

The primary purpose of performance reviews for faculty members is to identify particular accomplishments as well as areas of difficulty, and to promote discussion between individual faculty members and the Chair or Director concerning ways to structure and enhance future contributions.

A review is also necessary for all regular faculty members (Lecturers, Assistant Professors, Associate Professors, Full Professors) on full-time, part-time (≥ 50%), reduced load, and joint appointments in order that well-informed decisions can be made regarding selective salary increments (Ref: Memorandum of Agreement Article 13). In some cases this will also include definite term research professors, if specified in their contract. Probationary appointments and definite term contracts will be evaluated annually; tenured faculty and continuing lecturers will be evaluated every two years (evaluation to occur in odd numbered years for the previous two years). In even numbered years, continuing lecturers or tenured faculty who have not previously been evaluated at the University of Waterloo may choose to be evaluated their first year, or take the average for their rank. This choice may be made independently for each of scholarship, teaching, and service.

It is the responsibility of the Chairs/Director to assess the performance of each regular faculty member annually or biennially, to provide a written performance review and to be available to discuss it upon request. Performance reviews are especially important in helping new faculty members gauge their progress towards meeting the standards for reappointment and tenure/continuing status. Annual performance reviews form part of the evidence in tenure and promotion considerations, together with reports from external referees and more extensive career reviews carried out by the Department/School Tenure and Promotion Committee (D/STPC).

Article 13 of the Memorandum of Agreement (MoA) states the principles for the determination of salaries and the evaluation of faculty members. Specifically, section 13.5.1(c) of the MoA requires that each Faculty has Performance Evaluation Guidelines (this document) setting out the evaluation criteria specific to that Faculty. These Faculty-specific guidelines are intended to supplement the principles documented in the Memorandum of Agreement. If there is a conflict between these Guidelines and the MoA and/or Policy 77, the provisions in the MoA and/or Policy 77 shall take precedence. These guidelines are to be made available to all Members prior to the commencement of the calendar year(s) being evaluated.

2. AREAS OF REVIEW

A regular professorial faculty appointment involves three main responsibilities: to communicate the knowledge and nature of one's discipline through teaching, to advance the state of one's discipline through scholarship, and to contribute to the administrative functions that support these goals through effective service. The performance review will focus on recent activity in all three areas: teaching, scholarship, and service.

A regular lecturer appointment will involve teaching and service as described above. It may also include scholarship, depending upon the contract.

University teaching encompasses a wide range of activities. It takes many different forms (e.g., undergraduate and graduate courses, graduate seminars, project and thesis supervision), has many different components (e.g., lectures, tutorials, setting and grading of assignments and examinations, interaction with students outside the classroom, curriculum development), and can occur in many different environments (e.g., large lecture theatres, small seminar
Guidelines for Faculty Performance Evaluation

rooms, distance education, online courses, off-campus short courses and workshops, clinics, laboratories, one-on-one supervision). Research into the pedagogy of teaching and education may be considered teaching for the purposes of evaluation. Contribution to a wide range of teaching activity is considered valuable. Graduate supervision is evaluated in the Teaching category for the Faculty of Mathematics.

Scholarship is broadly defined to include research articles in refereed journals, research monographs, textbooks, expository articles at all levels, conference papers, reports, reviews, patents, addresses to professional/learned societies, etc. Peer-reviewed research with respect to pedagogy and peer-reviewed research with respect to innovative teaching may be considered scholarship for the purposes of evaluation. The originality, quality, impact, and quantity of scholarly work are all considered in reviewing performance. The level of contract or grant support is not in itself to be used as a measure scholarly achievement, although the peer evaluation system in grant selection committees is respected.

Service includes contributions through administrative appointments and committee membership at all levels within the University, direction of laboratories, organizational involvement in Groups, Centres and Institutes, outreach, and student advising. It also includes service to the discipline through granting council committees, editorial boards, conference organization, and working committees of professional societies.

Although the official review period is one or two calendar years, it is desirable that the evaluation take place in the context of a somewhat longer viewpoint (2 years for teaching and service, and 4 years for research). Consecutive performance evaluations should not change dramatically owing to sabbatical leaves, number of teaching terms, or publication delays. Chairs/Directors must also pay particular attention to the provisions of Section 13.5.4 of the MoA regarding evaluations for Members on leave.

3. REVIEW PROCEDURE

Committee

Each Department or School with 15 or more members shall conduct their evaluations with a Departmental/School Performance Review Committee (D/SPRC), advisory to the chair/director. By December 1st, the Members of the Department or School shall elect an advisory committee of no more than five Members to assist the Chair/Director with their responsibilities.

Faculty members appointed in the Dean’s Office will be evaluated by an equivalent Performance Review Committee, advisory to the Dean. This Committee will include the Director of the Mathematics Undergraduate Group (at time of writing Associate Dean, Undergraduate Studies), the CEMC Director, and a representative of the Math/Business programs appointed by the Dean; two additional Dean’s Office faculty members are to be elected by their peers.

Activity Report

By early January, each faculty member under evaluation in that period will submit to the Chair/Director a completed Activity Report for the evaluation period, along with any other relevant documentation. Faculty members with probationary or definite term contracts shall provide documentation each year for the preceding year. Tenured faculty and continuing lecturers shall provide documentation every other year on odd numbered years for the preceding two calendar year(s). For many, the completed Activity Report will be sufficient, but some may wish to include (or be asked by the Chair/Director to include) other material such as copies of publications, teaching materials, and letters of commendation. Failure to submit a report will result in an overall rating of at most 0.5 as outlined in the MoA.
Guidelines for Faculty Performance Evaluation

The Activity Report shall include the weights that the faculty member believes should be used for their Performance Review. These weights will be reviewed by the D/SPRC and compared with any formal written agreements that are on file.

Review Procedures at Department/School level

Based on the Activity Report and any other relevant documentation, the Chair/Director, together with the Review Committee, will review each faculty members’ contributions in teaching, scholarship, and service. They will prepare a written review for each faculty member, addressing each of the three areas.

Role of the Dean

The Chair/Director will inform the Dean of the proposed ratings and weightings for each of the three categories. The Dean will carefully review and if necessary modify the proposed ratings to ensure that fair and consistent standards and criteria are being employed across the Faculty. The Dean may establish an advisory committee to assist with this review.

The Dean will evaluate the performance of the Chairs/Directors, Associate Deans, Assistant Deans and Vice Dean, and shall forward the proposed performance ratings in the three categories and overall to the VPA&P for approval. The VPA&P will inform the Dean and the Chairs/Directors or the Associate Dean in writing with reasons of any changes in the recommended ratings.

The Dean may choose to consult with the Review Committee of the individual’s home unit for input upon their scholarship, teaching and service.

Communication of Ratings

By the end of March, each faculty member will receive a copy of their written performance review and overall rating from the Chair/Director or Dean. If a faculty member’s performance is considered to be less than satisfactory, the written review should carefully explain the reasons for the assessment, and give reasonable and explicit expectations and the details of any plans to enhance contributions. Each faculty member will be provided with the opportunity to discuss their performance review.

Dispute resolution

A faculty member who disagrees with their performance evaluation should proceed first to the Chair/Director, and then, if no resolution has been reached, to the Dean of the Faculty for final disposition prior to the 15th of April. A Chair/Director, Associate Dean, Assistant Deans or Vice Dean who disagrees with their performance evaluation should proceed first to the Dean, and then, if not resolved, to the VPA&P for disposition.

4. RATINGS AND WEIGHTS

A faculty member’s performance in each of teaching, scholarship, and service will be rated on a standard scale ranging from 0 to 2:

2.00 Outstanding
1.75 Excellent
1.50 Very good
1.25 Good
1.00 Satisfactory
0.75 Needs Some Improvement
0.50 Needs Improvement
0.25 Needs Major Improvement
0.0 Unsatisfactory.

Chairs and Performance Evaluation Committees should use the entire range of scores, as needed. The overall rating shall be computed as the weighted average of the individual ratings in teaching (t), scholarship (r) and service (s) for the period under review.

\[ R = at + br + cs \]

where a, b, c are non-negative weights adding to 1.

For members on a biennial performance review cycle, the rating and weightings for non-review years shall be equal to the rating for the previous review year.

A continuing member who has been on leave shall receive, in any category where assessment is not possible as a result of the leave, a rating equal to the average ratings of the three previous reviews in which the Member was not on leave.

Weights

For professorial faculty members with normal responsibilities, teaching and scholarship are considered to be about equally important and are weighted more heavily than service in evaluating overall performance. Thus for most professorial faculty members the default weights of 40%R (scholarship), 20%S (service) and 40%T (teaching) will be used. For lecturer positions, the default weights shall be 80 percent for teaching and 20 percent for service. These default weights do not apply to lecturer appointments made prior to May 1, 2008.

Weights and duties may be adjusted in a formal written agreement between the faculty member and the Chair/Director with the approval of the Dean. The weights shall be at least 20% in every category, except in the case of lecturer appointments which allows for 0% or 10% weight on the Scholarship component. Weight redistribution does not modify the performance quality standards expected in any of the three areas, though expectations for quantity will change. Some examples of non-standard weights used in the Faculty of Mathematics are:

- 60%R, 20%S, 20%T for individuals with special appointments or national awards that entail increased research expectations and reduced teaching loads (e.g., salary award holders such as Steacie and Killam Fellows, NSERC Industrial Research Chairs, CRCs etc.);
- 20%, 60%S, 20%T for individuals with major administrative duties and reduced teaching loads (e.g., Vice Dean, Chairs/Director and Associate Deans);
- 20%, 20%S, 60%T for individuals who have negotiated increased teaching loads and reduced expectations in scholarship.

In the case of appointments starting or ending partway through the evaluation period, the practice in the Math faculty is to use a weighted average to determine the weightings for the evaluation period. For example, if an individual had weights 40%R, 60%S, 20%T for the first six months of the two year cycle, and had weights 20%R, 60%S, 20%T for the last 18 months of the two year cycle, then you would use the weights 25%R, 50%S, 25%T. Here 25%R = \( \frac{6}{12} \times 40\% + \frac{18}{12} \times 20\% \), etc.

With mutual agreement of the faculty member and their unit head weights may change for faculty members who are not evaluated, if there is a significant change in their circumstances.

5. SALARY INCREASES

A pool of funds for selective salary increases is provided to the Faculty in accordance with Memorandum of Agreement Article 13.3.2. A faculty member’s selective salary increase depends both on their annual performance...
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rating (actual R) and on the position of their salary relative to the threshold T1 and T2 for their rank. The selective increases are described in detail in MoA Section 13.3.

Additionally, the MoA allow for adjustments for salary anomalies and for Outstanding Performance Awards, both of these are described in Section 13.3.3 of the MoA.

6. APPROVALS AND DOCUMENTATION

This document will be circulated annually to members of the Department/School. The guidelines will be used to evaluate performance over the course of the next calendar year(s). It shall be reviewed and updated no less than once every five years with any changes approved by a majority vote of the Faculty Council by October 15th in the year before the evaluation calendar year to which the changes would apply.

Documents related to the Performance Evaluation process, including this guideline document, are available at https://sharepoint.uwaterloo.ca/sites/DOM/FacultyPerformance