1. Minutes of the Faculty Council meeting held November 17, 2020 (attached)

2. Report from the Associate Dean, Undergraduate Studies - B. Charbonneau (attached)
   Motions to be voted upon:

   Motion group 1. Updates
   • 1.1 Release of Exams Update

   Motion group 2. New Courses
   • 2.1. CS 346 Report #88 (Dec. 7th 2020)

   Motion group 2. Course Changes
   • 3.1. CS 383 Report #88 (Dec 7th 2020)
   • 3.2. Math 237/247 #88 (Dec 7th 2020)
   • 3.3. COMM 432 #87 (Jan 25th 2021)

   Motion group 4. Plan Changes
   • 4.1. Computational Fine Arts Specialization (Dec. 7th 2020)
   • 4.2. Human-Computer Interaction (HCI) Specialization (Dec. 7th 2020)
   • 4.3. Software Engineering (SE) Specialization (Dec. 7th 2020)
   • 4.5. Mathematics/Business Administration (Jan 25th 2021)

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

   i. Combinatorics & Optimization
      Motion to make calendar changes in order to update the following courses’ descriptions: CO 685 and CO 687.

   ii. Computer Science
      Motions to make calendar changes for the following:
      1) Allow MDSAI students to enrol in CS 638
      2) Add CS 794 to the “Table of categories and areas of courses” under the areas of “Scientific and Symbolic Computing” and “Computational Statistics”
      3) Remove the Graduate Record Examination (GRE) General test statement for all CS programs

   iii. MMT
Motion to make calendar changes for the following:
1) Minimum course grade requirement and frequency with which student performance is assessed to reflect current practice.
2) For MATH 674: removing department consent and adding corequisites of MATH 600 and MATH 692

iv. Pure Mathematics
   1) Motion to update the Master’s Research Paper milestone description in the Calendar to identify the review process for MMath in Pure Mathematics MMath in Pure Mathematics - Quantum Information.
   2) Motion to make a calendar change due to the “Comprehensive Examination” milestone being changed to the “Qualifying Examination” milestone.

v. Statistics and Actuarial Science
   Motions to approve:
   1) Inactivation of ActSc 833 and Stat 837
   2) New course activation ActSc 854 (Longevity and Mortality using Predictive Analytics)
   3) New course activation Stat 940 (Deep Learning)
   4) Course name change and description update in ActSc 855.

4. Report from the Dean – M. Giesbrecht
5. Report from the Associate Dean, Undergraduate Admissions and Outreach - T. Vasiga
6. Notice of election for Chair of Faculty Council – B. Ferguson
7. Future meetings:
   • Tuesday April 20, 2021 – 3:30 PM
8. Other business
Minutes of the Mathematics Faculty Council held Tuesday, November 17, 2020 at 3:30 p.m. via Webex. There were 86 attendees.

1. The minutes of the Faculty Council meeting held September 15, 2020 were approved.

2. Report from the Dean – Mark Giesbrecht
   
   - Budget update: we are currently operating on a continuation of the 2019/20 budget; 9% of the 15% holdback in May 2020 has now been returned to us. The budget outlook for the university is stable but concerning due to an anticipated tuition freeze and COVID-related expenses. Some faculty and staff hiring in Math has been restarted by special permission in recognition of our large intake of undergraduate students.

   - We are successfully progressing through Fall 2020 with ~580 first-year Math students on campus; we are expecting approximately 550 in Winter.

   - International employment: grad students should be encouraged to get to Canada as soon as they are able to do so; special arrangements allowing those with a bank account and SIN to work from out of country are in place for Winter 2021, but this is unlikely to continue. Postdocs must arrive in Canada by end of 2020 before taking the position.

   - Winter 2021 term: The start of classes has been delayed until January 11th. Reading week will continue as planned.

   - Martin Lysy will be Associate Dean of Computing starting January 1, 2021, replacing Steve Vavasis; Jodi Szimanski will be leaving the position of the Faculty’s Director of Communication.

   - Strategic Plan Progress Report:
     
     - Initiatives were created, cancelled, or changed as a result of the COVID-19 pandemic; some implementation initiatives were put on hold for financial reasons. Six of the initiatives proposed were implemented in 19/20:

       - Community Engagement Coordinator (on time; on budget)
       - Increases to top-end Undergraduate Scholarships (on time; on budget)
       - Increased Instructional Support Roles (delayed; on budget)
       - Professional Development Support for Teaching (on time; on budget)
       - Competitive Funding to Graduate Students (on time; on budget)
       - MMT Scholarships for Indigenous Teachers (on time; on budget)
3. Report from the Associate Dean, Undergraduate Studies - B. Charbonneau
   - Despite the late start, the Associate Dean confirmed that there will still be 60 teaching days in the Winter 2021 term.
   - Motion Group 1: Course Changes
     - Motion carried
   - Motion Group 2. Linear Algebra Curriculum Review
     - There was some discussion about the content of the report including: the placement of abstract vector space material, and complex numbers. There was also discussion about the use of course notes vs. a textbook. It was noted that there is no direct impact on the advanced courses.
     - Motion carried

4. Report from the Associate Dean, Co-operative Education - L. Case
   - Pre-COVID 19 student employment – there has been a more than 50% increase in scheduled work terms in the past 7 years; despite this employment rates have been in excess of 95% for participating Math students over the past 4 years.
   - In Spring and Fall 2020, employment rates were lower; however the rate of students not participating in the process has increased significantly.
   - Flexibility has been introduced to adjust the number of work terms required for a degree; minimum length of jobs has also been reduced; special considerations are available for co-op students in graduate programs.
   - Starting in Fall 2020, credit was granted for some international students working in their home countries; international students need work permits to access WaterlooWorks during recruitment.
   - This year’s large incoming first year class has significant impact on the number of students who will be looking for co-op employment. Additional resources have been added by CEE to help develop new jobs. Faculty members are asked to participate in training for CEE, and in the identification of referrals.
   - The complete report is attached.

5. Report from the Associate Dean, Undergraduate Admissions and Outreach - T. Vasiga
   - Report on 1A Enrolment. The Faculty 1A intake target as of December 2019 was 1280; in June the target was revised to 1726. Math Faculty enrollment as of November 1 is 2269. Admission targets for Fall 2021 are under discussion; our current wish is to revert to 1280. The University as a whole is 16% over target.
   - Outreach and Recruitment Activities
     - Waterloo Virtual Fair was a Waterloo-only replacement for Ontario Universities fair; there were 4600 attendees.
     - Waterloo Virtual Open House held November 7th; there were 3290 attendees.
Other key recruitment initiatives include Mathinfo events, third-party fairs, live “virtual” tours and guidance counselor events.

The complete report is attached.

6. Future meeting times were announced

7. Other business
   - There was a question about the status of the backlog of academic integrity cases; a number of resources have been added over the past several weeks and the cases are being reviewed.

The meeting adjourned at 5:00 PM.
Faculty of Mathematics Council
Faculty Council
Dean’s Report

Presented by: Mark Giesbrecht, Dean of Mathematics
Presented to: Faculty of Mathematics Faculty Council
Date: November 17, 2020

Photo: J. Petrik
Budget Update

As of November 17, 2020, still officially on continuity budget from 2019-2020 carried forward

- There was a 15% holdback in May 2020 plus a “soft freeze” on all hiring
- Budget outlook for the university is stable but concerning
  - Domestic tuition: expected to be frozen for an additional 2 years (on top of 10% cut + freeze)
  - Many COVID-related costs
  - Still uncertain outlook on student intake going forward (esp. international)
- Math hiring has restarted in the faculty by special permission and in recognition of our large intake of undergrad students (and their budgetary implications)
  - New/incremental lecturer hires were approved in June
  - Math professorial hiring was restarted in August on previously allocated positions
  - Some additional incremental professorial and lecturer hires were tentatively approved as of today (November 17, 2020) and I will be communicating this to units affected
Progressing through Fall 2020 (successfully!)

- Around 580 first-year Math students on campus
  - 48 on-campus sections of Math 135 and 137 plus one grad course (58 online)
  - Expecting 550 on campus students in Winter

- Only 5 active cases of COVID-19 on campus (total 8 so far this term)

- We are in the final stretch!

- Thank you to all faculty and staff for your extraordinary investment of time and energy to continue to deliver an excellent undergrad and grad program
Progressing through Fall 2020 (successfully!)

Math TOTAL: 157 courses / 249 sections

- ACTSCI 10 courses, 10 sections
- AMATH 14 courses, 14 sections
- CO 16 courses, 16 sections
- COMM 4 courses, 4 sections
- CS 43 courses, 99 sections
- MATHBUS 2 courses, 2 sections
- MTHEL 3 courses, 10 sections
- PMATH 12 courses, 12 sections
- STAT 24 courses, 24 sections
- CORE AND SERVICE 29 classes, 58 sections
Grad Student and Postdoctoral Employment

- International grad students
  - Those who have a bank-account/SIN will be able to work from out-of-country for Winter 2021 term
  - Expectation is that this accommodation will end and students should prepare to arrive in Canada
  - TAs cannot be paid to grad students without bank-account/SIN
  - New student offers should acknowledge that TA funding is contingent on residence
  - Previous (F20) funding commitments will be honoured but with an expectation of best effort to move TA terms

- Postdoctoral fellows
  - Faculty of Math funding not yet approved, but hope for some progress shortly
  - Postdocs must arrive in Canada by end of 2020/before taking position.
  - I am working on exceptions, but new contracts should reflect residence requirement
Change of Schedule for Winter 2021 term

Approved at Senate yesterday:

- Delaying the start of winter term classes until January 11.
- All other winter term activities and regular operations for employees will begin as usual on January 4.
- Classes cancelled on Monday, March 15 and Tuesday, March 16 to create a four-day weekend for students from March 13 to 16. March 15 and 16 will be normal work days for employees.
- Reading week will continue as planned from February 13 to 21.
- All employees will be provided with two additional days off to be used in the January-April window.
Math 4 = Data Innovation Hub
Comings and goings

Martin Lysy (Statistics and Actuarial Science) will be Associate Dean for Computing and head of MFCF starting January 1, 2021

- Many many thanks to Steve Vavasis for all his hard work in this position over the past 2.5 years, and especially through the past 9 months!

Jodi Szimanski is off to Co-op

- Jodi has been our Director of Communications since October 2017.
- She is moving become Director of Communications in CEE (Co-op) starting next week
- Congratulations on building a fantastic communications team in Math and all the best in your new position.
FACULTY OF MATHEMATICS
STRATEGIC PLAN 2018:
Progress Report 2019/20

Presented by: Mark Giesbrecht, Dean of Mathematics
Presented to: Faculty of Mathematics Faculty Council

11/17/2020
FACULTY OF MATHEMATICS STRATEGIC PLANNING PROCESS

Self Study
• MAY-NOV/17

Consult
• SEPT-DEC/17

Draft & Review
• JAN-JUN/18

Final Plan
• JULY-SEPT/18

Strike IWGs
• SEPT-OCT/18

Implement & Monitor
• ONGOING
AN UNANTICIPATED CHANGE

The impact of the COVID-19 pandemic, which disrupted the University and its members as the 2019/20 implementation year was nearing its end, can be seen in this report.

- Some planned initiatives were cancelled or changed.
- Some new initiatives resulted from faculty, staff, and student innovation to address our new remote learning and working context.
- Due to financial uncertainty resulting from the pandemic, all strategic plan implementation initiatives were temporarily put on hold in April 2020.
- This decision did not affect the 2019/20 implementation year.
- The implications of this temporary pause will be discussed in the 2020/21 report.
- An MSPC exercise in late 2020 will set the stage for a phased reintroduction of strategic plan implementation initiatives as the Faculty’s finances allow.
Teaser: Restarting Previously Approved Initiatives

Initiatives with Highest Priority to Restart, per MSPC:

- MMT Indigenous Scholarships
- Graduate Student Funding (Math IMAEs and Excellence Scholarship)
- Increases to Undergraduate Top-End Scholarships
- Community Engagement Co-Ordinator
- Instructional Support Roles (MUO)
- Professional Development Support for Teaching
- Prestigious Postdoctoral Fellowships
- Enhance Assessment Practices
- Faculty of Math Mental Health Training

Strategic Plan Implementation Meeting on Tuesday, November 24
Implementation Working Groups (IWGs) discuss their priority area and generate ideas.

IWGs select top ideas and develop implementation initiative proposals.

Mathematics Strategic Plan Committee (MSPC) evaluates proposals.

Select proposals are approved and funded, based on MSPC feedback and financial considerations.
Six of the implementation initiatives proposed by IWGs to begin in 2019/20 were approved and funded.

A brief summary of each initiative’s accountability report for 2019/20 follows.
Community Engagement Co-ordinator

Create a new position to focus on wellbeing and community within the Faculty of Mathematics. They will work with Faculty and University partners to create initiatives and events that raise awareness about mental health issues and engage in community-building activities for everybody within the Faculty.

✓ Role established and filled for an initial term July 2019 - January 2021

✓ Examples of supported initiatives:
  - Wellness Wednesdays
  - Bell Let’s Talk days
  - Initiation of an LGBTQ++ group
  - Leadership of the Student Wellbeing Committee
  - Enhanced campus communication and collaboration (Student Success Office, Campus Wellness, Wellness Collaborative, MathSoc, and Math GSA)
Increases to Top-end Undergraduate Scholarships

*Enhance current undergraduate scholarships by increasing the amount, firstly, and number, secondly, of scholarships for undergraduate students.*

- Fall 2019: 11 @ $15K accepted by admitted students
  - Acceptance rate is significantly higher than rate for non-scholarship offers and higher than acceptance rate for lower-valued scholarship offers
- Fall 2020: 8 @ $25K and 3 @ $15K accepted by admitted students
  - Acceptance rate is quite positive and increases proportionally to the size of scholarship offered
Increased Instructional Support Roles

Establish instructional support for core mathematics undergraduate courses, to improve course instruction, allow instructors more time to focus on student learning, and ensure greater uniformity across sections.

- Original workplan and timelines were revised to incorporate a needs assessment conducted through fall 2019 and winter 2020
- An Instructional Support Needs Assessment Team (ISNAT) of four undergraduate lecturers was tasked with supporting the teaching of selected courses and with reflecting on how Instructional Support Coordinator (ISC) positions could be implemented
- The ISNAT produced a 33-page final report in May 2020
Create a grant that instructors can apply to for their professional development related to teaching (e.g. conferences and workshops travel, teaching reduction for instructors with LITE grants, etc.).

- Supported 40-50 unique individuals through opportunities including:
  - International, national, and institutional conferences and meetings
  - Visiting Seminar speakers
  - Plans to host the regional Spring Meeting of the Mathematical Association of America (cancelled due to COVID-19)
- Enhanced reputation as a leader in the Canadian mathematics education community
- Catalyst for new “Studies on Teaching and Learning” initiative
- Increased interaction across the Faculty on our teaching mission
Provide Competitive Funding to Graduate Students

Provide Math-funded International Master’s Awards of Excellence (IMAE) to new international master’s students and create new prestigious scholarships to attract top students in our graduate programs.

✓ Math IMAEs and the Dean of Mathematics Excellence Scholarship were successfully established
  - Due to the timing of the 2019/20 initiative approvals, academic units could not be advised early enough to include in fall 2020 offers
✓ Awarded in 2019/20 (winter and spring admissions):
  - 7 Math IMAEs
  - 2 Dean of Mathematics Excellence Scholarships
The MMT program seeks to engage teachers who are indigenous or who are teaching in indigenous communities to encourage mathematical education and continuous learning. This full scholarship opportunity is designed to eliminate financial barriers that may exist for interested teachers and to increase awareness amongst indigenous teachers of mathematics and the indigenous communities they serve.

- **Fall 2019:** Scholarship terms of reference developed by MMT and GSPA with input from the Waterloo Indigenous Student Centre, the University’s Senior Director, Indigenous Initiatives, and the Indigenous Strategy Advisor to the Dean of Mathematics

- **Parallel exploratory discussions investigated cultural considerations**

- **Winter 2020:** Upon obtaining formal University approval, the award was announced through as many channels as possible

- **Four applications were received by the May 1, 2020 deadline**
Our strategic plan implementation is far from limited to IWG initiatives. Offices and individuals across Mathematics are moving us toward our strategic goals and objectives every day.

Highlights of some of the ways that is happening follow.
Highlights of Strategically-aligned Achievements & Initiatives

- Faculty growth
- Improvements to hiring processes
- New ways to engage with faculty, staff, and students remotely
- Wellbeing and inclusion content for course syllabi
- Increased communications of faculty and staff achievements and research
- Large targeted undergraduate recruitment initiative for India
- Handwritten congratulations notes to top undergraduate applicants
- Digital Assets Group
- SAS Instructional Support Co-ordinators
- New CS Undergraduate Research Fellowship
- C&O summer undergraduate research program rebuilt for online success
Highlights of Strategically-aligned Achievements & Initiatives

- MDSAI program
- Mathematics Doctoral Prize and new graduate student awards in AMATH and MActSc
- Improvements to admissions, comprehensive exam, and TA processes in PMATH
- New research conferences and research industry day in SAS
- Associate Dean, Innovation and Entrepreneurship
- Technical Writer to support grant and award development
- New and enhanced long-distance research connections and collaborations
- Many new faculty awards, honours, and chairs
- 30 press releases, 3 media advisories, 1 pitch and 1 OpEd
- CEMC@Home and drastically increased traffic to CEMC online courseware
These high-level descriptive measures are intended to complement the success measures that are in place for each of the Faculty-funded implementation initiatives.

The baseline for this tracking is 2018/19, the year the plan was approved and implementation planning started.
Undergraduate Students (fall headcount)

<table>
<thead>
<tr>
<th>Year</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018/19</td>
<td>7568</td>
</tr>
<tr>
<td>2019/20</td>
<td>7482</td>
</tr>
</tbody>
</table>

Undergraduate % Female (fall headcount)

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018/19</td>
<td>36.2%</td>
</tr>
<tr>
<td>2019/20</td>
<td>36.5%</td>
</tr>
</tbody>
</table>

Undergraduate FTE Students/Regular Faculty

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018/19</td>
<td>28.6</td>
</tr>
<tr>
<td>2019/20</td>
<td>26.7</td>
</tr>
</tbody>
</table>
ENGAGE WITH THE STRATEGIC PLAN

Visit https://uwaterloo.ca/math/about/strategic-plan-2018 to:

- Read the Faculty of Mathematics Strategic Plan 2018
- Submit an idea for an implementation initiative
- Read the annual progress report

- Contact Martha Foulds, Director of Planning (mfoulds@uwaterloo.ca) to:
  - Ask questions
  - Request a copy of this presentation
  - Share your feedback with MSPC
QUESTIONS?
Math Co-op through Covid-19 and beyond

Lori Case, Associate Dean, Co-operative Education
Jeremy Steffler, Faculty Relations Manager
TODAY

- Pre-covid-19 student employment
- Covid-19 affects on student employment
- Faculty and university response
- International students and international work terms
- Effects of larger incoming class
- A request for assistance
Pre-covid-19 student employment

- Number of Math co-op students have increased significantly in recent years
  - Scheduled work terms: 2013: 4100 → 2020: 6200: Over 50% increase

- Employment rates:
  - Ranging from 95%-99% for participating Math students over past 4 years

- Non-participating students:
  - Winter/Fall: 1-2% of all students scheduled for co-op
  - Spring: 5% of all students scheduled for co-op

- Actual (employed/scheduled) rates ranging from 90-97%
Effects of covid-19 on student employment

- Spring and Fall 2020

<table>
<thead>
<tr>
<th></th>
<th>Scheduled out</th>
<th>Employed</th>
<th>Not participating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2020</td>
<td>2014</td>
<td>73%</td>
<td>21%</td>
</tr>
<tr>
<td>Fall 2020</td>
<td>2310</td>
<td>64%</td>
<td>30%</td>
</tr>
</tbody>
</table>

- Winter 2021 preliminary results (after main round)

<table>
<thead>
<tr>
<th></th>
<th>Scheduled out</th>
<th>Employed</th>
<th>Not participating</th>
</tr>
</thead>
<tbody>
<tr>
<td>First WT</td>
<td>165</td>
<td>24%</td>
<td>2%</td>
</tr>
<tr>
<td>Non-first WT</td>
<td>1791</td>
<td>66%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Faculty and university response: Flexible Pathways

- Accommodations for unemployed students for Spring 2020, Fall 2020, Winter 2021:
  - One work term reduction in degree requirements for any students unemployed in any term
  - Unemployed students permitted to take a full-time course load instead of a maximum of 2

- Accommodations regarding jobs:
  - Minimum length of jobs acceptable for co-op credited reduced from 12 to 8 weeks

- Note: *Math did not reduce work report or PD course requirements*
Faculty and university response: Flexible Pathways

- Special considerations for co-op students in graduate programs.
- CEE assisted employers in utilizing special government funding for student positions.
- The university hired many students:
  - 128 math students hired in Spring, 103 in Fall, more in progress for Winter
- These accommodations are currently all under review
  - Some may no longer apply to Spring 2021 and beyond.
  - Students will be informed of changes by the start of recruiting for Spring 2021.
International students and international work terms

- In Spring 2020, credit was only available for students working in Canada.
- Starting in Fall 2020, credit was granted for some international students working in their home countries.
  - Other international positions are not generally being approved for co-op credit.
- International students require co-op work permits if working for a Canadian company remotely from outside Canada.
- International students need work permits to access WaterlooWorks during recruitment.
Fall 2020 Incoming class

- From Sept 2020 Faculty Council Report:

<table>
<thead>
<tr>
<th>Admitted</th>
<th>Regular</th>
<th>Co-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>2452</td>
<td>189</td>
<td>2263</td>
</tr>
</tbody>
</table>
### Effects of larger incoming class

<table>
<thead>
<tr>
<th></th>
<th>FIRST WORK TERM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A Fall 2019</td>
<td>S20: 673</td>
</tr>
<tr>
<td></td>
<td>F20: 273</td>
</tr>
<tr>
<td></td>
<td>W21: 155</td>
</tr>
<tr>
<td>1A Fall 2020</td>
<td>S21: 1038</td>
</tr>
<tr>
<td></td>
<td>F21: 812</td>
</tr>
<tr>
<td></td>
<td>W22: 417</td>
</tr>
<tr>
<td>CHANGE</td>
<td>+365</td>
</tr>
<tr>
<td></td>
<td>+539</td>
</tr>
<tr>
<td></td>
<td>+262</td>
</tr>
</tbody>
</table>
Based on increased Math enrolment and the expected number of Honours Arts students choosing co-op beginning in Winter 2021, ‘scheduled out’ figures for 2021-2022 are expected to set new records, particularly in Winter 2022.

Predicted ‘Scheduled Out’ Figures

*Predictions based on model using Nov 1st 2020 Count Date and historical sequence behavior.
What is Co-operative Education Doing?

- Additional hires
  - Business Developer
  - Digital Business Developer
  - Communications Specialist
  - Career Advisor *(Not specific to advising Math but to increase overall capacity)*

- Industry job development opportunities research completed

- Co-op referral campaign (Faculty, Alumni, Staff)

- Increased CEE support for International employers and students.

- Large-scale hiring strategy on-campus

- Doubled digital advertising and outreach to promote:
  - Digital skills campaign
  - Funding
What is Co-operative Education Doing?

- Outreach with current Math employers, Employer champion campaigns, WaterlooWorks research analysis
- Awareness Building and Employer Lead Generation
  - Association partnerships, industry event/conferences, On-campus partnerships
- Alumni Outreach
  - Co-op referral campaigns (Faculty, Alumni, Staff)
- Student Engagement
  - Arrange your own jobs, dedicated career development support
- Digital Campaign
  - Industry identification and google analytics to target regions of current and potential employers
A request for assistance

- Faculty & CEE Training Sessions
  - Will be looking for assistance with the offering training sessions (November/December 2020) on the following program groupings:
    - Computer Science
    - Graduate Co-op Programs
    - Math and Business
    - Mathematics
A request for assistance

- Identification of potential employment opportunities
  - Positions within the Faculty
    - Contact jeremy.steffler@uwaterloo.ca
  - Positions Outside of Waterloo
    - Alumni contacts?
    - Industry and/or Research Contacts?
    - Contacts within Professional or Industry Associations?
    - Current or new employers?
    - E-mail hire.talent@uwaterloo.ca.
Report from the Associate Dean,
Undergraduate Admissions and Outreach

Troy Vasiga

November 17, 2020
Discussion items

- Faculty of Math November 1st enrollment numbers
- Waterloo Virtual Fair
- Virtual Fall Open House
- Other key recruitment activites
- CEMC Contest update
Math Faculty 1A Enrollment as of November 1, 2020

<table>
<thead>
<tr>
<th>Plan</th>
<th>Dec Target</th>
<th>Jun Target</th>
<th>App</th>
<th>Adm</th>
<th>Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Faculty</td>
<td>1280</td>
<td>1726</td>
<td>15663</td>
<td>9562</td>
<td>2269</td>
</tr>
</tbody>
</table>

Notes:

- Admitted class is approximately 30% larger than the June target, but 177% over the original December 2019 target for Fall 2020.
- Admission targets for Fall 2021 are currently being discussed at the Faculty, Registrar’s Office and Provost level. Our strong push is for reverting to the original December 2019 targets for Fall 2021 admissions.
- Domestics vs. International enrollment: 1434 vs. 835
- MATH/ELAS number: 181
- UW as a whole is over-target by 16% overall
Waterloo Virtual Fair

- A UW-only replacement for Ontario Universities Fair (OUF)
- Held October 3rd, through Accelevents
- Over 7800 individuals registered and 4600 attended
- Faculty of Math presentations had over 1500 attendees
- These presentations have been viewed over 13000 times (and counting)
- Attendees indicated a very high level of value from these sessions
Waterloo Virtual Open House

- UW-only replacement for Waterloo Fall Open House
- Held November 7th, through Accelevents
- Over 6800 individuals registered and 3290 attended
- 91 different sessions in total, with 2400 individual attendees and 9800 session views
- On average each attendee viewed 4 different sessions
- 1300 booth visits
- Individual sessions:
  - Contest workshops: 331
  - Computer Science: 557
  - CFM: 109
  - Math/Bus: 178
  - Admissions: 478
  - Honours Math: 275
Other key recruitment initiatives

- Mathinfo ‘market’ events – problem solving session with Ian (CEMC), a current student from that region to provide testimonial, and a recruiter to highlight key differentiators about our faculty/school. We hosted these for: China, India, SE Asia, Middle East and USA/Caribbean. We saw over 750 participants for all of these sessions.

- We are participating in third-party fairs hosted by Canadian High Commissions or well-known higher education companies. We have done over 20 major higher-ed fairs, targeted to over 30 different countries and have collected thousands of leads for our CRM system.

- Live “virtual” tours are now happening twice weekly, where an ambassador walks through campus with their phone to give viewers a tour of campus and then we follow that by faculty specific break-out Zoom room to answer their questions.
Other key recruitment initiatives (cont’d)

- Guidance counselor event – this week. Hundreds of counselors from around the world are expected to join UWs Guidance counselor event and Math will have its own breakout room to address any questions or key brag points with counselors.
- Book a 1:1 meeting with one of our team
- CONNECT WITH US webpage: designed for prospective students to stay engaged.
  https://uwaterloo.ca/math/future-undergraduates/connect
- More than 100 individual school visits are on-going

Many thanks to the UAO team: Meghan McLellan, Amelia Burton, Vicky Liu, Pavak Vyas, Ashleigh Rosary for all their hard work through all of these events at all hours of the day and night, and the tremendous administrative support of Carolyn Sedore.
CEMC Contests

- Canadian Intermediate and Senior Math contests happen November 18th (tomorrow). Registrations are around 65% of last year’s numbers. Marking to happen in early December.
- Beaver Computing Challenge runs from November 9 to 20 for grades 5/6, 7/8, and 9/10. Registrations are around 80% of last year’s numbers.
- Logistics of contests in the Winter and early Spring to be decided shortly.
February 2021 Report

Report of Undergraduate Affairs Committee to Mathematics Faculty Council

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 meeting of the 7th of December 2020 and the 25th of January 2021.

1. **Update**
   1.1. Release of Exams Update

2. **New Courses**
   2.1. CS 346 Report #88 (Dec. 7th 2020)

3. **Course Changes**
   3.1. CS 383 Report #88 (Dec 7th 2020)
   3.2. Math 237/247 #88 (Dec 7th 2020)
   3.3. COMM 432 #87 (Jan 25th 2021)

4. **Plan Changes**
   4.1. Computational Fine Arts Specialization (Dec. 7th 2020)
   4.2. Human-Computer Interaction (HCI) Specialization (Dec. 7th 2020)
   4.3. Software Engineering (SE) Specialization (Dec. 7th 2020)
Release of Final Exam

It has been a long standing practice that we would not release final exams for Core courses. While each department may have a different opinion and may decide on their internal policy, including the choice to not make the decision for the instructor, Core courses belong to the whole Faculty, and the decision on whether or not to release Core and Service courses final exams therefore rests with UAC and Faculty Council. UAC has discussed whether a change should be made to this practice, and no consensus was reached on whether to change the practice.

This is a summary of the discussion

- The exams served as an official record of the University. Traditionally, not releasing them was useful as student could not alter them and ask for a regrading. The advent of Crowdmark has made this point moot, and the safe release of final exams that could not altered is now as easy as pressing a button.
- Arguments for the release of exams: 1) matter of transparency, 2) some instructors like to release final exams in their upper year courses and have not seen significant increases in remark requests, and 3) it is na"ive to believe students do not take screenshot in the current pandemic
- Arguments for not releasing exams: 1) allows us to preserve questions (understanding it is difficult to constantly create new good questions, 2) without more marking support, the labor of making helpful comments is not easy, 3) many students tend to ask for marks instead of wanting to learn from errors and releasing exams might encourage this behavior, and 4) not releasing exams allows instructors to scale without issue (it is much easier to explain this to a student visiting their exam than to the whole class)
- There is a disadvantage, to certain students, for each choice. For example, the practice of having students see their exams on campus favours non-coop students. The practice of releasing exams also gives advantage to students who like to request grade changes.
- No consensus was reached on whether to change the practice; some departments were consulted by their associate chair in advance of the meeting, and faculty members in those departments were evenly split.
NEW COURSES  (for approval)

Computer Science - David R. Cheriton School of

Effective 01-SEP-2022
CS 346  (0.50)  LAB, LEC, TST  Application Development
Introduction to full-stack application design and development. Students will work in project teams to design and build complete, working applications and services using standard tools. Topics include best-practices in design, development, testing and deployment.

Requisites : Prereq: CS 246; Computer Science students only
Rationale : This course is created to address the concern that many of our undergraduate students are lacking expertise in the most basic skills of software development.

COURSE CHANGES  (for approval)

Current Catalog Information
CS 383  (0.50)  STU  Computational Digital Art Studio
An upper-level studio course to create computational projects that function as art works and aesthetic experiences. Students will work in an interdisciplinary environment to combine computer science principles with fine art technical and conceptual skills. [Offered: W]
No Special Consent Required
Requisites : Prereq: CS 240; FINE 228 or 229; FINE 257 or ENGL 293
Cross-listed as: FINE 383
Effective 01-SEP-2022
Requisite Change : Prereq: CS 240, FINE 247 OR FINE 228, FINE 257
FINE 229 Hybrid Media will be inactivated for the 2021/2022 calendar and the new course FINE 247 Expanded Media: Interaction was created to cover the content of FINE 229. FINE 228 is included in the Prereq change because it is a second year studio course that will prepare students for CS 383. It was decided that FINE 257 was not required for CS 383 (but it is for the Comp Art Specialization).

Dean of Mathematics

Current Catalog Information
MATH 237  (0.50)  LEC, TST, TUT  Calculus 3 for Honours Mathematics
Calculus of functions of several variables. Limits, continuity, differentiability, the chain rule. The gradient vector and the directional derivative. Taylor's formula.
Optimization problems. Mappings and the Jacobian. Multiple integrals in various
cordinate systems. [Note: MATH 247 may be substituted for MATH 237 whenever the
latter is a plan requirement. Offered: F,W,S]

No Special Consent Required

Requisites :
Prereq: (MATH 106 or 114 or 115 or 136 or 146) and (MATH 128 with at least
70% or MATH 138 with at least 60% or MATH 148); Honours Math or
Math/Physics students. Antireq: MATH 207, 212/ECE 206, MATH 212N, 217, 227

Effective 01-SEP-2022

Requisite Change :
Prereq: (MATH 106 or 114 or 115 or 136 or 146) and (MATH 128 with at least
70% or MATH 138 with at least 60% or MATH 148); Honours Math or
Math/Physics students. Antireq: MATH 207, 212/ECE 206, MATH 212N, 217, 227,
247

Rationale :
As MATH 237 and MATH 247 are the only courses in the advanced and regular
pairings that are not antirequisites of each other, this change is bringing
consistency. This break in consistency happened for historical reasons. Pre
2008-2009 calendar, MATH 237 and MATH 247 were antirequisites of each
other. At the time, there was a rush of students trying to get into
Mathematical Finance without the appropriate knowledge of real analysis.
They wanted to go straight from MATH 237 to PMATH 351, which is a complete
disaster for most students. Taking MATH 247 was, for those students, a
burned course, because it was antirequisite with MATH 237. The Faculty
then decoupled the courses to enable a more reasonable pathway for those
students. In the 2008 and 2009 calendar, MATH 247 was antirequisite to MATH
237 but not the other way around, and in 2009-2010 up to now, neither
course listed the other as antirequisite. Since then, Pure Math has created
PMATH 333, which is specifically designed to bridge the gap between MATH
237 and PMATH 351. Now most students figure out that they want
Mathematical Finance before they take MATH 237. So there is really no need
to continue having MATH 237 and MATH 247 decoupled.

Current Catalog Information
MATH 247 (0.50) LEC, TST Calculus 3 (Advanced Level)
Topology of real n-dimensional space: completeness, closed and open sets,
connectivity, compact sets, continuity, uniform continuity. Differential calculus on
multivariable functions: partial differentiability, differentiability, chain rule,
Taylor polynomials, extreme value problems. Riemann integration: Jordan content,
integrability criteria, Fubini's theorem, change of variables. Local properties of
continuously differentiable functions: open mapping theorem, inverse function
theorem, implicit function theorem. [Offered: F,W,S]

No Special Consent Required

Requisites :
Prereq: MATH 146, 148; Honours Mathematics students only

Effective 01-SEP-2022

Requisite Change :
Prereq: MATH 146, 148; Honours Mathematics students only; Antireq: MATH 237

As MATH 237 and MATH 247 are the only courses in the advanced and regular
pairings that are not antireqs of each other, this change is bringing
consistency. This break in consistency happened for historical reasons. Pre
2008 and 2009 calendar, MATH 237 and MATH 247 were antirequisites of each other. At the time, there was a rush of students trying to get into Mathematical Finance without the appropriate knowledge of real analysis. They wanted to go straight from MATH 237 to PMATH 351, which is a complete disaster for most students. Taking MATH 247 was, for those students, a burned course, because it was antirequisite with MATH 237. The Faculty then decoupled the courses to enable a more reasonable pathway for those students. In 2008-2009, MATH 247 was antirequisite to MATH 237 but not the other way around, and in 2009-2010 up to now, neither course listed the other as antirequisite. Since then, Pure Math has created PMATH 333, which is specifically designed to bridge the gap between MATH 237 and PMATH 351. Now most students figure out that they want Mathematical Finance before they take MATH 237. So there is really no need to continue having MATH 237 and MATH 247 decoupled.
COURSE CHANGES  (for approval)

Dean of Mathematics

Current Catalog Information
COMM  432  ( 0.50 )  LEC, TUT  Electronic Business
This course will introduce students to approaches, techniques and terminology used in electronic business. Students will also study issues in disciplines related to electronic business. They will review a number of sites and identify efficient e-commerce analysis, design and development techniques. Students will be introduced to current electronic business tools and standards, and will construct their own simple electronic business site.
No Special Consent Required
Requisites :
Effective  01-SEP-2022
Prereq: BUS 352W, CS 330 or 490; Level at least 3A. Antireq: AFM 443
Requisite Change :
Prereq: (MGMT 244/ARBUS 302 or BUS 352W), CS 330 or 490; Level at least 3A. Antireq: AFM 443
Rationale :
To update prerequisites. As we expect more and more of Math/BA and MATH/ITM students will take MGMT 244/ARBUS 302 since their plan requirement change, we should update the prerequisites to include them so that we do not use the override form.

End of Report
Update to the Computational Fine Arts Specialization

**Motion and Rationale**
Effective fall 2022, allow the inclusion of FINE 130, FINE 228, FINE 229/247, FINE 257, VCULT 100, VCULT 200, and ENGL 293 to the specialization requirements. These changes make the computational art specialization more streamlined and more flexible for CS students. CS students will have more choices when taking required FINE courses and encounter fewer scheduling problems.

<table>
<thead>
<tr>
<th>Current</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>Three CS courses:</td>
</tr>
<tr>
<td>• CS 349 User Interfaces</td>
<td>• CS 349 User Interfaces</td>
</tr>
<tr>
<td>• CS 383/FINE 383 Computational Digital Art Studio</td>
<td>• CS 383/FINE 383 Computational Digital Art Studio</td>
</tr>
<tr>
<td>• CS 488 Introduction to Computer Graphics</td>
<td>• CS 488 Introduction to Computer Graphics</td>
</tr>
<tr>
<td>• FINE 100 Studio Fundamentals</td>
<td>One first year studio course:</td>
</tr>
<tr>
<td>• FINE 101/VCULT 101 Art History and Visual Culture</td>
<td>• FINE 100 Studio Fundamentals or FINE 130 Introduction to Digital Imaging</td>
</tr>
<tr>
<td>• FINE 229 Hybrid Digital Media</td>
<td>One second year studio course:</td>
</tr>
<tr>
<td>• FINE 257 Video, New Media &amp; the Digital Turn</td>
<td>• FINE 228 Design and Imaging, FINE 229 Hybrid Media, or FINE 247 Expanded Media; Interaction</td>
</tr>
</tbody>
</table>

On art theory course:
- FINE 257 Video, New Media & the Digital Turn, VCULT 200 Visual Studies Across the Discipline, or ENGL 293 Introduction to Digital Media Studies

One art history course:
- FINE 101 or VCULT 101

**Link:**
http://ugradcalendar.uwaterloo.ca/page/MATH-Computer-Sci-Computational-Fine-Art-Spec/?ActiveDate=9/1/2020
Update to the Human-Computer Interaction (HCI) Specialization

Motion and Rationale
Effective fall 2022, the changes in yellow allows Software Engineering (SE) students to take HCI Specialization. SE has been consulted and agree that the SE versions of the courses cover similar content.

<table>
<thead>
<tr>
<th>Current</th>
<th>Proposed</th>
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</thead>
<tbody>
<tr>
<td>All of</td>
<td></td>
</tr>
<tr>
<td>CS 349 User Interfaces</td>
<td>CS 349 User Interfaces</td>
</tr>
<tr>
<td>CS 449 Human-Computer Interaction</td>
<td>CS 449 Human-Computer Interaction</td>
</tr>
<tr>
<td>CS 492 The Social Implications of Computing</td>
<td>CS 492 The Social Implications of Computing</td>
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<tr>
<td>Two of</td>
<td>Two of</td>
</tr>
<tr>
<td>CS 446/ECE 452 Software Design and Architectures</td>
<td>CS 446/ECE 452/SE464 Software Design and Architectures</td>
</tr>
<tr>
<td>CS 454 Distributed Systems</td>
<td>CS 454 Distributed Systems</td>
</tr>
<tr>
<td>CS 458 Computer Security and Privacy</td>
<td>CS 458 Computer Security and Privacy</td>
</tr>
<tr>
<td>CS 484 Computational Vision</td>
<td>CS 484 Computational Vision</td>
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<tr>
<td>CS 488 Introduction to Computer Graphics</td>
<td>CS 488 Introduction to Computer Graphics</td>
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<tr>
<td>Two of</td>
<td>Two of</td>
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<tr>
<td>ENGL 108D Digital Lives</td>
<td>ENGL 108D Digital Lives</td>
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<tr>
<td>ENGL 293 Introduction to Digital Media Studies</td>
<td>ENGL 293 Introduction to Digital Media Studies</td>
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<tr>
<td>ENGL 295 Social Media</td>
<td>ENGL 295 Social Media</td>
</tr>
<tr>
<td>FINE 150 Appreciation and Expression</td>
<td>FINE 150 Appreciation and Expression</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
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<tr>
<td>-------------</td>
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</tr>
<tr>
<td>FINE 257</td>
<td>Video, New Media &amp; the Digital Turn</td>
</tr>
<tr>
<td>INTEG 251</td>
<td>Creative Thinking</td>
</tr>
<tr>
<td>KIN 320</td>
<td>Task Analysis</td>
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<tr>
<td>PSYCH 207</td>
<td>Cognitive Processes</td>
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<tr>
<td>PSYCH 261</td>
<td>Physiological Psychology</td>
</tr>
<tr>
<td>STAT 332</td>
<td>Sampling and Experimental Design</td>
</tr>
<tr>
<td>STAT 430</td>
<td>Experimental Design</td>
</tr>
</tbody>
</table>
**Update to the Software Engineering (SE) Specialization**

**Motion and Rationale**
Effective fall 2022, allow students completing the SE Specialization to take CS 442, CS 451, or CS 480 to fulfill the SE Specialization requirements. The School of Computer Science has introduced several new fourth-year courses which are appropriate to include in the SE Specialization.

<table>
<thead>
<tr>
<th>Current</th>
<th>Proposed</th>
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</thead>
<tbody>
<tr>
<td><strong>Foundations</strong></td>
<td><strong>Foundations</strong></td>
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<tr>
<td>All of</td>
<td>All of</td>
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<tr>
<td>CS 446/ECE 452 Software Design and Architectures</td>
<td>CS 446/ECE 452 Software Design and Architectures</td>
</tr>
<tr>
<td>CS 447/ECE 453 Software Testing, Quality Assurance and Maintenance</td>
<td>CS 447/ECE 453 Software Testing, Quality Assurance and Maintenance</td>
</tr>
<tr>
<td>CS 492 The Social Implications of Computing</td>
<td>CS 492 The Social Implications of Computing</td>
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<tr>
<td><strong>Applications</strong></td>
<td><strong>Applications</strong></td>
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<tr>
<td>Two of</td>
<td>Two of</td>
</tr>
<tr>
<td>CS 343 Concurrent and Parallel Programming</td>
<td>CS 343 Concurrent and Parallel Programming</td>
</tr>
<tr>
<td>CS 348 Introduction to Database Management</td>
<td>CS 348 Introduction to Database Management</td>
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<tr>
<td>CS 349 User Interfaces</td>
<td>CS 349 User Interfaces</td>
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<tr>
<td>Two of</td>
<td>Two of</td>
</tr>
<tr>
<td>CS 444 Compiler Construction</td>
<td><strong>CS 442 Programming Languages</strong></td>
</tr>
<tr>
<td>CS 448 Database Systems Implementation</td>
<td>CS 444 Compiler Construction</td>
</tr>
<tr>
<td>CS 449 Human-Computer Interaction</td>
<td>CS 448 Database Systems Implementation</td>
</tr>
<tr>
<td>CS 450 Computer Architecture</td>
<td>CS 449 Human-Computer Interaction</td>
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<tr>
<td>CS 452 Real-time Programming</td>
<td>CS 450 Computer Architecture</td>
</tr>
<tr>
<td>CS 454 Distributed Systems</td>
<td>CS 451 Data Intensive Distributed Computing</td>
</tr>
<tr>
<td>CS 456 Computer Networks</td>
<td>CS 452 Real-time Programming</td>
</tr>
<tr>
<td>CS 457 System Performance Evaluation</td>
<td>CS 454 Distributed Systems</td>
</tr>
<tr>
<td>CS 458 Computer Security and Privacy</td>
<td>CS 456 Computer Networks</td>
</tr>
<tr>
<td>CS 484 Computational Vision</td>
<td>CS 457 System Performance Evaluation</td>
</tr>
<tr>
<td><strong>CS 485 Statistical and Computational Foundations of Machine Learning</strong></td>
<td>CS 458 Computer Security and Privacy</td>
</tr>
<tr>
<td>CS 486 Introduction to Artificial Intelligence</td>
<td>CS 480 Introduction to Machine Learning</td>
</tr>
<tr>
<td>CS 488 Introduction to Computer Graphics</td>
<td>CS 484 Computational Vision</td>
</tr>
<tr>
<td></td>
<td>CS 486 Introduction to Artificial Intelligence</td>
</tr>
<tr>
<td></td>
<td>CS 488 Introduction to Computer Graphics</td>
</tr>
</tbody>
</table>
Motion and Rationale:
Effective fall 2022, allow students in the Mathematics/Information Technology Management program to take either MGMT 244/ARBUS 302 or BUS 352W to fulfill the current BUS 352W requirement. MGMT 244/ARBUS 302 covers almost the same topics as BUS 352W. The change gives the student more scheduling flexibility and provides an option when there are no seats in the Laurier course for some reason. The motion was discussed and agreed with the Department of Economics at UW.

Calendar text:
Students in this plan must fulfill all the requirements in Table I and Table II. This must include at least 20 math courses, and the following specific requirements:

One of
MATH 239 Introduction to Combinatorics
MATH 249 Introduction to Combinatorics (Advanced Level)

One of
CO 250 Introduction to Optimization
CO 255 Introduction to Optimization (Advanced Level)

All of
CS 230 Introduction to Computers and Computer Systems
CS 330 Management Information Systems
CS 338 Computer Applications in Business: Databases
CS 430 Applications Software Engineering
CS 436 Networks and Distributed Computer Systems
STAT 371 Applied Linear Models and Process Improvement for Business
STAT 372 Survey Sampling and Experimental Design Techniques for Business

All of
AFM 101 Introduction to Financial Accounting
AFM 102 Introduction to Managerial Accounting
BUS 111W Understanding the Business Environment
BUS 121W Functional Areas of the Organization
BUS 352W Introduction to Marketing Management
BUS 481W Business Policy I
COMM 231 Commercial and Business Law for Mathematics Students
COMM 431 Project Management
COMM 432 Electronic Business
ECON 101 Introduction to Microeconomics
ECON 102 Introduction to Macroeconomics
MSCI 211 Organizational Behaviour
MSCI 311 Organizational Design and Technology
MATBUS 371 Introduction to Corporate Finance
STV 202 Design and Society
One of
MGMT 244/ARBUS 302 Principles of Marketing
BUS 352W Introduction to Marketing Management

One of
MSCI 421 Strategic Management of Technology
Any 300- or 400-level STV course

One additional 300- or 400-level math course.

Three additional courses (1.5 units).

Note
BUS courses are offered by Wilfrid Laurier University. See the Laurier Calendar for course details.
**Motion and Rationale:**
Effective fall 2022, allow students in the Mathematics/Business Administration plan to take either MGMT 244/ARBUS 302 or BUS 352W to fulfill the current BUS 352W requirement. MGMT 244/ARBUS 302 covers almost the same topics as BUS 352W. The change gives the student more scheduling flexibility and provides an option when there are no seats in the Laurier course for some reason. The motion was discussed and agreed with the Department of Economics at UW.

**Calendar text:**
Students in this plan must fulfill all the requirements in Table I and Table II. This must include at least 21 math courses, and the following specific requirements:

One of
MATH 237 Calculus 3 for Honours Mathematics
MATH 247 Calculus 3 (Advanced Level)

One of
CO 250 Introduction to Optimization
CO 255 Introduction to Optimization (Advanced Level)

All of
AMATH 350 Differential Equations for Business and Economics
CO 370 Deterministic OR Models
CS 330 Management Information Systems
CS 338 Computer Applications in Business: Databases
MATBUS 371 Introduction to Corporate Finance
STAT 371 Applied Linear Models and Process Improvement for Business
STAT 372 Survey Sampling and Experimental Design Techniques for Business

Three additional math courses.

All of
AFM 102 Introduction to Managerial Accounting
BUS 111W Understanding the Business Environment
BUS 121W Functional Areas of the Organization
BUS 352W Introduction to Marketing Management
BUS 481W Business Policy I
COMM 231 Commercial and Business Law for Mathematics Students
ECON 101 Introduction to Microeconomics
ECON 102 Introduction to Macroeconomics
HRM 200 Basic Human Resources Management

One of
MGMT 244/ARBUS 302 Principles of Marketing
BUS 352W Introduction to Marketing Management
One of
AFM 101 Introduction to Financial Accounting
BUS 227W Introduction to Financial Accounting

One of
MSCI 211 Organizational Behaviour
PSYCH 238 Organizational Psychology

One additional 300- or 400-level COMM course.

One additional 300- or 400-level BUS or COMM course.

One additional course (0.5 unit) chosen from
ARBUS 202/PHIL 215 Professional and Business Ethics
COMM 400 Entrepreneurship, Technology and the Emerging Information Economy
LS 271/PACS 202 Conflict Resolution
LS 319/PACS 323 Negotiation: Theories and Strategies
PSYCH 339 Personnel Psychology

Any AFM, BUS, COMM, ECON, HRM, MSCI, PSCI, or STV course

Three additional courses (1.5 units).

Note
BUS courses are offered by Wilfrid Laurier University. See the Laurier Calendar for course details.
Report from Associate Dean, Graduate Studies - Adam Kolkiewicz

Motions to be voted upon:

1. **Combinatorics & Optimization** (attachments)
   
   Motion to make calendar changes in order to update the following courses’ descriptions: CO 685 and CO 687.

2. **Computer Science** (attachments)
   
   Motions to make calendar changes for the following:
   
   1) Allow MDSAI students to enrol in CS 638
   2) Add CS 794 to the "Table of categories and areas of courses" under the areas of "Scientific and Symbolic Computing" and "Computational Statistics"
   3) Remove the Graduate Record Examination (GRE) General test statement for all CS programs

3. **MMT** (attachments)
   
   Motion to make calendar changes for the following:
   
   1) Minimum course grade requirement and frequency with which student performance is assessed to reflect current practice.
   2) For MATH 674: removing department consent and adding corequisites of MATH 600 and MATH 692

4. **Pure Mathematics** (attachment)
   
   1) Motion to update the Master’s Research Paper milestone description in the Calendar to identify the review process for MMath in Pure Mathematics MMath in Pure Mathematics - Quantum Information.
   2) Motion to make a calendar change due to the “Comprehensive Examination” milestone being changed to the “Qualifying Examination” milestone.

5. **Statistics and Actuarial Science** (attachments)
   
   Motions to approve:
   
   1) Inactivation of ActSc 833 and Stat 837
2) New course activation ActSc 854 (Longevity and Mortality using Predictive Analytics)
3) New course activation Stat 940 (Deep Learning)
4) Course name change and description update in ActSc 855.
Prior to form submission, review the content revision instructions. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

**Faculty:** Mathematics  
**Effective date:** Term: Fall Year: 2021

### Milestone
Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- ☐ New: Choose an item.
- ☐ Inactivate: Choose an item.
- ☐ Revise: from Choose an item. to Choose an item.

### Course
Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- ☐ New: Complete all course elements below
- ☐ Inactivate: Complete the following course elements:  
  - Course subject code, Course number, Course ID, Course title
- ☒ Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (e.g. Course description, Course title):
  
  Updating the course description

**Course elements** (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: CO

Course number: 685

Course ID: 010331

Course title (max. 100 characters including spaces): The Mathematics of Public-Key Cryptography

Course short title (max. 30 characters including spaces): Public-Key Cryptography

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required
Current description: An in-depth study of public-key cryptography, including: number-theoretic problems -
prime generation, integer factorization, discrete logarithms; public-key encryption; digital signatures; key
establishment; secret sharing; and security definitions and proofs.

Revised description: An in-depth study of public-key cryptography, including: number-theoretic problems -
prime generation, integer factorization, discrete logarithms; public-key encryption; digital signatures; key
establishment; elliptic curve cryptography; post-quantum cryptography; and security proofs.

Meet type(s): Lecture  Choose an item.  Choose an item.  Choose an item.

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with: CO 485

Rationale for request: Updating the course description to better reflect the course contents;
similar changes have been proposed for CO 485 which is held with CO 685.

Form completed by: Alfred Menezes

Department/School approval date (mm/dd/yy): 01/20/21
Reviewed by GSPA (for GSPA use only) ☐ date (mm/dd/yy): 01/25/21
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Prior to form submission, review the content revision instructions. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Fall Year: 2021

Milestone
Note: milestone changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Choose an item.
☐ Inactivate: Choose an item.
☐ Revise: from Choose an item to Choose an item.

Course
Note: some course changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Complete all course elements below

☐ Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title

☒ Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (e.g. Course description, Course title):

Updating the Course description

**Course elements** (complete as indicated above. Review the glossary of terms for details on course elements)

Course subject code: CO

Course number: 687

Course ID: 010471

Course title (max. 100 characters including spaces): Applied Cryptography

Course short title (max. 30 characters including spaces): Applied Cryptography

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required
Current description: A broad introduction to cryptography, highlighting the major developments of the past twenty years, including symmetric ciphers, hash functions and data integrity, public-key encryption and digital signatures, key establishment, and key management. Applications to internet security computer security, communications security, and electronic commerce will be studied.

Revised description: A broad introduction to modern cryptography, highlighting the tools and techniques used to secure internet and messaging applications. Symmetric-key encryption, hash functions, message authentication, authenticated encryption, public-key encryption and digital signatures, key establishment, key management.

Meet type(s): Lecture

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with: CO 487

Rationale for request: Updating the course description to better reflect the course contents; similar changes have been proposed for CO 487 which is held with CO 687.

Form completed by: Alfred Menezes
Department/School approval date (mm/dd/yy): 01/20/21
Reviewed by GSPA (for GSPA use only) ☐ date (mm/dd/yy): 01/25/21
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
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): Description and requisites

Course Subject code: CS Course number: 638
Course Title (max. 100 characters incl. spaces): Principles of Data Management and Use
Course Short Title (max. 30 characters incl. spaces): Principles of Data Mgmt & Use
Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.

Course Description:
A user-oriented approach to the management of large collections of data. Relational database technology, relational algebra, SQL, database views, transactions, data modelling methodology, entity-relationship models. Introduction to several current topics in database research, such as warehousing, data mining, managing data streams, data cleaning, data integration, and distributed/parallel databases. Master of Health Informatics students only.

New course description (for revision only):
A user-oriented approach to the management of large collections of data. Relational database technology, relational algebra, SQL, database views, transactions, data modelling methodology, entity-relationship models. Introduction to several current topics in database research, such as warehousing, data mining, managing data streams, data cleaning, data integration, and distributed/parallel databases. Master of Health Informatics and Master of Data Science and Artificial Intelligence students only.

Meet Type(s): Lecture Choose an item. Choose an item. Choose an item.
Primary Meet Type: Lecture
Requisites: MHI and MDSAI Students only / Only offered Online

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

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

Rationale for request:
This course was initially created to support the MHI program and so the enrolment was limited to MHI students only. As the creation of the new MDSAI program last year, this course has been on the list of one of the core courses. To allow MDSAI students to enrol, we need to change the course description and requisites.

Prepared by: Denise Shantz
Date: 1-Sep-20
Graduate Studies
Program Revision Template

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 794 to the “Category and Area” (course requirements) table.

Is this a major modification to the program? No

Rationale for change(s):
CS 794 was recently created and offered in 2018. It needs to be added to the Category and Area Table. In consultation with the recent instructors, it is recommended to add CS 794 in the areas of Computational Statistics and Scientific and Symbolic Computing.

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/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

https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/david-r-cheriton-school-computer-science/doctor-philosophy-phd-computer-science-quantum-information

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

#### Content:

<table>
<thead>
<tr>
<th>Category</th>
<th>Area</th>
<th>Computer Science (CS) Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computing Technology</td>
<td>Software Engineering</td>
<td>CS 645, CS 646, CS 647, CS 745, CS 746, CS 846</td>
</tr>
<tr>
<td></td>
<td>Programming Languages</td>
<td>CS 642, CS 644, CS 744, CS 842</td>
</tr>
<tr>
<td></td>
<td>Hardware and Software Systems</td>
<td>CS 650, CS 651, CS 652, CS 654, CS 655, CS 656, CS 657, CS 658, CS 755, CS 758, CS 854, CS 856, CS 858**, CS 869</td>
</tr>
<tr>
<td>Mathematics of Computing</td>
<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>
</tr>
<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>
</tr>
<tr>
<td></td>
<td>Computational Statistics</td>
<td>CS 680, CS 685, CS 786, CS 885</td>
</tr>
<tr>
<td></td>
<td>Quantum Information and Computation</td>
<td>CS 766, CS 768, CS 867</td>
</tr>
<tr>
<td>Applications</td>
<td>Artificial Intelligence</td>
<td>CS 684, CS 686, CS 784, CS 785, CS 787, CS 886</td>
</tr>
<tr>
<td></td>
<td>Databases</td>
<td>CS 640, CS 648, CS 740, CS 741, CS 742, CS 743, CS 848, CS 856*</td>
</tr>
<tr>
<td></td>
<td>Graphics and User Interfaces</td>
<td>CS 649, CS 688, CS 781, CS 783, CS 788,</td>
</tr>
</tbody>
</table>

### Proposed Graduate Studies Academic Calendar

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<td>CS 649, CS 688, CS 781, CS 783, CS 788,</td>
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</table>
How will students currently registered in the program be impacted by these changes?

_Students who took it previously will have it counted in either of the areas towards their degree._

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<th>Current Graduate Studies Academic Calendar</th>
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<td>Bioinformatics</td>
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</tr>
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</tr>
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</tr>
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<table>
<thead>
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**Departmental approval date** (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/01/2020

**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 Computer Science

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 Graduate Studies Course/Milestone Form.

Removing the GRE requirement from the admission requirements.

Is this a major modification to the program? No

Rationale for change(s):
There is no strong evidence that success of graduate studies and GRE scores are closely correlated. By requiring the GRE, we may miss out potentially strong applicants who do not or cannot write the exam. Furthermore, GRE has been criticized as having a negative impact on diversity and inclusion.

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/david-r-cheriton-school-computer-science/master-mathematics-mmth-computer-science

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<td>Admission requirements</td>
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</tr>
<tr>
<td>• Minimum requirements</td>
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<tr>
<td>o An Honours Bachelor degree in Computer Science or Engineering (or equivalent degree) with at least a 78% standing.</td>
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**How will students currently registered in the program be impacted by these changes?**

This change will go into effect after the current application cycle closes. Therefore the new applicants for Winter 2022 admission for the Master of Mathematics (MMath) in Computer Science program will be the first applicants who will not require the GRE in their program application.

**Department/School approval date** (mm/dd/yy):
**Reviewed by GSPA** (for GSPA use only) ☐ **date** (mm/dd/yy):
**Faculty approval date** (mm/dd/yy):
**Senate Graduate & Research Council (SGRC) approval date** (mm/dd/yy):
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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 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 Graduate Studies Course/Milestone Form.

Removing the GRE requirement from the admission requirements.

Is this a major modification to the program? No

Rationale for change(s):

There is no strong evidence that success of graduate studies and GRE scores are closely correlated. By requiring the GRE, we may miss out potentially strong applicants who do not or cannot write the exam. Furthermore, GRE has been criticized as having a negative impact on diversity and inclusion.

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/david-r-cheriton-school-computer-science/master-mathematics-mmath-computer-science-quantum-information

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

This change will go into effect after the current application cycle closes. Therefore the new applicants for Winter 2022 admission for the Master of Mathematics (MMath) in Computer Science – Quantum Information program will be the first applicants who will not require the GRE in their program application.

Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) □ date (mm/dd/yy):
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: 1) Doctor of Philosophy (PhD) in Computer Science
2) Doctor of Philosophy (PhD) 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 Graduate Studies Course/Milestone Form.

Removing the GRE requirement from the admission requirements.

Is this a major modification to the program? No

Rationale for change(s):

There is no strong evidence that success of graduate studies and GRE scores are closely correlated. By requiring the GRE, we may miss out potentially strong applicants who do not or cannot write the exam. Furthermore, GRE has been criticized as having a negative impact on diversity and inclusion.

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/david-r-cheriton-school-computer-science/doctor-philosophy-phd-computer-science

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<td>---------------------------------------------------</td>
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</tr>
<tr>
<td>Science, who have not completed a 4 year undergraduate degree at a North American University where English is the primary language of instruction.</td>
<td>Successful applicants will have an outstanding academic record, breadth of knowledge in computer science, and strong letters of recommendation.</td>
</tr>
<tr>
<td>o Student with an undergraduate degree in Computer Science may apply for admission directly to the PhD program. Successful applicants will have an outstanding academic record, breadth of knowledge in computer science, and strong letters of recommendation.</td>
<td>o PhD applicants may be admitted into the Master of Mathematics (MMath) program. Like all MMath students, they will have the option to transfer into the PhD program before completing the master's thesis if their performance warrants.</td>
</tr>
<tr>
<td>o PhD applicants may be admitted into the Master of Mathematics (MMath) program. Like all MMath students, they will have the option to transfer into the PhD program before completing the master's thesis if their performance warrants.</td>
<td></td>
</tr>
</tbody>
</table>

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

This change will go into effect after the current application cycle closes. Therefore the new applicants for Winter 2022 admission for the Doctor of Philosophy (PhD) in Computer Science and then Doctor of Philosophy (PhD) in Computer Science – Quantum Information programs will be the first applicants who will not require the GRE in their program applications.

**Department/School approval date** (mm/dd/yy):
**Reviewed by GSPA** (for GSPA use only) □ date (mm/dd/yy):
**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 for Teachers (MMT)

**Program contact name(s)**: J.P. Pretti and Jacqueline Bailey

**Form completed by**: J.P. Pretti

**Description of proposed changes**: Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

> Clarify minimum course grade requirement and frequency with which student performance is assessed to reflect current practice.

**Is this a [major modification](#) to the program?** No

**Rationale for change(s)**:

> Grades below 70% are relatively uncommon in the MMT but they do occur. A grade of less than 70% should not count towards degree requirements but also should not result in the removal of a student from the program. Currently, when a grade less than 70% is received by a student, the program reaches out to provide support and to clarify that the course does not count towards the 4.50 units required to complete an MMT degree. As a course-based program, MMT student performance is assessed after each term.

**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/mathematics-teachers/master-mathematics-teachers-mmt](https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/mathematics-teachers/master-mathematics-teachers-mmt)

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</thead>
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<tr>
<td><strong>Degree requirements</strong></td>
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</tr>
<tr>
<td>• Courses</td>
<td>• Courses</td>
</tr>
<tr>
<td>o Students are required to complete the equivalent of 9 one-term (0.50 unit weight) graduate level courses.</td>
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</tr>
<tr>
<td>o Among their courses totaling 4.50 unit weight, students must complete:</td>
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</tr>
<tr>
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</tr>
<tr>
<td>---------------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>▪ MATH 600 Introduction to Mathematical Software for Teachers (0.25 unit weight)</td>
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</tr>
<tr>
<td>▪ MATH 692 Reading, Writing and Discovering Proofs (0.25 unit weight)</td>
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</tr>
<tr>
<td>▪ MATH 681 Problem Solving and Mathematical Discovery (0.50 unit weight)</td>
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</tr>
<tr>
<td>▪ MATH 699 Master of Mathematics for Teachers Capstone (0.50 unit weight)</td>
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</tr>
<tr>
<td>o MATH 600 and MATH 692 should be taken in a student's first term in the program.</td>
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</tr>
<tr>
<td>o The remaining courses are to be MATH courses at the 600 and/or 700 level.</td>
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</tr>
<tr>
<td>o Each of these courses are offered online, with the exception of MATH 690, which is offered on-campus in Waterloo.</td>
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</tr>
<tr>
<td>o MATH 699 Master of Mathematics for Teachers Capstone: the capstone project is designed to give students an opportunity to showcase the knowledge that they have gained and to provide a forum for bringing that knowledge into their own classroom. In most cases, with the guidance of a faculty member, students will be asked to choose a mathematical concept or area of study, perform all necessary background reading, and then design and complete a project consisting of a short three week mini-course on the chosen topic that would be accessible to their students and colleagues. To be successfully completed, the capstone project must be approved by the student's capstone supervisor. Students can begin the capstone requirement any time after they have completed the equivalent of 6 courses (0.50 unit weight).</td>
<td>o MATH 699 Master of Mathematics for Teachers Capstone: the capstone project is designed to give students an opportunity to showcase the knowledge that they have gained and to provide a forum for bringing that knowledge into their own classroom. In most cases, with the guidance of a faculty member, students will be asked to choose a mathematical concept or area of study, perform all necessary background reading, and then design and complete a project consisting of a short three week mini-course on the chosen topic that would be accessible to their students and colleagues. To be successfully completed, the capstone project must be approved by the student's capstone supervisor. Students can begin the capstone requirement any time after they have completed the equivalent of 6 courses (0.50 unit weight).</td>
</tr>
<tr>
<td>o Students must maintain an overall average of 75% in the program, with individual course marks of at least 70%. Student performance will be assessed annually for progress towards the MMT degree.</td>
<td>o Students must maintain an overall average of 75% in the program. Only courses with grades of at least 70% contribute to the required 4.50 units but all numeric grades contribute to the overall average. Student performance is assessed after each term for progress towards the MMT degree.</td>
</tr>
</tbody>
</table>
How will students currently registered in the program be impacted by these changes?

Students reading the GSAC will now see a more accurate reflection of the consequences of a grade less than 70% and how often their performance is assessed.

Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) □ date (mm/dd/yy): 10/27/20
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. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2021

Milestone
Note: milestone changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Choose an item.
☐ Inactivate: Choose an item.
☐ Revise: from Choose an item. to Choose an item.

Course
Note: some course changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Complete all course elements below

☐ Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title

☒ Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (e.g. Course description, Course title):
Course consent: removing department consent.
Requisites: adding corequisites of MATH 600 and MATH 692

Course elements (complete as indicated above. Review the glossary of terms for details on course elements)

Course subject code: MATH
Course number: 674
Course ID: 014213
Course title (max. 100 characters including spaces): Special Topics in Mathematical Connections
Course short title (max. 30 characters including spaces): Mathematical Connections
Grading basis: Numerical
Course credit weight: 0.25
Course consent required: Not required

Course description: This course is intended to give the student insight to an important area of mathematics and how it connects with problems in the real world. Each topic consists of one six-week module. The emphasis will
be on how the mathematics is used in a real world context.

Meet type(s): Lecture    Choose an item.    Choose an item.    Choose an item.

Primary meet type: Lecture

Delivery mode: Only offered online

Requisites: MATH 600 and 692 are co-requisites

Special topics course: Yes ☒ No ☐

Cross-listed course: Yes ☐ No ☒

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request:

Department Consent Required was in place largely to enforce a rule limiting students to taking 8 of the current 10 possible topics. The MMT Graduate Committee no longer sees a compelling reason to impose this limit. (GSPA has confirmed that this limit is not encoded in the calendar and so formal approval is not needed to remove or adjust the limit.)

Form completed by: J.P. Pretti

Department/School approval date (mm/dd/yy):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/27/20

Faculty approval date (mm/dd/yy):

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
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 Pure Mathematics
Program contact name(s): Nancy Maloney, Barbara Csima
Form completed by: Nancy Maloney

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Updating the Master's Research Paper milestone description to identify the review process.

Is this a major modification to the program? No

Rationale for change(s):

The Department felt the review process for the research paper should be stated in the Calendar.

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-pure-mathematics/master-mathematics-mmath-pure-mathematics

<table>
<thead>
<tr>
<th>Current Graduate Studies Academic Calendar content:</th>
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<tr>
<td>Degree requirements</td>
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How will students currently registered in the program be impacted by these changes?
We currently advise students of this requirement before they complete their research papers, so they will not be impacted by this change.

Department/School approval date (mm/dd/yy): 10/06/20
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/30/20
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 Pure Mathematics - Quantum Information

Program contact name(s): Nancy Maloney, Barbara Csima

Form completed by: Nancy Maloney

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Updating the Master’s Research Paper milestone description to identify the review process.

Is this a major modification to the program? No

Rationale for change(s):

The Department felt the review process for the research paper should be stated in the Calendar.

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-pure-mathematics/master-mathematics-mmath-pure-mathematics-quantum-information

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

*We currently advise students of this requirement before they complete their research papers, so they will not be impacted by this change.*

Department/School approval date (mm/dd/yy): 10/06/20  
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/30/20  
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) Doctor of Philosophy (PhD) in Pure Mathematics
            2) Doctor of Philosophy (PhD) in Pure Mathematics - Quantum Information

Program contact name(s): Nancy Maloney, Barbara Csima

Form completed by: Nancy Maloney

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Changing the “Comprehensive Examination” milestone to the “Qualifying Examination” milestone. Some contradictions and redundancies with general Qualifying Examination guidelines are being removed, with a link to the University-level PhD Qualifying Examination minimum requirements instead. The scope of the exams is being increased slightly to allow any undergraduate material, rather than just third and fourth year material, to be included in the syllabus.

Is this a major modification to the program? No

Rationale for change(s):

The PMath Comprehensive Examination will now be considered the Qualifying Examination, so the calendar text is being updated to reflect the change, and the new requirements. The restriction to material covered in the University of Waterloo's third and fourth year undergraduate courses was awkward since some standard material that ought to appear on the syllabus is actually offered in our second year courses.

Proposed effective date: Term: Spring Year: 2021

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

[link to current GSAC page]
[link to current GSAC page]

Proposed Graduate Studies Academic Calendar content:

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</table>
### Current Graduate Studies Academic Calendar content:

- **PhD Comprehensive Examination**
  - Students in the PhD in Pure Mathematics program are required to meet the following requirements:
  - Satisfactory performance in 2 written Comprehensive Examinations:
    - 1 in algebra
    - 1 in analysis and topology
  - Each exam is set and assessed by two examiners, with oversight from the Graduate Committee. Members of the Graduate Committee are allowed to serve as examiners. The outcome of each exam is determined by the Graduate Committee.
  - The syllabus is based on the material covered in the University of Waterloo's third and fourth year undergraduate courses. The Graduate Committee offers these written exams annually.
  - Students must attempt both exams within one year of their registration in the PhD program, and both exams must be successfully completed within seven terms.

- **PhD Qualifying Examination**
  - Students are required to meet the University-level PhD Qualifying Examination minimum requirements outlined in the “Minimum requirements for the PhD degree” section of the Graduate Studies Academic Calendar (GSAC).
  - In addition to the University-level PhD Qualifying Examination minimum requirements, students in the PhD in Pure Mathematics program are also required to meet the following requirements:
  - Satisfactory performance in 2 written Qualifying Examinations:
    - 1 in algebra
    - 1 in analysis and topology
  - The syllabus is based on the material covered in the University of Waterloo's undergraduate courses, and is posted on the Department webpage. These written exams are offered annually.
  - Students must attempt both exams within one year of their registration in the PhD program.

### Proposed Graduate Studies Academic Calendar content:

- **PhD Qualifying Examination**
  - Students are required to meet the University-level PhD Qualifying Examination minimum requirements outlined in the “Minimum requirements for the PhD degree” section of the Graduate Studies Academic Calendar (GSAC).
  - In addition to the University-level PhD Qualifying Examination minimum requirements, students in the PhD in Pure Mathematics program are also required to meet the following requirements:
  - Satisfactory performance in 2 written Qualifying Examinations:
    - 1 in algebra
    - 1 in analysis and topology
  - The syllabus is based on the material covered in the University of Waterloo's undergraduate courses, and is posted on the Department webpage. These written exams are offered annually.
  - Students must attempt both exams within one year of their registration in the PhD program.

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

The Qualifying Examination milestone will replace the Comprehensive Examination milestone. Students who have passed or conditionally passed a portion of the existing Comprehensive Examination will be considered to have passed or conditionally passed the corresponding portion of the Qualifying Examination, with the same conditions, if any.

**Department/School approval date** (12/14/20):
**Reviewed by GSPA** (for GSPA use only) ☒ **date** (mm/dd/yy): 01/25/21
**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: ACTSC  Course number: 833
Course Title (max. 100 characters incl. spaces): Analysis of Mortality Data
Course Short Title (max. 30 characters incl. spaces): Analysis of Mortality Data
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: ActSc 433

Rationale for request:

This course will be changed to ActSc 454/854.

Prepared by: Mary Lou Dufton  Date: 14-Nov-19
Faculty: Math
Effective term: Term/Year Spring 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: STAT Course number: 837
Course Title (max. 100 characters incl. spaces): Analysis of Longitudinal Data in Health Research
Course Short Title (max. 30 characters incl. spaces):
Grading Basis: Choose an item.
Course Credit Weight: Choose an item.
Course Consent Required: □ Choose an item.

Course Description:
New course description (for revision only):

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

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:

Rationale for request: This course was previously held with Stat 437 and since the change in the undergraduate program for Statistics in Health, this course is no longer offered at the grad level.

Prepared by: Mary Lou Dufton Date: 26-Feb-20
Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

**Faculty**: Mathematics

**Effective date**: Term: Winter  Year: 2021

**Milestone**

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- [X] New: Choose an item.
- [ ] Inactivate: Choose an item.
- [ ] Revise: from Choose an item to Choose an item.

**Course**

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- [X] New: Complete all course elements below

- [ ] Inactivate: Complete the following course elements:
  - Course subject code, Course number, Course ID, Course title

- [ ] Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (e.g. *Course description*, *Course title*):

**Course elements** (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: ACTSC

Course number: 854

Course ID:

Course title (max. 100 characters including spaces): Longevity and Mortality using Predictive Analytics

Course short title (max. 30 characters including spaces): Mortality Pred Analytics

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Meet type(s): Lecture

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes □ No ☑

Cross-listed course: Yes □ No ☑

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with: ActSc 454

Rationale for request:
A new course to replace ActSc 433/833

Form completed by: Mary Lou Dufton
Department/School approval date (mm/dd/yy): 10/30/2020
Reviewed by GSPA (for GSPA use only) □ date (mm/dd/yy):
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
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: STAT Course number: 940
Course Title (max. 100 characters incl. spaces): Deep Learning
Course Short Title (max. 30 characters incl. spaces): Deep Learning
Grading Basis: NUMERICAL
Course Credit Weight: 0.50
Course Consent Required: ☐ Choose an item.

Course Description: Deep learning uses artificial neural networks to create representations of data with multiple levels of abstraction. Deep learning usually refers to a set of algorithms and computational models that are composed of multiple processing layers. These methods have significantly improved the state-of-the-art in many domains including Natural Language Processing (NLP), Natural Language Understanding (NLU), Speech Recognition, Computer Vision, Classification, Pattern Recognition and Bioinformatics. This course will cover the modern practice of deep networks, different architectures of deep networks including feed forward and convolutional models, methods for sequence modeling, variational and adversarial models, attention mechanism and optimization and regularization for deep models.

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/heldwith:

Rationale for request:

Currently a topics course taught annually with high enrollment with students from our department and other departments across campus. This course will have an on campus offering in Fall term and an on-line offering in the Winter term.
Prior to form submission, review the content revision instructions. For questions about the form submission, contact Trevor Clews, Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2021

Milestone
Note: milestone changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Choose an item.
☐ Inactivate: Choose an item.
☐ Revise: from Choose an item. to Choose an item.

Course
Note: some course changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Complete all course elements below

☐ Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title

☒ Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (e.g. Course description, Course title):

Updating the Course title and Course description.

Course elements (complete as indicated above. Review the glossary of terms for details on course elements)

Course subject code: ACTSC

Course number: 855

Course ID: 000078

Course title (max. 100 characters including spaces): Life Contingencies 3

Course short title (max. 30 characters including spaces): Life Contingencies 3

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Profit testing for traditional and non-traditional life insurance. Pricing and valuation of embedded options in life insurance products. Defined benefit and defined contribution pension plan design. Theory and practice of unit credit methods for pension plan funding and valuation for final average salary, career average earnings, and career average revalued earnings pension plans; post-retirement health benefits.
Meet type(s): Lecture

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with: ACTSC 455

Rationale for request: To accommodate the changes made in the undergraduate ACTSC 455 course. These changes have been (partially) triggered by new requirements on the professional actuarial curriculum as well as current trends in the actuarial science profession.

Form completed by: Mary Lou Dufton

Department/School approval date (mm/dd/yy): 10/30/2020

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/05/2020

Faculty approval date (mm/dd/yy):

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