

# Cyclical Program Review of Academic Programs offered by the Department of Mathematics and Statistics

## Progress Report on Implementation Plan 4-year

Date: 3/28/2022

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| Programs                                                                                                                                            | Degrees                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Mathematics and Statistics                                                                                                                          | MSc, PhD                      |
| Mathematics                                                                                                                                         | BA, BAH, BSc, BScH, MA, MAsC  |
| Statistics                                                                                                                                          | BA, BSc, BScH                 |
| Mathematics and Engineering<br>With the Depts. Of Mechanical & Materials Engineering,<br>Electrical & Computer Engineering, and School of Computing | BASc, BASc with PI, MAsC, PhD |

Table 1 Add/delete rows as required

, a final assessment report and implementation

and Learning Office and the Deans of the Faculty of Arts and Sciences and the School of Graduate Studies. These deans are responsible for monitoring the implementation plan. This report is an important step in the overall cycle of continuous improvement and is an opportunity to reflect on, and document, the progress made on incremental improvements to address recommendations in the implementation plan.

Please complete the table below to report on progress made in the past 4 years against the implementation plan. Add further explanation, if necessary, in the additional notes section.







|                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Include a completion percentage                                              | 75%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Please provide a brief description of the current, completed or planned work | Enrollment numbers have dropped and stabilized to a somewhat more manageable level. We have also hired a 3-year term faculty member (Kexue Zhang) which has helped to alleviate some of the strain in the short term. What have re-organized some of our course offerings to make the program more sustainable. For example, in the coming year MTHE 334 will no longer be offered and MATH/MTHE 328 ('Real Analysis') will take its place (the latter is already a regular offering). A review of all EngSci programs at Queen's was also conducted recently (The Cluett Report) and we will be continuing to work with our FEAS colleagues to implement parts of this report as appropriate. |

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Recommendation 5: Actively recruit research statisticians to the faculty and hire a program coordinator for the BSc Statistics program.

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|----------------------------------------------|-----------|
| What is the current status of the follow-up? | Completed |
|----------------------------------------------|-----------|

Include a completion percentage: 75%

What is the current status of the

|                                                                              |                                                                                |
|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| What is the current status of the follow-up?                                 | Completed                                                                      |
| Include a completion percentage                                              | 100%                                                                           |
| Please provide a brief description of the current, completed or planned work | Our recent hires in stats discussed above have helped to address this concern. |

|                                                                                                                                                                 |                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recommendation 9: Implement training sessions for new postdoctoral fellows and assign mentors for them. Create a faculty handbook for the postdoctoral fellows. |                                                                                                                                                                                                                                          |
| Proposed followup                                                                                                                                               | Initiate meeting with representatives from the School of Graduate Studies and Human Resources. Create a training session for mentors to ensure they are properly trained and aware of postdoc's collective agreement and other policies. |
| Responsibility for leading follow-up                                                                                                                            | Department Head in conjunction with School of Graduate Studies and Human Resources                                                                                                                                                       |
| Timeline for addressing recommendation                                                                                                                          | Implement by 2019-20 academic year                                                                                                                                                                                                       |
| Are there additional deliverables associated with the proposed follow-up?                                                                                       | Yes                                                                                                                                                                                                                                      |
| Which <a href="#">support units</a> have been engaged as collaborators in supporting additional deliverables?<br>(If no, please indicate 'N/A')                 | N/A                                                                                                                                                                                                                                      |

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|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| What is the current status of the follow-up?                                 | In process                                                                                                                                                                                                                                                                                                                                                                                                         |
| Include a completion percentage                                              | 50%                                                                                                                                                                                                                                                                                                                                                                                                                |
| Please provide a brief description of the current, completed or planned work | <p>COVID delayed our plans with this but we are currently in the process of putting together a handbook for new postdocs.</p> <p>Comments from the Dean of SGSPA: Training for new postdoctoral fellows are now provided by the School of Graduate Studies and Postdoctoral Affairs. The Postdoctoral Coordinator will be happy to assist the program in creating a faculty handbook for postdoctoral fellows.</p> |

|                                                                                                                                                           |                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recommendation 10: Develop a well-articulated, long-term strategic hiring plan, in response to shortage of statistics and engineering faculty in the unit |                                                                                                                                                       |
| Proposed followup                                                                                                                                         | Establish working group to develop the department's strategic plan that includes a hiring plan which will guide the department for the next 3-5 years |
| Responsibility for leading follow-up                                                                                                                      | Department Head                                                                                                                                       |
| Timeline for addressing recommendation                                                                                                                    | Complete strategic plan in 2018. Implement by 2019-20 academic year                                                                                   |

Are there additional

|                                                                              |                                                                                                                                 |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| (If no, please indicate 'N/A')                                               |                                                                                                                                 |
| What is the current status of the follow-up?                                 | In process                                                                                                                      |
| Include a completion percentage                                              | 50%                                                                                                                             |
| Please provide a brief description of the current, completed or planned work | COVID delayed our plans with this but we are currently in the process of drafting a detailed strategic plan for our department. |



(3) Set Problems Clearly, Articulate Assumptions and State Precise Definitions

STAT 456/856 - understanding the distinction between Bayesian and classical statistics

(4) Articulate Precise Mathematical Statements

STAT 362 - understanding the relationship between statistical ideas and the syntax used in R

STAT 466/866 - understanding the relationship between statistical ideas and the syntax used in SAS

(5) Use Mathematical Reasoning to Derive Logical Conclusions

STAT 252 - understanding random variables and their relationship to distributions

STAT 456/856 - understanding the distinction between Bayesian and classical statistics

(6) Construct and Analyze Proofs

(7) Transfer Ideas and Methods Between Different Branches of Mathematics

STAT 456/856 - understanding the distinction between Bayesian and classical statistics

STAT 457/857 - using various mathematical ideas to understand the rationale for methods of machine learning

## KNOWLEDGE OF METHODOLOGIES

### (9) Select Appropriate Mathematical Models and Tools

STAT 252 - understanding which random variables apply in different contexts

STAT 362 - determine the appropriate way to analyze data

STAT 466/866 - determine the appropriate way to analyze data

STAT 456/856 - determine when Bayesian analysis is appropriate

STAT 457/857 - determining which machine learning method is appropriate to given situations

### (10) Demonstrate Proficiency in Using Sophisticated Mathematical Models in Analysis of Problems

STAT 362 - analyzing real-world data

STAT 466/866 - analyzing real-world data

STAT 456/856 - analyzing real-world data

STAT 457/857 - analyzing real-world data

## APPLICATION OF KNOWLEDGE

### (11) Analyze Data to Draw Valid Conclusions

STAT 362 - analyzing real-world data

STAT 466/866 - analyzing real-world data

STAT 456/856 - analyzing real-world data

STAT 457/857 - analyzing real-world data

(12) Validate Experimentally Mathematical Models and Techniques

STAT 457/857 - validate machine learning methods

(13) Understand Limitations of Mathematical Models Through Experimentation and Simulation

STAT 252 - understanding how the limitations of commonly used probability distributions

(14) Compare,

## COMMUNICATION SKILLS

(16) Demonstrate a Capacity for Leadership and Decision-making

(17) Work Creatively and Sufficiently with Mathematics

(18) Use Graphics Appropriately to Explain, Interpret, and Assess Information

STAT 362 - presenting summary data to best illustrate the conclusions of statistical analyses

STAT 466/866 - compare visual versus analytical outputs in data analysis

STAT 457/857 - determine most suitable way to visualize output of machine learning results

## AWARENESS OF LIMITATIONS OF KNOWLEDGE

(21) Acquire Skills Needed for Life\_long Learning

(22) Evaluate Information for Authority, Currency and Objectivity

STAT 252 - understanding how stochasticity factors into everyday situations

STAT 362 - analyzing real-world data

STAT 466/866 - analyzing real-world data

STAT 457/857 -