



**UNIVERSITY OF CALGARY | FACULTY OF SCIENCE**

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**CURRICULUM REVIEW REPORT**  
**PROGRAM: ACTUARIAL SCIENCE**  
**DEPARTMENT: MATHEMATICS AND STATISTICS**



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# Curriculum Review Team

The Curriculum Review process has extended over a few years. Committee and team membership lists include all members having served on the committees/teams during parts or all of this period.

Actuarial Science Program review lead: Rohana Ambagaspitya

Actuarial Science Program review team: Rohana Ambagaspitiya, David Scollnik, Chao Qiu, Alex Badescu

Graduate Attributes, Program level outcomes: David Scollnik, Rohana Ambagaspitiya

Course Outcomes development and mapping: Alex Badescu, Alex Brudnyi, Alex de Leon, Anatoliy Swishchuk, Berndt Brenken, Chao Qiu, Cindy Sun, Claude Laflamme, Clifton Cunningham, Cristian Rios, Danny Glin, David Scollnik, Deniz Sezer, Elena Braverman, Gemai Chen, Gilad Gour, Hua Shen, Jim Stallard, JingjingWu, Joseph Ling, Keith Nicholson, Karen Seyffarth, Karoly Bezdek, Kristine Bauer, Larry Bates, Mark Bauer, Matthew Greenberg, Michael Cavers, Michael Lamoureux, Mohammed Aiffa, Renate Scheidler, Robert Woodrow, Rohana Ambagaspitiya, Ryan Hamilton, Scott Robison, Thi Dinh, Tony Ware, Wenyan Liao, Xuewen Lu, Ying Yan, Yousry Elsbouty, Yuriy Zinchenko

Full-time faculty members teaching courses that support the program: Most full-time faculty members in the Department of Mathematics and Statistics

Data analysis and Action plan: All faculty members and all sessional instructors invited to participate

Undergraduate Programs and Curriculum Committee: Kristine Bauer, Scott Robison, Cindy Sun, Mohammed Aiffa, Ryan Hamilton, Rohana Ambagaspitiya, Jim Stallard, Yuriy Zinchenko, Matthew Greenberg, Elena Braverman, Thi Dinh, Nancy Chibry, Joseph Ling, Diana Gibson (student), Jeremy Gillespie (student), Mathieu Weachter

Undergraduate Director and Chair of the Undergraduate Programs and Curriculum Committee: Nancy Chibry, Joseph Ling

## Executive Summary

The actuarial science program has been graduating students since 1990; during the last five years we have graduated around 20 students per year and at present, there are close to two hundred actuarial science majors. It is a popular and very successful program in the department of mathematics and statistics.

The actuarial science program syllabus covers the content of the preliminary education syllabus of international actuarial association syllabus. Eight of our courses are accredited by the Canadian Institute of Actuaries. The Society of Actuaries lists our program as one of the universities with undergraduate programs in actuarial science; to be included in this list a program needs to satisfy certain requirements with respect to course offerings and staffing. Our program gives students the opportunity to get a head start on earning professional designations from the actuarial societies.

Due to these facts, our courses are constantly monitored and updated to keep them current with the development that occurs in professional actuarial societies.

From the review, it is clear that our students are generally very happy with the current state of the program. There are a few areas where improvements can be made:

1. Provide more opportunities to students for teamwork and then oral and written presentation of findings.
2. Provide some support for the Society of Actuaries exam preparation.
3. Provide more support for student placements in traditional actuarial and non-traditional actuarial career paths.
4. Hire actuarial faculty with industry experience.

# Overview and Context of the Program

The actuarial science major program is designed to provide students a thorough technical foundation to the actuarial profession. Our program was established in late 1980s and we have graduated around 20 students per year over the last five years.

In the program, we offer two types of courses, core courses and non-core courses. Many of the core courses in the Actuarial Science Program are designed to satisfy the educational requirements of the relevant professional actuarial societies, and their content is regularly reviewed by said societies. In particular, ACSC 425, STAT 429, STAT 505 can be used to satisfy Validation by Educational Experience requirements of the Society of Actuaries. Also, the Canadian Institute of Actuaries has accredited our program and accepts grades at or above the cut-off grade in courses listed below courses in lieu of passing the corresponding professional examinations.

Course	Cutoff Grade
ACSC 325	B
ACSC 327	B+
ACSC 427	B+
ACSC 437	B+
ACSC 515	B+
ACSC 527	B+
ACSC 531	B+
ACSC 537	B+

Non-core actuarial courses are built on material relevant to fellowship level exams and current actuarial practice.

Program Outcomes:

By the end of the program, students will be able to:

Appreciation:

Acquire an appreciation of how actuarial work depends on external factors (*including the context of the work, the economic environment, and assumptions regarding future years*), and a recognition that actuarial work often addresses issues and problems that span decades.

Knowledge:

Acquire core actuarial knowledge (*relating to interest theory, actuarial mathematics, contingency theory, and of the fundamental actuarial and statistical methods for quantitatively assessing risk*), and advanced actuarial skills in a variety of actuarial practice areas (*including corporate finance and enterprise risk management, quantitative finance and investments, life insurance, general insurance, and retirement benefits*).

Software:

Demonstrate the ability to productively use at least one statistical software package (e.g. R) and one spreadsheet program (e.g. Excel) in the context of actuarial work.

Teamwork:

Demonstrate the ability to work effectively in teams to solve problems and present results.

Communication:

Demonstrate the basic elements of effective communication, know how to structure a report appropriate for submission to one's supervisor or client, and know how to develop a presentation in PowerPoint or some other presentation software package and then orally presenting them.

Management:

Demonstrate the ability to prioritize tasks and manage time efficiently and meet deadlines.

Professionalism:

Appreciate that the actuarial career is a formal, qualified, and legally recognized profession, and that formal codes of ethics, rules of professional conduct, and standards of practice bind its members.

Professional designation:

Acquire the expertise and knowledge required to pass or otherwise earn credit for the early to intermediate examinations of the professional actuarial bodies (*e.g., Society of Actuaries, Casualty Actuarial Society*), and demonstrate this by passing or otherwise earning credit for at least two of these examinations prior to graduation.

## Guiding Questions

The following two guiding questions were selected not only for the Actuarial Science programs, but also for the new Mathematics program and the General Mathematics program.

1. Where will students next apply the skills they acquire in this course in the context or upon completion of the Actuarial Science program?
2. What skills obtained in this course will a successful student be able to translate into a CV or resume item, or in support of a scholarship or other application?

Based on the data from the National Survey of Student Engagement, the Faculty of Science is seeking additional information regarding High-Impact Educational Practices.

1. Are High Impact Practices being used regularly in this program?
2. If not, what is preventing these practices from being used?

# Action Plan

## Action Plan:

Recommendation	Action Item	Who is Responsible?	Due Date
Provide greater training in GLMs and other predictive modelling / data science methodologies for ACSC majors	<ul style="list-style-type: none"> <li>• Introduce a course in GLMs with an actuarial focus for ACSC students.</li> <li>• Introduce advanced data science concepts to the ACSC curriculum</li> </ul>	<ul style="list-style-type: none"> <li>• David Scollnik</li> <li>• ACSC program faculty members, in conjunction with department teaching and curriculum committees and data science program proponents elsewhere on campus.</li> </ul>	<p>Anticipated in Fall 2017</p> <p>On going</p>
Provide opportunity to analyze large insurance data files with opensource software.	Introduce a new course in actuarial computing which includes MySQL and Python Data Analysis library.	Rohana Ambagaspitiya	Anticipated in Fall 2018 or later.

<p>Update the ACSC program curriculum as professional actuarial societies update theirs.</p>	<p>Monitor and maintain adherence to the educational requirements of the professional actuarial societies</p>	<p>CIA Accreditation Actuary (Rohana Ambagaspitiya) and other ACSC program faculty members, in conjunction with department teaching and curriculum committees.</p>	<p>On going</p>
<p>Provide greater training in effective communication, emphasize the socially responsible service roles an actuary plays in the community, and enhance student engagement in research activities</p>	<ul style="list-style-type: none"> <li>• Encourage faculty to include more on all of these topics in a holistic manner. E.g., when developing the mathematics for a financial security product, also mention how important it is that an actuary be able to explain this product to a layman, explain how the product serves the needs of members of society, and have the students research / consider how the product might have to be revised in light of changes in external (e.g. economic) factors (e.g. like interest rates or investment returns).</li> <li>• Invite a representative from Careers Services (or elsewhere) to make a presentation to senior students on effective resume writing, interview</li> </ul>	<p>Who is Responsible: ACSC program faculty members.</p>	<p>On going</p>

	skills, career networking, etc. Perhaps this can best be implemented in some of the non-core courses.		
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# Conclusion

## **Conclusion**

The curriculum review was an extensive exercise to evaluate the actuarial science program which has been successfully graduating students since 1990s. Currently actuarial science program is the largest in the department with approximately 200 majors with around 20 graduating every year.

Core courses in our actuarial curriculum closely follow syllabus set forth by the international actuarial association. Some of these courses are accredited by the Canadian Institute of Actuaries. Many of our graduates become successful actuaries and a few successful entrepreneurs. Our program provide flexibility to our students in choosing non-core courses. Overall students are happy with our program.

We need to address some of the definiteness that we discovered through the survey. We need to provide greater training in effective communication, emphasize the socially responsible service roles an actuary plays in the community. We also need to include specialized computing course for actuaries. We also need to expand our actuarial science co-op program.