Statistics & Actuarial Sciences

Final Assessment Report & Implementation Plan
March 2020

Faculty / Affiliated University College	Faculty of Science
Degrees Offered	B.Sc.
Modules Reviewed	▪ Honours Specialization in Actuarial Science ▪ Honours Specialization in Data Science (joint with Computer Science) ▪ Honours Specialization in Financial Modelling ▪ Honours Specialization in Statistics ▪ Major in Actuarial Science ▪ Major in Data Science (joint with Computer Science) ▪ Major in Financial Modelling ▪ Major in Applied Statistics
External Consultants	Dr. Richard Lockhart, Professor, Simon Fraser University Dr. David Landriault, Professor, University of Waterloo
Internal Reviewer	Dr. Jeff Wood, Associate Dean Undergraduate Studies, Faculty of Engineering, Western
Date of Site Visit	March 5-6, 2020
Evaluation	**Good Quality**
Approval Dates	SUPR-U: January 20, 2021 SCAPA: February 3, 2021 Senate (for information only): February 12, 2021
Year of Next Review	Year of next cyclical review – 2027-28

Overview of Western's Cyclical Review Assessment Reporting Process

In accordance with Western's Institutional Quality Assurance Process (IQAP), the Final Assessment Report (FAR) provides a summary of the cyclical review, internal responses, and assessment and evaluation of the undergraduate modules delivered by the **Department of Statistics & Actuarial Sciences** in the **Faculty of Science.**

This report considers and reports on the following documents: the program's self-study, the external consultants' report and the responses from the Department and the Associate Dean of Science.

This Final Assessment Report (FAR):

i) provides an Executive Summary of the Review Process, including an overview of the Department as outlined in the Self-Study brief;
ii) identifies the strengths of the program;
iii) identifies opportunities for program enhancement and improvement; and,
iv) prioritizes the recommendations of the external consultants in the Implementation Plan.

The Implementation Plan details the recommendations from the Final Assessment Report that are required for implementation, identifies who is responsible for approving and acting on the recommendations, outlines any action or follow-up that is required, and provides the timeline for completion.

The Final Assessment Report and Implementation Plan is sent for approval through SUPR-U, SCAPA, Senate and the Ontario Universities' Council on Quality Assurance and is made available on a publicly accessible location on Western's IQAP website. The Final Assessment Report with the Implementation Plan is the only document resulting from the undergraduate cyclical review process that is made public; all other documents are confidential to the Program/School/Faculty and SUPR-U.

Executive Summary (from the departmental self-study brief)

Overview
Founded in 1980, the Department of Statistical and Actuarial Sciences is located in the School of Mathematical and Statistical Sciences, along with the Departments of Mathematics and Applied Mathematics. Learning Outcomes for all modules offered have been developed according to Western's Degree Outcomes with subsequent curriculum mapping. The goals of the Department of Statistical and Actuarial Sciences are to:

- provide leading undergraduate and graduate programs in Statistics, Data Science, Financial Modeling and Actuarial Science;
- offer high-quality introductory statistical and actuarial science courses that are suitable for a wide range of disciplines;
- explore innovative teaching methods;
- advance its four areas of specialization through high quality research;
- contribute to developing innovative modeling and analytic methodologies via collaborative research conducted within and outside the university

There are currently 26 full-time faculty members, one of whom is a Faculty Scholar, one a Western Research Chair, four are CRC's, two are Fellows of the Society of Actuaries and three are Associates of the Society of Actuaries. The faculty complement is divided into two major areas: the Actuarial and Financial Modelling Group is a group of acknowledged research leaders who provide trainings in the fields of actuarial science and financial mathematics; the Statistics and Data Science Research Group is

comprised of three chaired appointments, a Western Research Chair, TD Professor in Data Analytics, and a Tier 1 CRC in Data Science. This research group also has joint appointments with Computer Science, Biology, and Oncology.

Although student enrolment has doubled in the last six years, surveys and testimonials by current students and alumni report a high satisfaction in their courses with a reported hiring rate of about 90%.

Western has a modular degree structure that allows students to combine subjects from different departments and faculties. Undergraduate students may earn an Honours Bachelor's degree by completing 20 courses (40 half or one-semester courses) including at least one Honours Specialization module or two Major modules. Students may also graduate with a 4-year general degree, which requires the completion of at least one major module. It is also possible to graduate with a 3-year general degree that includes at least one major or two minors. The Department of Statistical and Actuarial Sciences offers modules in Actuarial Science, Financial Modelling, and Statistics, as well as modules in Data Science offered jointly with the Department of Computer Science, designed to meet the needs of employers.

The undergraduate modules in Statistics, Actuarial Science, Financial Modeling and Data Science include:

- Honours Specializations
  Actuarial Science
  Data Science (joint with Computer Science)
  Financial Modelling
  Statistics
- Majors
  Actuarial Science
  Data Science (joint with Computer Science)
  Financial Modelling
  Applied Statistics
- Minors
  Applied Statistics
  Applied Financial Modeling
  Data Science (joint with Computer Science)

The Department's strategic priorities include High Impact Learning Experiences for students, with a focus on Career Preparedness; External Community and Alumni Engagement; Development of Professional Programs and Training; Maintaining Industrial and Government Connections; Promoting Excellence in Research; and Internationalization, including expansion of undergraduate international enrolments and research connections.

Strengths/Innovations of the Program (as identified in the brief)

- Student scholarships combined with work terms
- Excellent employment statistics for graduates
- Excellent library support
- 3+1+1 agreements with four universities in China
- Accreditation by the Society of Actuaries and the Casualty Actuarial Society

Opportunities for Development

- Advance the Multi-Hazard Risk Assessment Research Group
- Rebuild links with the Schulich School of Medicine and Dentistry where there is a burgeoning field of health informatics

Changes & Enhancements

Since the last periodic review, the Department has undergone a departmental review as well as external reviews to qualify for accreditation. As a result, the Department has engaged in a number of strategic faculty hires, developed successful regional high-school outreach initiatives, enabled students to take the Introductory Business courses offered by the Ivey Business School, increased the 5-year dual degree Ivey program, supported junior faculty in pursuing their actuarial designations, maintained accreditation with the Society of Actuaries as a Center of Actuarial Excellence, modified course contents and module requirements to conform to changes in the professional actuarial curriculum, facilitated the development of strategies in connection with the Department's research agenda, and, jointly with Computer Science, developed and introduced new modules in Data Science.

Self-Study Process

The information summarized above was collected from the Department's self-study document (Volume I). The unit's self-study was a collective effort involving participation from all members of Statistics & Actuarial Sciences at Science Western. Multiple faculty meetings and retreats were designated for the purposes of reviewing the undergraduate modules and resulted in the recent mapping of the curriculum to the Learning Outcomes. In addition, feedback about the effectiveness of the curriculum was solicited from students, alumni through surveys, testimonials, and questionnaires.

Review Process

During the onsite external review, the review committee (comprised of the two external reviewers and one internal reviewer) were provided with Volumes I and II in advance of their visit and then met over two days with:

- John Doerksen, Vice Provost (Academic Programs)
- Karen Campbell, Vice Provost (Academic Planning, Policy and Faculty Relations)
- Jeff Hutter, Associate Dean (Academic), Faculty of Science
- Kristina Sendova, Chair, Department of Statistics & Actuarial Science
- Serge Provost, Undergraduate Chair, Department of Statistics & Actuarial Science
- Undergraduate Faculty, Stats/Data Science, Department of Statistics & Actuarial Science
- Undergraduate Faculty, Actuarial Science/Financial Modeling, Department of Statistics & Actuarial Science
- Undergraduate Students, Department of Statistics & Actuarial Science
- Associate Chief University Librarian & Associate Librarian, Collections & Content Strategies
- 7 members of Administrative Staff, Faculty of Science

The reviewers also engaged in a guided tour of the of the department's teaching and research facilities.

Following the onsite review, the external reviewers submitted a comprehensive report of their findings which was sent to the Chair and the Dean for review and response. These formative documents, including Volumes I and II of the Self-Study, the External Report, and the Faculty response, have formed the basis of this summative assessment report of the Statistics & Actuarial Science undergraduate programs.

Summative Assessment by the External Reviewers[1]

… From our assessment, DSAS has demonstrated a strong commitment to keep their undergraduate programs relevant to serve the public good and to produce graduate students who are well equipped to make meaningful contributions in their area of specialization upon graduation.

Strengths of the Program

- Clear and appropriate learning requirements and Learning Outcomes
- Curriculum mappings relate to Program Learning Outcomes and the Western Degree Outcomes.
- *Faculty qualifications are highly appropriate. We see very good to outstanding research records almost all of which are in areas relevant to these programs. We do not see any major research areas which are needed but not covered. We were impressed by the numbers of awards and prizes receive by faculty in this unit; there are far too many to list. In terms of the programs we are impressed to see quite a few teaching awards going to quite a few department members. On the research side there is excellent grant support, an impressive array of best-paper awards, numerous society awards, and some quite high prestige awards like the CRM-SSC prize.*
- Strong student evaluations of teaching.
- Internship program

Challenges for the Program

- Revamping the curriculum: *It is…our perception that the process…has been one of matching up existing curriculum with the PLLOs and with the Western Degree Outcomes but that the process has not so far been used to drive curricular change. We think this is a longer-term process and that the process so far is a good and meaningful start.*
- Faculty complement in Actuarial Science: *The actuarial group is small with just 5 faculty members (including the current department chair who is on a reduced teaching load). This can be viewed as an area of concern given that a rather large portion of the undergraduate students in the department (and of the department's activities as a matter of fact) are in Actuarial Science. Also, it is essential for accreditation and maintenance of the Center of Excellence designation that there be a Fellow of the Society of Actuaries among this group.*

[1] This section summarizes information in the External Reviewers' Report. Direct quotes from the report are noted in italics.

Summary Statement

It is our perspective that this unit is delivering excellent teaching built on a foundation of strong research and scholarship. This has been the case for quite some time and we are confident the Department of Statistical and Actuarial Sciences (DSAS) is well positioned to maintain their leading position in the years to come.

Summary of the Reviewers' Key Recommendations and Department/Faculty Responses

Reviewers' Recommendations	Departmental/Decanal Response
1. *We recommend that the university gather more information on the actual experience of individual graduating students in order to determine which PLLOs are being met to what level within each module*.	Rather than commenting on the individual recommendations made by the reviewers, the Department response to the recommendations was expressed as: *To be sure, we shall in time give heed to the consultants' insightful comments and constructive recommendations with a view to bolstering up our undertakings and further enhancing our undergraduate offerings.* The decanal response notes that attention will be paid to: 1. Reviewing curriculum mapping to ensure that it is used to inform curriculum design and course content. 2. Review will be made of the new Data Science modules, which are offered jointly with the Department of Computer Science to ensure some course requirements in Computing Science. 3. Examining and balancing theory and application (data) in the Statistical Science modules. 4. Ensuring the presence of a Fellow of the Society of Actuaries in the Department in case of upcoming retirements. 5. Reviewing student enrolment, given the high proportion of international students and potential concerns.
2. *We recommend that the department continue to review and update these maps and develop processes by which the maps are used to influence program and course curriculum design*.	
3. *We recommend that the department be careful to make certain that its modules do an adequate job of ensuring that Western graduates of these modules have strong communication skills.*	
4. *DSAS may want to review the computing requirements in all modules to ensure that students get enough exposure (and coherently thought through exposure) over the course of their undergraduate degrees.*	
5. *We recommend that the departmental leadership engage in a forward-looking planning exercise, identifying potential initiatives both in and beyond data science, which will help improve the quality over the long term.*	

Implementation Plan

The Implementation Plan provides a summary of the recommendations that require action and/or follow-up. The Department Chair/Director, in consultation with the Dean of the Faculty/Affiliated University College Principal will be responsible for monitoring the Implementation Plan. The details of progress made will be presented in the Deans' Annual Report and filed in the Office of the Vice-Provost (Academic).

Recommendation	Proposed Action and Follow-up	Responsibility	Timeline
1. Ensure strong communication skills across all programs	Review program curricula; assess student performance and suggest curriculum revisions as appropriate	Department Chair	July 2022
2. Computer skills: ensuring sufficient and coherent exposure throughout the degree program			
3. Gather information from graduates to assess the success in meeting PLLOs	Establish a formal annual review process to collect, analyze and review student performance data in order to inform curriculum changes	Department Chair	Ongoing
4. Review and update curriculum maps to inform program and course design			
5. Conduct a planning exercise to identify potential initiatives within and external to Data Science to maintain quality of the program			