

Self Study Report

The report highlighted a number of program strengths including:

- Curriculum and Standards
- Faculty Expertise
- Student Opportunities
- Program Size and Inclusivity
- Industry Connections
- Commitment to Equity
- Flexibility
- Student Enrollment

The report also noted some challenges experienced by the program:

- Faculty and Staffing Shortages
- Lack of Research Chairs
- Curriculum Limitations
- Resource Constraints
- Experiential Learning
- Teaching Load
- Growing Pains
- Program Perception

The report made several recommendations and asked for External Reviewer feedback on several areas including:

- Faculty expertise and development: The faculty have expertise in emerging areas such as Quantum, AI, and LLMs, and courses can be offered in these areas. The core offerings in the program should be strengthened by hiring faculty with research expertise in the core areas. Adding a few more faculty would help to add breadth to teaching at the undergraduate level.
- Curriculum Enhancement and Innovation: The integration of and training on the use of Generative AI. There is a possibility of expansion to new areas of studies such as data science and quantum computing.
- Program design and focus: Given the faculty expertise, short and focused programs offering stackable diplomas or certificates could be designed, targeting people who already have a degree and perhaps have already worked in industry but are now looking to enhance their skills in certain areas in demand.
- Student engagement: There are some opportunities for undergraduate students to engage in extracurricular activities, for example in research and applied studies.
- Based on our enrolments, we have a very strong 4-year program in Lethbridge, as well as strong 2-year Post-Diploma programs in both Lethbridge and Calgary. The initial numbers in the new B.Sc./BFA (New Media) combined degree also look promising. However, our remaining programs - including ones with more rigidly defined requirements - have not had as much uptake in the past several years. Is it time to consider deleting some or all of these programs in favour of our stronger ones? In addition, are there any new programs we should introduce?
- We offer most of our 4000-level courses in our series streams, which allows us to offer variety based on teaching/research interest and benefits our undergraduate students. However, these are also co-offered as 5000- and 7000- courses for both our M.Sc. and Ph.D. program, which is a detriment to our graduate

students and the programs in general. Is it time for us to look at regularizing some courses from our stream offerings?

- We are currently reviewing our undergraduate curriculum. What is the feasibility of pursuing specialized undergraduate streams - for example, Database, Artificial Intelligence, Algorithms - at the 3000/4000 level?
- Some of our classes - in particular those offered in the Summer I semester - are offered fully online including exams (if specified). What do the external reviewers think of this practice? Should we continue this, or do the externals have other suggestions for alternatives?
- Alumni comments about relevance of the curriculum to industry standards are summarized in the report. Based on these comments, we seek feedback on the following: How can we enhance industry involvement in the design of our curriculum to ensure it aligns with current market demands and effectively prepares students with the skills needed for knowledge and technology jobs of now and in the future?
- Since the pandemic, attendance for most of our classes and labs has been at an all-time low, despite efforts to encourage attendance, engaging students, etc. Do the reviewers have any suggestions on how to address the class attendance issue?

External Review Report

The External Review Report contained sixteen (16) recommendations for improving the program:

- Undertake a comprehensive curriculum renewal aligned with ACM/IEEE 2023 standards, identifying areas of study that are missing from current curricular offerings, particularly learning outcomes associated with professional practice.
- Engage an industry advisory board to allow consultation on curriculum and other opportunities.
- Identify (and advocate to reinforce) gaps in research expertise that can negatively affect the department's ability to deliver modern Computer Science curriculum, especially: Human-Computer Interaction, Networking, Cybersecurity, and Machine Learning.
- Strengthen areas of research that align with the priority areas of funders and stakeholders, specifically the Provincial Government; and leverage to secure increased funding and support for these priority areas.
- Re-allocate retirement vacancies to high-enrolment and growing programs to support increased load of high-volume program delivery.
- If gaps in research expertise can be filled, broaden and modernize the offering of specialisations related to student interest and industry practices. If not, identify a streamlined minimal Computer Science curriculum that can be appropriately supported, and reduce or eliminate peripheral programs that are unsustainable.
- Identify existing combined degrees that are resource-constrained (such as CS-GIS) and limit or remove these programs. Identify existing combined degrees that do not add additional constraints (such as CS-New Media) and further promote and develop these programs. Identify potential opportunities for new combined degrees that align with the priorities of the provincial government to capitalize on these stated priorities.
- Consider specifying and further developing the specifics of cross-listed courses between graduate and 4th year undergraduate, to clarify expectations and reinforce the rigour of the graduate program.
- Consider increasing undergraduate research opportunities, including undergrad theses, and consider an honours designation connected to the thesis.

- Align enrolment targets, staffing, and course scheduling to ensure consistent instructional quality and curricular coverage.
- Reinforce the success of the post-diploma program at the Calgary campus by building additional remote elective opportunities, and growing opportunities for students at the Lethbridge campus to seek co-op opportunities in Calgary and beyond. Consider integrations between Calgary and Lethbridge offerings of equivalent courses.
- Consider expanding co-op opportunity development into industry sectors not traditionally associated with Computer Science.
- Explore the potential to increase and diversify course offerings via recruitment of industry sessional instructors.
- Engage the Office of Research Services (or equivalent) to support building engagements between faculty, industry, and government, to develop projects relevant to emerging areas of computer science.
- Consider providing space and support for undergraduate clubs and student groups.
- Based on the excellent self-study work that has been done, consider embarking on a strategic planning process to solidify unit cohesion, select priorities for development, and establish goals and success metrics.

Program Response

In their Program Response, the Self Study Committee addressed the recommendations from the External Review Report:

1. Undertake a comprehensive curriculum renewal aligned with ACM/IEEE 2023 standards, identifying areas of study that are missing from current curricular offerings, particularly learning outcomes associated with professional practice.	The program area agrees. Some initial work has begun on the program review, and will continue into the new year now that our AQA review is wrapping up.
2. Engage an industry advisory board to allow consultation on curriculum and other opportunities.	The program area agrees.
3. Identify (and advocate to reinforce) gaps in research expertise that can negatively affect the department's ability to deliver modern Computer Science curriculum, especially: Human-Computer Interaction, Networking, Cybersecurity, and Machine Learning.	The program area agrees. We note that we do offer courses in Human Computer Interaction, Networking and Machine Learning, but currently have expertise related to Machine Learning only. These courses – and others we do offer and some we cannot offer such as Cybersecurity – would benefit from an expert delivering them.
4. Strengthen areas of research that align with the priority areas of funders and stakeholders, specifically the Provincial Government; and leverage to	The program area agrees. The Office of the Dean of Arts and Science has secured Targeted Enrolment Expansion funding for the past 3+ years, which is deeply appreciated. However, we and the Dean's office acknowledge that sources of funding that lead to more permanent recruitment and retention are needed.

	secure increased funding and support for these priority areas.	
5.	Re-allocate retirement vacancies to high-enrolment and growing programs to support increased load of high-volume program delivery.	The program area agrees.
6.	If gaps in research expertise can be filled, broaden and modernize the offering of specialisations related to student interest and industry practices. If not, identify a streamlined minimal Computer Science curriculum that can be appropriately supported, and reduce or eliminate peripheral programs that are unsustainable.	The program area agrees.
7.	Identify existing combined degrees that are resource-constrained (such as CS-GIS) and limit or remove these programs. Identify existing combined degrees that do not add additional constraints (such as CS-New Media) and further promote and develop these programs. Identify potential opportunities for new combined degrees that align with the priorities of the provincial government to capitalize on these stated priorities.	The program area agrees.
8.	Consider specifying and further developing the specifics of cross-listed courses between graduate and 4th year undergraduate, to clarify expectations and reinforce the rigour of the graduate program.	The program area agrees.
9.	Consider increasing undergraduate research opportunities, including undergrad theses, and consider an honours designation connected to the thesis.	<p>The program area agrees to the consideration of increasing undergraduate research opportunities. Every year, the department runs a session on undergraduate research funding opportunities and projects. In addition, some students undertake Independent Studies and Applied Studies, and Undergraduate Theses (for students with a qualifying GPA) to pursue research projects. In general, these avenues could be explored for further undergraduate research opportunities for students who are interested.</p> <p>The program area also agrees (albeit with reservations) with expanding the offering of the Undergraduate Thesis. Faculty interest in offering the Undergraduate Thesis exists, as observed in the past few years. Our concern is the following: unless resource constraints, eligibility requirements, and</p>

	<p>supervisory committee membership requirements are addressed, the option to expand Undergraduate Thesis offerings is not practical at the moment.</p> <p>We are aware that there already exists an Honours Thesis designation for UTs. We accept responsibility for not communicating this clearly to the external reviewers</p>
10. Align enrolment targets, staffing, and course scheduling to ensure consistent instructional quality and curricular coverage.	The program area agrees.
11. Reinforce the success of the post-diploma program at the Calgary campus by building additional remote elective opportunities, and growing opportunities for students at the Lethbridge campus to seek co-op opportunities in Calgary and beyond. Consider integrations between Calgary and Lethbridge offerings of equivalent courses.	<p>The program area agrees with the recommendation to grow co-op opportunities in Calgary and beyond. However (as noted in Recommendation #12 below), this would require the co-operation of CareerBridge in order to be successful.</p> <p>The program also agrees (albeit with reservations) with considering integrations between Calgary and Lethbridge course offerings, which could extend to additional CS elective courses. This would require further discussion, agreements to teaching at “off-times” on both sides, and additional teaching resources in order to co-ordinate teaching in hybrid mode across multiple and much larger course sections.</p> <p>However, the overarching concerns we have are with respect to sustainability and program quality. First, although the number of students in the Post-Diploma program at Calgary Campus (at 75) is certainly satisfactory, we understand that the numbers of students in other programs at Calgary Campus - including the UICC - are lower than in the past. Second, there are concerns with what could be perceived to be a discrepancy between the GPAs on main campus vs. the Calgary Campus Post-diploma program. However, this is based on Calgary Campus data that is only 2 years old, where Main Campus data goes back many years, so currently this is not a fair comparison. More data - both in terms of the Post-Diploma program and enrolments trends of all programs - would be required before proper comparisons can be made between the programs on both campuses and to ensure that Calgary Campus overall is sustainable.</p>
12. Consider expanding co-op opportunity development into industry sectors not traditionally associated with Computer Science.	The program area agrees - however, the co-operation of CareerBridge is required in order for this to be successful.
13. Explore the potential to increase and diversify course offerings via recruitment of industry sessional instructors.	The program area agrees to exploring the potential of recruiting instructors or professors of practice in order to increase and diversify course offerings.
14. Engage the Office of Research Services (or equivalent) to support building engagements between faculty, industry, and government, to develop projects relevant to emerging areas of computer science.	The program area agrees.
15. Consider providing space and support for undergraduate clubs and student groups.	The program area agrees. A department member is assigned every year to provide support to undergraduate student clubs, but dedicated club space is still needed.

<p>16. Based on the excellent self-study work that has been done, consider embarking on a strategic planning process to solidify unit cohesion, select priorities for development, and establish goals and success metrics.</p>	<p>The program area agrees - after the reviews of our existing programs is completed.</p>
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Dean's Response

This is a summary of the Dean of the Faculty of Art and Science's response to the above documents:

The Dean's Office thanks the External Reviewers, Dr. David Gerhard (University of Manitoba) and Dr. Janet Light-Thompson (University of New Brunswick) for their comprehensive expert review. We also thank the Computer Science AQA Program Committee, Dr. Wendy Osborn (Chair), Dr. Daya Gaur and Dr. Howard Cheng, for a particularly informative self-study and for beginning to consider the external reviewer's recommendations thoughtfully in the Program Response.

We were pleased that the external reviewers recognized the effective work of our Computer Science faculty members. We agree with many of their recommendations, such as the benefit that would come from curriculum review and strategic planning, enhanced engagement with industry, a reassessment of low-enrolment combined degrees and new opportunities, clarifying the deliverables of courses cross-listed at the graduate level, and ensuring that students make the most of experiential learning options, including coop and applied studies beyond the local region and undergraduate research.

Provost's Action Plan

Consulting the External Reviewer Recommendations, the Program Response, and Dean Matt Letts, the Academic Quality Assurance Committee made the following five (5) recommendations for action which the Program must report on in 1 and 3 years:

1. The Department of Mathematics & Computer Science will hold a retreat to solidify unit cohesion and discuss priorities for the Computer Science program going forward. This discussion may include a strategic planning process to establish goals and metrics for success.
2. The Computer Science Program will complete a curriculum review to ensure that their current programs reflect available resources and faculty strengths. Items to consider include:
 - a. Streamlining the program to support desired learning outcomes and student demand.
 - b. How to best align program learning outcomes with ACM/IEEE standards, identifying gaps and strategizing around how they may be addressed given existing resources.
 - c. The ongoing viability of existing majors, combined degrees, and pathways, including identifying which ones may be streamlined or combined and which may have room for growth.
 - d. Continuing to discuss the potential of creating a joint Mathematics and Computer Science degree, leveraging existing resources across both areas.
 - e. Clarifying requirements for courses cross-listed between graduate and 4th year offerings.
 - f. The viability of offering more hybrid courses that provide opportunities for expanded offerings for students on both the Lethbridge and Calgary campuses.
3. The Computer Science Program should work with the Office of Research Services:

- a. To facilitate connections with Economic Development Lethbridge and Regional Innovation Network of Southern Alberta to determine the best ways to address industry needs at the local level; this may include the development of an advisory committee.
 - b. To help identify and apply for additional funding opportunities at the provincial level.
4. The Computer Science program will work with Career Bridge to discuss the availability of Co-ops and Applied Studies courses.
5. The Computer Science Program will work with the Faculty of Arts and Science Dean's Office to identify space and support for undergraduate clubs and student groups, ensuring not to duplicate resources/opportunities already available through the ULSU and GSA.

The Academic Quality Assurance Committee is satisfied that the Computer Science Program academic quality assurance review has followed the U of L's academic quality assurance process appropriately, and acknowledges the successful completion of the review.

Sincerely,



Dr. Lynn Kennedy
Chair, Academic Quality Assurance Committee
Associate Professor, Department of History and Religion

cc Michelle Helstein, PhD.
Provost & Vice-President (Academic)