Computer Science
Final Assessment Report & Implementation Plan
June 2024

Faculty / Affiliated University College	Faculty of Science
Degrees Offered	B.Sc.
Date of Last Review	2015-2016
Modules Reviewed	Honours Specialization in Computer Science Honours Specialization in Bioinformatics Specialization in Computer Science Major in Computer Science Minor in Computer Science Minor in Software Engineering Minor in Game Development
External Reviewers	Dr. Kelly Lyons, Faculty of Information University of Toronto	Dr. Nur Zincir-Heywood, Faculty of Computer Science, Dalhousie University
Internal Reviewer	Dr. Brad Urquhart, Associate Dean, Basic Medical Sciences Undergraduate Education	Adira Daniel, PhD. Candidate, Psychology
Date of Site Visit	February 26 & 27, 2024
Date Review Report Received	April 18, 2024
Date Program/Faculty Response Received	Program: June 5, 2024 Faculty: June 5, 2024
Evaluation	Good Quality
Approval Dates	SUPR-U: September 18, 2024 ACA: October 1, 2024 Senate (for information): October 11, 2024
Year of Next Review	2031-2032
Progress Report	June 2027

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 Computer Science Program delivered by the Faculty of Science.

This FAR considers the following documents:
- the program's self-study brief;
- the external reviewers' report;
- the response from the Program; and
- the response from the Dean, Faculty of Science.

This FAR identifies the strengths of the program and opportunities for program enhancement and improvement, and details the recommendations of the external reviewers – noting those recommendations to be prioritized for implementation.

The Implementation Plan details the recommendations from the FAR that have been selected for implementation, identifies who is responsible for approving and acting on the recommendations, specifies any action or follow-up that is required, and defines the timeline for completion.

The FAR (including Implementation Plan) is sent for approval through the Senate Subcommittee on Program Review - Undergraduate (SUPR-U) and ACA, then for information to Senate and to the Ontario Universities' Council on Quality Assurance. Subsequently, it is publicly accessible on Western's IQAP website. The FAR is the only document from the undergraduate cyclical review process that is made public; all other documents are confidential to the Computer Science Program, Faculty of Science, and SUPR-U.

Executive Summary

The Department of Computer Science at Western University is one of the oldest departments associated with the discipline in the country, founded in 1969. The department now offers seven undergraduate modules. Like many computer science programs across Canada, the program in computer science at Western has been growing consistently for the past ten or more years. In 2012, the department had approximately 100 students across all undergraduate offerings. The number of undergraduate students enrolled in computer science is now over 800.

The self-study was informed by dedicated town hall sessions held with students in spring 2023, which subsequently informed the development of surveys distributed to current students and alumni. Later in the spring, a departmental retreat was held to discuss existing strengths, existing and possible future program offerings and Equity Diversity Inclusion and Decolonization (EDI-D) goals. In the summer, revisions were made to the program learning outcomes and a curriculum mapping exercise was completed.

The external reviewers shared a positive assessment of the Computer Science Program. They offer three recommendations with considerations for further enhancement.

Strengths and Innovative Features Identified by the Program

- Ranked in the top 9 programs nationally by Macleans, and in the top 250 globally by Times Higher Education.
- Offerings are particularly strong in Artificial Intelligence, Data Science and Computer Systems and Networks.
- Curriculum: 1) flexibility enables students to take a variety of pathways. For instance, combining Computer Science with Business, Statistics and Actuarial Science, Mathematics, Management and Medical Sciences; 2) experiential learning components provide opportunities for students to incorporate real-world learning, including paid internships; and 3) is constantly updated to reflect current industry trends.
- Minor in Game Development is the first of its kind in Canada and is internationally recognized.
- Student feedback notes particular satisfaction with extent of theoretical focus and the development of teamwork skills.
- Long-standing articulation agreement with Fanshawe College defines a pathway program that allows graduates of Fanshawe's three-year Computer Programmer Analyst program to obtain a block transfer credit of the equivalent of 16 courses towards Computer Science modules.

- Institutional appointment of a Chief AI Officer, a faculty member from Computer Science, reflects the importance of the use of AI technology in teaching and learning.

Concerns and Areas of Improvement Identified and Discussed by the Program

- Growth in faculty complement is necessary for further enrolment growth.
- Heavy workload is cited by faculty members as a limiting factor in the development of new course and modules.
- Need for better alignment of pathway courses between Computer Science and Fanshawe College to ensure limited overlap in content.
- International exchange students experience significant difficulties in registering for courses as they arrive later in the registration period.
- Student feedback indicated areas for improvement in large-scale software systems and industry standard tools, and sensitivity, privacy and security.
- Enhance EDID components in the program learning outcomes and in courses that cover human impacts of software design and use.
- Advance the concepts of Universal Instructional Design and provide a central touchpoint for course design within Computer Science.
- Large class sizes at all levels prevent significant interaction between faculty members and students. The sizes can impose barriers on faculty members from developing innovative teaching approaches.
- The configuration of Middlesex College, the building housing the program, presents challenges to the Department. The accessibility of the building is not appropriate.
- TA funding has placed significant constraints on the Department. To manage TA expenses, the Department has had to maintain a 60:1 student to TA ratio.

Review Process

As part of the external review, the review committee, comprising two external reviewers, an internal reviewer and a student reviewer, were provided with Volume I and II of the self-study brief in advance of the scheduled review and then met over two days with the:

- Vice-Provost (Academic Programs)
- Associate Vice-Provost (Academic Planning, Policy and Faculty Relations)
- Director of Academic Quality and Enhancement
- Dean, Faculty of Science
- Associate Dean, Faculty of Science
- Associate University Librarian
- Chair, Department of Computer Science
- Undergraduate Chair, Department of Computer Science

- Manager, Integrated and Experiential Learning
- Administrative Staff
- Program Faculty
- Program Students

Following the site visit, the external reviewers submitted a comprehensive report of their findings which was sent to the Program and Dean for review and response. Formative documents, including Volumes I and II of the Self-Study, the External Report, and the Program and Decanal responses form the basis of this Final Assessment Report (FAR) of Computer Science Program. The FAR is collated and submitted to SUPR-U by the Internal Reviewer with the support of the Office of Academic Quality and Enhancement.

Summative Assessment – External Reviewers' Report

External reviewers shared that the "*program is well positioned to contribute to the strategic objectives of Western University and the Faculty of Science and has solid support from the Dean's office in the Faculty of Science. The department is fortunate to have a strong faculty complement, significant research strengths, dedicated department leadership, outstanding staff, and warm collegiality among staff and faculty.*"

Strengths of the Program

- Implementing the direct entry structure for 2024-2025 would elevate the visibility of the program to potential applicants and attract more domestic and international students.
- Faculty member: 1) collaborations with industry enable them to continuously update the curriculum to keep abreast of disciplinary and technological changes; 2) significant research strength, substantial funding, high-impact publications, high numbers of patents is reflected in the department being ranked in the top 250 of Times Higher Education global rankings.
- Collegiality of the staff, faculty members and the senior management continues to create an enabling environment for student success.
- Western's goal of more hands-on applications, more work-integrated learning, and additional research opportunities for undergraduate students are well supported by the undergraduate program which provides diverse experiential learning opportunities for students.
- Program structure that enables computer science offerings to be combined with modules in other units such as business, statistics and actuarial science, mathematics, business, and medical sciences.

Prospective Improvements for the Program to Consider

- With the growth in student enrollment, class sizes have increased which is impacting faculty workload and the ability to innovate and invest in new courses. Consequently, this may be negatively impacting student learning and the overall student experience. (*Associated with Recommendation #1*)
    - Staff expressed concern regarding increased workload resulting from complex program requirements and increasing enrollments. (*Associated with Recommendation #1*)
- Improve diversity pool of program applicants. (*Associated with Recommendation #2*)
- Invest in enhanced incorporations of EDI-DI across the program and Universal instructional design throughout the curriculum. (*Associated with Recommendation #2 and #3*)
- Explore ways to more systematically monitor student success post-graduation.
- Students and some faculty members noted the need to include more topics that will prepare students for the workforce, and more opportunities for group projects and work-integrated learning.

Summary of the Reviewers' Recommendations and Program/Faculty Responses

The following are the reviewers' recommendations in the order listed by the external reviewers.

Reviewers' Recommendation	Program/Faculty Response
Recommendation #1 Develop and Implement Mechanisms to Navigate Program Growth.	**Program:** The Department: • will recruit already-allocated positions (2 tenure-track, 1 CRC and 1 Teaching Scholar) within the remaining two years of the current budget cycle. Further positions are warranted by existing growth. • has developed a long-term strategy of increasing course sections at the 2nd and 3rd year levels to handle program growth. This is supported in part by increased faculty complement, but also through increased limited duties appointments. The plan includes a minimum of two offerings of most third-year courses and three offerings of all required second-year courses. Progress has been made already in increasing offerings. • plans to add new 4th year course offerings to increase innovation in the program. Planned new courses are in Deep Learning, Reinforcement Learning, and Security. **Faculty:** The Dean's Office fully supports the Program's proactive response to address the challenges posed by rapid enrollment growth; and, endorses the planned recruitment of the already-allocated positions. This strategic hiring plan is essential for sustaining the department's growth and advancing its commitment to innovation.
Recommendation #2 Identify ways to Align with Western's Commitment to Equity, Diversity, Inclusion, Decolonization and Indigenization.	**Program:** The Department will: 1) review the establishment of a committee which has a mandate to consider EDI-DI issues; 2) work with the Faculty of Science to develop a plan for ongoing data collection in the areas related to EDI-DI. In particular, student and program success data will require additional staff resources; and 3) identify existing Universal Design for Learning (UDL) approaches in the program and catalogue these efforts, in conjunction with encouraging faculty participation in new Centre for Teaching and Learning (CTL) programs on UDL. **Faculty:** The Dean's Office fully supports the Program's commitment to enhancing EDI-DI within its offerings in an attempt to attract a more diverse pool of applicants, thereby strengthening the program and responding to the evolving needs of society. Given the growth in undergraduate enrollments, the workload of the current staff, including the undergraduate assistant and the program coordinator, has become unreasonably high. While additional staff may eventually become necessary to manage increased responsibilities and to ensure the department can undertake new initiatives such as student and alumni opinion recording and

	tracking, this request should be carefully considered in future budget submissions. This enhancement in staffing will be evaluated as part of the ongoing commitment to support the long-term success and sustainability of the program's EDI-DI efforts.
Recommendation #3 Work with Western's Centre for Teaching and Learning (CTL) to Embark on a Curriculum Review.	**Program:** The Department will: 1) consult with the CTL on curriculum review; 2) review the HSP in Bioinformatics to determine whether enrolment can be increased, or whether the HSP should be closed; and 3) identify opportunities for additional EDI-DI principles to be embedded into course content. **Faculty:** The Dean's Office fully supports the department's intention to consult with Western's CTL on a comprehensive curriculum review. This initiative is crucial as the department transitions to a direct-entry structure. The Dean's Office commends the department's commitment to evaluating the balance of theoretical versus applied courses, enhancing community and inclusiveness, and incorporating EDI-DI principles into the curriculum. Additionally, the department's proactive approach to reviewing the Honours Specialization in Bioinformatics and considering potential changes demonstrates a strong commitment to optimizing program offerings and resources.

Implementation Plan

The Implementation Plan provides a summary of the recommendations that require action and/or follow-up. In each case, the Program Chair, and the Dean of the Faculty are responsible for enacting and monitoring the actions noted in Implementation Plan.

Recommendation	Proposed Action and Follow-up	Responsibility	Timeline
Recommendation #1 Develop and Implement Mechanisms to Navigate Program Growth.	• Recruit allocated program hires (2 tenure-track, 1 CRC and 1 Teaching Scholar) within the remaining budget cycle. • Continue increasing course sections at the 2nd and 3rd year - a minimum of two offerings of most third-year courses and three offerings of all required second-year courses. • Add a new 4th year course offerings in Deep Learning, Reinforcement Learning, and Security to increase innovation in the program.	• Department Chair • Undergraduate Chair	By June 2027
Recommendation #2 Identify ways to Align with Western's Commitment to Equity, Diversity, Inclusion, Decolonization and Indigenization.	• Explore establishing a committee which has a mandate to consider EDI-DI issues. • Work with the Faculty to develop a plan for ongoing data collection in the areas related to EDI-DI. • Identify existing UDL approaches in the program and catalogue these efforts. • Encourage faculty participation in CTL programs on UDL. • Evaluate staffing needs as part of the ongoing commitment to support the long-term success and sustainability of the program's EDI-DI efforts.	• Department Chair • Undergraduate Chair	By July 2025

Recommendation #3 Work with Western's Centre for Teaching and Learning (CTL) to Embark on a Curriculum Review.	• Consult with the CTL to plan and implement a curriculum review.
	   o Examine gaps and redundancies in the curriculum via a mapping exercise.
	   o Identify opportunities to further incorporate EDI-DI principles into course content.
	• Review the Honours Specialization in Bioinformatics to determine whether enrolment can be increased, or whether the Honours Specialization should be closed.
		• Department Chair
		• Undergraduate Chair
			By July 2026