

FINAL ASSESSMENT REPORT
Evaluation of Undergraduate Programs
School of Electrical Engineering and Computer Science (EECS)
Cyclical Review Period: 2020–2021
Date: October 13, 2022

I. Evaluated Programs

- Honours BSc with Specialization in Computer Science
- Honours BSc with Specialization in Computer Science, Management and Entrepreneurship option
- Honours BSc with Specialization in Computer Science, Data Science option
- Joint Honours BSc in Computer Science and Mathematics
- Honours BSc in Mathematics and Honours BSc in Computer Science (Data Science)
- Major in Computer Science

II. Evaluation Process (outline of the visit)

- This final assessment report on the above programs was prepared from the following documents: (a) the self-study report produced by the academic unit, (b) the report of the external evaluation following the virtual visit, and (c) the comments outlined in the action plan by the Dean of the Faculty of Engineering, Jacques Beauvais and by Associate Director for the Computer Science programs, Carlisle Adams.
- The virtual visit took place on Friday, March 4 and Monday, March 7, 2022 and was conducted by Christian Blouin, Dalhousie University, and Ziad Kobti, University of Windsor.
- Evaluators met with Aline Germain-Rutherford (Vice-Provost Academic affairs), Claude D'Amours (Director of EECS), the administrative staff of EECS, a selection of full-time faculty and part-time instructors, a group of undergraduate students from year 1 to 4, the staff from the undergraduate office of the Faculty of Engineering, the laboratory support staff for this Faculty, and finally with Jacques Beauvais (Dean, Faculty of Engineering) and Michel Labrosse (Vice-Dean Undergraduate Studies, Faculty of Engineering).
- The entire visit was facilitated by Carlisle Adams (Associate Director for the Computer Science undergraduate programs).

III. Summary of Reports on the Quality of Programs

EMPHASIZING THE STRENGTHS AND IDENTIFYING CHALLENGES

STRENGTHS

- The programs are substantially aligned with the Association for Computing Machinery (ACM) guidelines and accredited by the Computer Science Accreditation Council (CSAC) of the Canadian Information Processing Society (CIPS).
- A discipline in high demand by the job market.
- A very good level of bilingualism at all levels: program offerings, students, and faculty.
- Diversified programs with a wide range of options and specializations.

- An excellent co-op program, well run and offering students a very high placement rate.
- A state-of-the-art building and laboratories, and a beneficial cohabitation with other engineering programs.
- An ideal location near what is known as “Silicon Valley North”, with privileged access to public and private employers.
- A student association (CSSA) very active in the organization of events.
- The number of admissions requests, as well as the number of national and international students admitted, are constantly increasing.
- Full-time professors with high national and international reputations and excellent teaching evaluations.
- Ethnic and gender diversity of faculty that is above national norms.
- Programs aligned with the university's strategic plan.
- Students are satisfied with the quality of the education they receive.
- A committed and very effective team of support personnel.

CHALLENGES

- A need to recruit full-time faculty and/or lecturers to lighten the teaching load and reduce the student/faculty ratio.
- The increasing number of applications is forcing the administration to raise admission criteria, which may create barriers for rural and First Nations students.
- The pressures of limited teaching capacity, growing student numbers, and the need to offer programs in both languages, limit innovation initiatives.
- Part-time faculty do not all have the same awareness of academic integrity concerns.
- The large size of the programs has a negative effect on students' sense of belonging.
- A need for a physical space dedicated to computer science student meetings and activities.
- A need to introduce more students to research activities to encourage them to undertake post-graduate studies.
- Need for advisors specific to students in programs.
- Need to improve the gender diversity ratio of students in different programs.

IV. Program Improvements

The programs under evaluation are in conformity with the standards of the discipline. The following recommendations aim at maintaining or increasing the level of quality already achieved by the programs.

Recommendation #1: Emphasize and enforce the processes of Academic integrity in courses taught by part-time faculty.

Recommendation #2: Hire teaching intensive faculty in-lieu of part-time faculty dependency.

Recommendation #3: Address the issue of the shortage of French-speaking faculty.

Recommendation #4: Laboratory resources, particularly software and hardware access for specialized courses, should be reviewed.

Recommendation #5: Define a practical double major with Mathematics by disambiguating course exclusions and pre-requisites. Likewise, agree on the composition of a Minor in Computer Science for Science students.

Recommendation #6: Enhance the quality of formative feedback in assignments and laboratories where needed.

Recommendation #7: Replacement of retirees.

Recommendation #8: More recruitment efforts for domestic graduate students and improved scholarship levels.

Recommendation #9: Build on the success of Hub350 to produce direct research funding and scholarship opportunities for students in addition to experiential learning.

Recommendation #10: Find a balance in graduate course enrolments so as to address the imbalance in enrolment numbers.

Recommendation #11: Ensure that leadership for specializations is clearly identified and that topics such as Entrepreneurship or Data Science are reviewed and improved on a continual basis.

V. Action Plan

The program leadership agrees with the recommendations of the external evaluation. The actions to be undertaken are clearly detailed and their chronology well indicated. These actions also have the support of the Dean's office. The SCEUP committee underlines that recommendation 10 (Find a balance in graduate course enrolments so as to address the imbalance in enrolment numbers) does not apply to the evaluation of an undergraduate program.

VI. Conclusion

In the view of the external evaluators, the programs evaluated are of very high quality and meet the standards of the discipline, as evidenced by their accreditations, the level of student satisfaction, and the increasing number of applications. The main strengths of these programs are the level of diversification of options and specializations offered, their bilingualism, their location in the nation's capital, and the excellence of the faculty and support staff. The major challenges facing these programs are in fact the result of their great popularity, and management is aware of them and has developed a sound action plan to overcome them.

Considering this positive assessment, the committee members would like to thank all participants for the evaluation of the programs. They congratulate the unit on the rigour of the work

accomplished and on the quality of the self-study report, as well as that of the report produced by the external reviewers.

Schedule and Timelines

A progress report that outlines the completed actions and subsequent results will be submitted to the evaluation committee by December 15, 2024.

The next cyclical review will take place in no more than eight years, in 2027-2028. The self-study brief must be submitted no later than June 15, 2027.

Unit Response and Action Plan

Faculty:

- Engineering

Programs evaluated:

- Honours BSc with Specialization in Computer Science
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- Joint Honours BSc in Computer Science and Mathematics
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- Major in Computer Science

Cyclical review period:

- 2020-2021

Date:

- May 2, 2022

Notes:

- **This document is submitted to the Senate, as well as the Quality Council, and will be published on the University Web site.**

General comments:

On April 20, 2022, the Computer Science undergraduate program was made aware of the External Review Report produced in the context of the cyclical program evaluation. We were very pleased with the positive evaluation of our program. Given that the Computer Science program has committed to providing an outstanding training experience, we were gratified to see that the external reviewers found that our “programs are well designed”, that “the programs are well supported and successful” and that “Strong researchers, popular courses, along with a variety of program specializations are the strongest assets”. The report makes 11 recommendations, of which 3 are considered high priority. We take all the recommendations seriously and feel confident that by addressing them, our undergraduate program will be even stronger. The recommendations and our response, produced by both the unit and the Faculty, are included below.

Recommendation 1: Emphasize and enforce the processes of Academic integrity in courses taught by part-time faculty. (Presented as **high** priority.)

Unit response: [AGREED TO UNCONDITIONALLY] Academic integrity is taken very seriously by the Faculty and uOttawa. In 2022, uOttawa joined the few institutions in Ontario that have mandatory training in academic integrity for all incoming students. Next year, the program will benefit from the lessons learned this year and offer even more engaging and efficient training. In addition, significant content was recently created by uOttawa for professors to support academic integrity in the classroom (<https://www2.uottawa.ca/about-us/provost/academic-integrity/professor>), and an institution-based licence for fraud detection software Ouriginal was purchased (in addition to MOSS already used at the Faculty), so that every student and professor in every course can access it. Finally, with teaching and final exams expected to return to in-person mode starting from September 2022, issues with academic integrity should remain under control. That said, the Recommendation directly points to a training or information gap regarding academic integrity when it comes to part-time professors. Created in 2019 by the Vice-Dean, Undergraduate Studies, the Professor Handbook is a useful and regularly updated document for existing and new professors at the Faculty, and highlights the expectations from the professors regarding course delivery and the resources available. In particular, it has a section on academic integrity and details how to handle and report academic fraud cases, consistent with University Regulations. Therefore, it is critical that newly hired part-time professors be made aware of the document. This needs to be done by the individual doing the hiring for the School, because this is the first person in contact with the new part-time professors and serves as contact person between the Faculty and the professors. Should issues arise, at least one representative of the part-time professors is present at School Council and Faculty Council meetings so that questions can be answered.

Decanal response: I agree with the Unit response

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|---------------|-----------------------|--------------------|
| 1 | Ensure that the person hiring new part-time professors for the School shares and points to the Professor Handbook as an important reference to get familiar with academic integrity expectations and resources. | EECS Director | Summer 2022 (Ongoing) | Not anticipated |
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* PRIORITY LEVEL: 1. URGENT-IMMEDIATE ACTION REQUIRED 2. IMPORTANT-ACTION REQUIRED WITHIN 18 MONTHS (MAXIMUM) 3. ADVISED: DEVELOPMENT AND STRATEGY-ACTION TO BE DISCUSSED AND MUST BE IN PLACE BY MID-CYCLE (WITHIN 4 YEARS)

Recommendation 2: Hire teaching intensive faculty in-lieu of part-time faculty dependency. (Presented as **high** priority.)

Unit response: [AGREED TO UNCONDITIONALLY] This has been pursued by our Faculty vigorously for many, many years, but it has never been approved by the APUO. We have been forced to settle for long-term appointment (LTA) positions instead.

Decanal response: I agree with the Unit response. The collective agreement of the APUO does not allow for teaching intensive positions, the only possibility is to increase the number of long-term appointment contracts with our best part-time professors when such positions become available.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|---------------------------------------|--------------------|--------------------|
| 1 | Continue to lobby for the creation of tenure-stream teaching-intensive positions at University of Ottawa. | Dean of Engineering, Jacques Beauvais | May 2022 (Ongoing) | Not anticipated |
| 1 | If the previous action remains unsuccessful, then continue to lobby for additional LTA positions (within the Faculty, and specifically within our unit). Explore the possibility of converting some of our current excellent part-time or replacement professors to LTA professors. | Dean of Engineering, Jacques Beauvais | May 2022 (Ongoing) | |
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Recommendation 3: Address the issue of the shortage of French-speaking faculty. (Presented as **high** priority.)

Unit response: [AGREED TO UNCONDITIONALLY] This has been pursued vigorously for several years, but the senior administration of the university needs to approve additional hiring and additional office & lab space for the new professors. More French-speaking professors are needed if we are to achieve the goal of having all our programs within the Faculty fully bilingual. We have been forced to settle for part-time professors, but finding qualified part-time faculty with a Ph.D. to teach in French is an ongoing challenge.

Decanal response At this time, it is particularly challenging to find and recruit top candidates in this field, with or without the required competency in French in order to complement the existing group of bilingual professors. It remains critical that when positions become available, the unit must prioritize bilingual candidates after using all means at their disposal, including their personal networks, to attract such candidates.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|--|-----------------------|--------------------|
| 1 | Continue to lobby for additional French (or fully bilingual) professorial positions (within the Faculty, and specifically within our unit). | Dean of Engineering, Jacques Beauvais, and Provost and Vice-President, Academic Affairs, Jill Scott | May 2022 (Ongoing) | Not anticipated |
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Recommendation 4: Laboratory resources, particularly software and hardware access for specialized courses, should be reviewed. (Presented as **medium** priority.)

Unit response: [AGREED TO IF ADDITIONAL RESOURCES PERMIT] The Recommendation says that “Dedicated resources for Computer Science programs are required for the successful delivery and enhanced student experience.” While this is undoubtedly true, the IT team in the Faculty of Engineering has done an excellent job in acquiring / managing hardware and software resources that can meet the needs of all our programs. Furthermore, professors are asked to submit a list of any special hardware or software requirements for their courses prior to the start of every semester.

Decanal response I agree with the Unit response. It is also necessary for the unit to prioritize the software being used and to harmonize as much as possible the wide spectrum of tools in order to focus on the best dedicated resources. Several actions are currently under way, including the AnyWare project, to provide improved cloud platforms to ensure that all students have optimized access to the laboratory resources.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|--|--------------------------------------|--------------------|
| 2 | Review the laboratory needs of the Computer Science programs to assess whether any specific courses could benefit from specialized hardware or software resources. If so, meet with the Finance team of the Faculty to negotiate budgetary support for any required purchases or licenses. | Director, Information Technology, Lucien Levreault, and CSI professors that teach resource-intensive CSI courses/labs, and Chief Administrative Officer of the Faculty, Silvana Gandolfini | Complete the assessment by July 2023 | Not anticipated |
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Recommendation 5: Define a practical double major with Mathematics by disambiguating course exclusions and pre-requisites. Likewise, agree on the composition of a Minor in Computer Science for Science students. (Presented as **medium** priority.)

Unit response: [AGREED TO IN PRINCIPLE] This would definitely benefit our students and reduce the workload of our undergraduate program Academic Officers. (There are several cases where one course is required in another program, a different course is required in our program, and the two courses cannot be combined for units because they cover similar material but at different levels. Thus, students that switch from the other program to our program need to take the similar course and cannot count the first course.) As stated in the Recommendation, however, achieving this requires agreement/action from other academic units (which may have little motivation to make such changes since the changes will not affect their students).

Decanal response The associate director must also work with the Faculty Vice-Dean Undergraduate Studies to determine the feasibility.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|--|---|--|
| 2 | Initiate/continue/intensify discussions of appropriate course exclusions and prerequisites with the other units (to simplify program transfers and to specify a Minor in Computer Science for Science students). | Associate Director, Computer Science, Carlisle Adams, and Academic Officer, Undergraduate Office, Chantale Morasse (or one of her team), and An academic officer from the undergraduate office in the Faculty of Science | Complete a proposal for program requirements by July 2023 | Potentially (in the Faculty of Science, or in the Faculty of Engineering, or both) |
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Recommendation 6: Enhance the quality of formative feedback in assignments and laboratories where needed. (Presented as **medium** priority.)

Unit response: [AGREED TO UNCONDITIONALLY] We do have training material for new TAs, as well as an established process for (formally and informally) evaluating the performance of a TA. We also award a prize annually for the best teaching assistant in the Faculty (to motivate good TA practices). However, as indicated by this Recommendation, more can be done to ensure that TAs provide helpful feedback to their students.

Decanal response I agree with the Unit response.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|--|---|--------------------|
| 1 | Training in the area of formative feedback must be extended and emphasized so that TAs are more aware of the quality of feedback expected. | EECS Assistant to the Director, Lisa Ursaki (to ensure that before a TA contract is signed, the candidate TA at least completes TA training from TLSS) | The requirements and process can be developed over the summer (to be ready for first delivery in Fall 2022) | Not anticipated |
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Recommendation 7: Replacement of retiree. (Presented as **medium** priority.)

Unit response: [AGREED TO UNCONDITIONALLY] Whether or not retirement is actively encouraged, there must be a commitment to replace professors that do retire. Losing positions has a detrimental effect on the quality of our programs (as well as on the research output of the remaining professors who then need to teach more).

Decanal response General considerations for professor allocations include alignment with the strategic plan of the University and the Faculty, research priorities, SMA3, compliance, program support, EDI and bilingualism. The Unit must prioritize its requests and ensure that over time, faculty renewal aligns with these general and strategic considerations overall, and as indicated, program support in particular. The programs themselves continue to evolve and new faculty positions must be prioritize in areas that reflect this evolution in needed expertise.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|--|-----------------------|--------------------|
| 1 | Continue to lobby for replacement positions (within the Faculty, and specifically within our unit) when we lose professors through retirement. | Dean of Engineering, Jacques Beauvais, and Provost and Vice-President, Academic Affairs, Jill Scott | May 2022 (Ongoing) | Not anticipated |
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Recommendation 8: More recruitment efforts for domestic graduate students and improved scholarship levels. (Presented as **medium** priority.)

Unit response: [AGREED TO UNCONDITIONALLY] This has been pursued for some time, but perhaps most extensively in the last few years. We have introduced an “accelerated Master’s” program for our undergrad CS students, as well as scholarships that cover tuition for students with a sufficiently high CGPA. We also have a pool of money called the “merit fund” which is used to provide Master’s students with a CGPA of 9.0 and above an amount of \$7500 (if they do not otherwise receive a scholarship).

However, as indicated by this Recommendation, more can be done to encourage domestic students to enroll in our graduate programs.

Decanal response Continued engagement of the professors in the unit remains essential in all recruitment activities, through leadership roles, through their engagement with excellent undergraduate students and through promoting their research activities in their undergraduate courses. The University of Ottawa has one of the most generous scholarship programs in Canada, and increased funding must be sought out by the professors, including industry partnerships, to develop strong and attractive scholarship programs for the students. Increased use of Mitacs scholarships with industry and government partners is also an avenue that is under-utilized in order to attract students to graduate programs.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|---|---|--------------------|
| 1 | Provide more extensive advertising of the accelerated Master’s and the graduate scholarship opportunities to upper-year undergraduate students. | Marketing and Communications Manager, Marcelle Kimberley, and Vice-Dean, Undergraduate Studies, Michel Labrosse | Advertising material can be developed over the summer (to be ready for first delivery in Fall 2022) | Not anticipated |
| 1 | Promote the UROP (Undergraduate Research Opportunity Program) to get undergraduate students interested in research during their 3 rd and 4 th years. | Marketing and Communications Manager, Marcelle Kimberley, and Vice-Dean, Undergraduate Studies, Michel Labrosse | Advertising material can be developed over the summer (to be ready for first delivery in Fall 2022) | Not anticipated |

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| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|---|---|-----------------------|--------------------|
| 1 | Increase the amount of scholarship money available and consider opening the merit fund to students with a CGPA of 8.0 and above (so that more students are able to obtain these funds). | Chief Administrative Officer of the Faculty, Silvana Gandolfini, and Director, Stakeholder Engagement (STEM), Heather Howes | August 2022 (Ongoing) | Not anticipated |

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Recommendation 9: Build on the success of Hub350 to produce direct research funding and scholarship opportunities for students in addition to experiential learning. (Presented as **medium** priority.)

Unit response: [AGREED TO UNCONDITIONALLY] The Hub350 initiative is still a relatively recent effort, but there is good potential to leverage it for research funding and student scholarships.

Decanal response Direct and increased engagement of the professors from the unit is essential for increasing research funding and scholarship opportunities for students, including Mitacs and other sources of funding. The main responsibility for increasing research funding lies directly with the unit professors rather than with External Relations (Stakeholder Engagement) which plays a supporting role. There are considerable sources of funding available through NSERC Alliance grants and Mitacs grants, and a significantly increased level of engagement by professors with external organizations is vital to develop these opportunities. Finalizing one new funding commitment by July 2023, as indicated in the Timeline below, is thus a primary responsibility of the professors.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|--|---|--------------------|
| 2 | Engage with Hub350 participants (and with the Kanata North high-tech park generally) to secure funding for scholarships and for research activities. | Director, Stakeholder Engagement (STEM), Heather Howes | Finalize at least one new funding commitment by July 2023 | Not anticipated |
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Recommendation 10: Find a balance in graduate course enrolments so as to address the imbalance in enrolment numbers. (Presented as **low** priority.)

Unit response: [AGREED TO IN PRINCIPLE] Achieving a better balance in enrolment numbers across our graduate courses is a laudable goal (at the very least, to ensure that all students have equal access to all the courses they wish to take). However, we recognize that it is unavoidable that some courses (e.g., on the latest “hot topics” or by the most popular professors) will be in higher demand than other courses, regardless of “marketing” and content upgrades. However, we do cancel courses if enrolment is too low, split courses into multiple sections if enrolment is too high, and allow our students to register for graduate courses offered at Carleton University (and Carleton students to register for our graduate courses) – these measures help to balance the enrolment numbers to some extent.

Decanal response I agree.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|-------------|----------|--------------------|
| N/A | Not applicable (N/A): this Recommendation is about graduate course enrolments, which is effectively out-of-scope for an action/implementation plan that is intended to respond to an undergraduate program evaluation. | N/A | N/A | N/A |
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Recommendation 11: Ensures that leadership for specializations is clearly identified and that topics such as Entrepreneurship or Data Science are reviewed and improved on a continual basis. (Presented as **low** priority.)

Unit response: [AGREED TO IF ADDITIONAL RESOURCES PERMIT] It is true that some of our long-established programs (such as the Management and Entrepreneurship option) no longer have a clearly identified “leader” (i.e., a professor who is “in charge” of the program and available to respond to program-related questions from students or others). There is an Associate Director for Computer Science, but there is not an individual professor named for every option and specialization. Such a “leader” has not been seen as necessary (except for new programs – Data Science, for example – which are expected to receive many queries in the first few years).

If resources permit, we can designate a professorial “leader” for each program option and specialization. It is important to note, however, that the Academic Officers in the Undergraduate Office are very knowledgeable about all the program variations and are typically the first point-of-contact for students that wish to learn more about any specific program type.

Decanal response Agree in principle with the unit response.

| Priority Level* | Actions to be undertaken | Assigned to | Timeline | Curriculum change? |
|-----------------|--|--|-----------------------------------|--------------------|
| 3 | Monitor program inquiries by students and other interested parties to determine if professorial “leaders” are warranted. | Associate Director, Computer Science, Carlisle Adams, and Academic Officer, Undergraduate Office, Chantale Morasse | Make a determination by July 2025 | Not anticipated |
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