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# **PROGRAM QUALITY ASSURANCE COMMITTEE (PQAC)**

# **CYCLICAL REVIEW - FINAL ASSESSMENT REPORT & IMPLEMENTATION PLAN**

**January 28, 2015**

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| **DEGREE PROGRAMS BEING REVIEWED** | **BA in Computing Systems****BSc in Computing Systems****BA Joint Major in Computing Systems****BSc Joint Major in Computing Systems****BA Joint Major in Information Systems****BSc Joint Major in Information Systems****BSc in Computing Systems and Physics** |
| **DEPARTMENT RESPONSIBLE** | **Computing and Information Systems** |
| **EXTERNAL REVIEWERS** | **Dr. Michael Bauer, University of Western****Dr. Christie Eziefe, University of Windsor** |
| **INTERNAL REPRESENTATIVE** | **Dr. Raul Ponce-Hernandez, Trent University** |
| **DATE OF REVIEW VISIT** | **April 9-10, 2014** |

**SUMMARY**

*This Final Assessment Report (FAR), in accordance with Trent University’s Institutional Quality Assurance Policy (IQAP), provides a synthesis of the cyclical review of the undergraduate degree programs. The report considers four evaluation documents: the Program’s Self-Study, the External Reviewers’ Report, the Program Response, and the Decanal Response. A summary of the review process is as follows: the academic unit(s) is responsible for completing a self-study which encompasses all degree programs under review. The self-study addresses all components of the evaluation criteria as outlined in Trent’s IQAP. Appendices will include the course outlines in each of the degree programs and CVs for full-time faculty members teaching in the degree programs. Qualified external reviewers are invited to conduct a review of the degree programs which involves a review of all relevant documentation (self-study, appendices, IQAP), and participating in a university site visit. During the site visit reviewers meet with the Provost and Vice President Academic, relevant Dean(s), the Chair and or Director of the degree program(s), full- and part-time faculty, support staff and students. Once the external reviewers’ report is received both the program and dean provide responses to the report.*

*The Program Quality Assurance Committee (PQAC) reviews and assesses the quality of the degree programs based on the four review documents and reports on significant program strengths, opportunities for improvement and enhancement, and the implementation of recommendations. The Final Assessment Report (FAR), prepared by PQAC will include an Implementation Plan which identifies those recommendations selected for implementation, and will specify: proposed follow-up, who is responsible for leading the follow-up, and the timeline for addressing the recommendation.*

During the academic year 2013-2014, the Department of Computing and Information Systems completed a review of the BSc and BA in Computing Systems, the BA and BSc Joint Major in Computing Systems, the BA and BSc Joint Major in Information Systems, and the BSc in Computing Systems & Physics. Two arm’s-length external reviewers (Dr. Michael Bauer, University of Western; Dr. Christie Eziefe, University of Windsor) and one internal member (Dr. Raul Ponce-Hernandez) were invited to review the self-study documentation and then conducted a site visit to the university on April 9-10, 2014.

PQAC concurs with the reviewers that the offerings of the Computing and Information Systems are both complex and difficult to understand. The reviewers also commented that ‘There are too many (21 in counting) programs being offered.’ Currently PQAC notes that the following degree programs are offered:

Degree Offerings

* BA/BSc in Computing Systems (Honours/General)
* BA/BSc Joint-Major in Computing Systems (Honours/General)
* BA/BSc Joint-Major in Information Systems (Honours/General)
* BA/BSc Joint-Major Computing Studies (General) \*
* BSc Computing Systems & Physics (Honours)
* BSc Mathematical Computer Science *(reviewed with mathematical degrees)*

Specializations are available in: Computer Science, High Performance Computing, and Software Engineering.

 Minors are available in: Computing Systems, Information Systems, and Computer Studies.

 *Notes:*

*\* The* BA/BSc Joint-Major Computing Studies (General) was *discontinued in September 2008. The Department*

*did try to re-introduce the program however the Ontario University Council on Quality Assurance did not allow this. 2014-2105 is the final year of offering.*

The review committee ‘was extremely impressed with the teaching of the faculty … The full-time faculty are very dedicated to ensuring that the program is of high quality and, most importantly, that students receive a high quality education and have a very positive experience. Both the full-time and part-time faculty are passionate about their students and the education they provide. COIS has a dedicated team of instructors who truly care about the education experience of students. The degree of contact and interaction between students and instructors is ‘one of the distinctive features of the program.’

During their visit reviewers noted that it was evident that students are highly satisfied with the ‘delivery of the programs and ‘the strong commitment to their learning, the helpful and welcoming environment provided by the department.’

Reviewers noted that ‘the number of faculty in COIS is at a level which is precarious.’ This is a serious concern, apart from the need for additional program(ming) to ensure high quality, relevant computing programs. Without an increase in full time faculty complement, it is difficult to see how the Program can carry out its interdisciplinary educational mandate with quality and completeness that is consistent with the institution's mission and academic plans. The Department needs to be seriously considering succession planning in alignment with the long term plan and vision of the Department and University.’

The Dean fully supports the reviewers, ‘the Department of Computing and Information Systems (COIS) is at a crossroads … the department manages to maintain and offer a rather large variety of degrees. Added to the multitude of degree options is a significant increase in both students enrolled in COIS courses and student majors.’ Strategic decisions must be made ‘to put COIS on the path to a sustainable future. This can be accomplished by a de-cluttering and streamlining of the curriculum with the goal to give the program a distinctive direction and focus. The department should better differentiate its various degrees from each other and make individual degrees more distinct.’

PQAC noted that the department continues to try to offer curriculum in many areas of computing systems, science, and information while faculty resources decrease. Reviewers commented on the lack of depth and breadth in some areas which suggests that the department may be trying to do too much with too little. The Department needs to make some difficult and important decisions on the future of degree program offerings and consider focussing on one or two specialty areas. A strategic plan needs to be developed ‘to put COIS on the path to a sustainable future’ with a focus on offering quality degree programs with current faculty resources.

**SIGNIFICANT PROGRAM STRENGTHS**

* The quality of the instruction provided by the faculty.
* The dedication of the faculty and staff to ensuring quality instruction and support of the students.
* Students feel very positive about the program and the faculty; they feel that they are receiving a quality education. This is especially true for transfer students.
* COIS courses generally have very healthy enrolment which indicates greater impact across students in other programs in the University.
* Strong relationships and pathways with Ontario Colleges and for College transfers. ‘Tremendous success attracting college students through those agreements.
* Promoting interdisciplinary studies throughout program content.
* Students wishing to pursue a BA are supported through the multi-disciplinary aspect of the program goals.

**OPPORTUNITIES FOR PROGRAM IMPROVEMENT AND ENHANCEMENT**

* Reviewers noted that the department could strengthen the program and meet the Association for Computing Machinery (one of the original organizations for computer science) curriculum requirements through the addition of courses in Algorithm, Theory of Computation, Compiler construction, operating systems, and systems programming.
* The Department can enhance student experiential learning through the introduction of a final year project for all Honours students as well as broadening the internship education program.
* There is an opportunity to enhance the program by establishing synergies or developing new collaborations with other academic units within the university or with colleges in the fields of: geomatics, Geographical Information Systems, remote sensing and image processing, and visualization. It is important to offer fields of study that are both current and expanding in the area of computing technology.

* Data analytics is becoming an increasingly important inter disciplinary area combining Computer Science and Statistics with many other disciplines. A core set of courses in data analytics could form a useful minor that would be attractive to students in many other Departments in Science, Business and Social Sciences.
* Reviewers noted that internship programs could increase the practical experiences for students in computer science.
* The reviewers noted possible ‘opportunities for the Department to work more closely with the IT Department,

e.g. to provide access to large servers (e.g. Unix systems), and to more effectively make use of general computing labs within the University.’

* Reviewers noted that the department is ‘fortunate to have a pool of part-time instructors. These are dedicated individuals who contribute to the overall health of the department and the quality of the programs – they believe in the Department and the University. They are involved in a variety of community outreach activities which contribute to the University’s visibility. They bring “real world” experience to the courses they teach and provide additional experience and viewpoints to the students and the students appreciate the expertise they bring.’
* The expertise of part-time faculty who are ‘actively engaged in the local business community’ is an opportunity to involve students in community projects.

**COMPLETE LIST OF RECOMMENDATIONS**

Recommendations 1 through 13 were presented by the External Reviewers. PQAC made one additional recommendation – Recommendation 14.

**Recommendation 1**

**That the program streamline curriculum by deleting some programs and restructuring of others:**

**a) Discontinue Joint General Programs due to inadequate coverage of depth and breadth of Computer Science.**

**b) Discontinue the BSc Computing Systems & Physics (Honours) due to low enrolment.**

**c) Replace the BA and BSc Computing Systems Honours degrees and specialization options with the following:**

* **BSc Computing Systems with Specialization in Computer Science (Honours)**
* **BSc Computing Systems with Specialization in Software Engineering (Honours)**
* ***Note: BA Single Major Option in Computing Systems, non-specialized BSc Honours in Computing Systems, and the Specialization in High Performance Computing would be discontinued.***

**Recommendation 2**

**That 4 tenure track faculty members and 1 lab instructor be recruited immediately to address the shortage.**

**Recommendation 3**

**That the Department: provide a course in Java or C++ programming; revise the title of the systems programming course to reflect the ‘language C’; for full coverage offer a second course in C programming; and, consider offering a course in Compiler construction and functional programming language.**

**Recommendation 4**

**That a 4th year Honours Project be included in the curricula of the single-major programs to involve students in experiential engagement in designing, implementing, researching and the evaluation of existing systems and identifying areas for future improvement of real or prototype systems.**

**Recommendation 5**

**That a cooperative (coop) education or internship program be introduced in the curricula so as to increase skills and experiential training in industry.**

**Recommendation 6**

**That courses in Computer Ethics and Professional and Technical Writing be added to the curricula in order to further fulfill the UUDLES requirements. At least one tenure track faculty with expertise in relevant areas of Information Systems would be required.**

**Recommendation 7**

**That admission requirements for the programs include a recommendation for high school Calculus and Vectors, Advanced functions so students coming into the program can better handle the Math requirements.**

**Recommendation 8**

**That additional space be allocated for offices, graduate student work and laboratories, ideally located in close proximity to the COIS departmental office.**

**Recommendation 9**

**That undergraduate students be encouraged to revive the Student Computer Science Society in order to promote a sense of community, support and belonging among each other.**

**Recommendation 10**

**That the COIS program engage relevant academic units (GEOG, ERS, BIOL, ARCH) in the university to examine complementary curriculum content, and future common curricular content, in the generic field of Geomatics, , GIS, remote sensing and image processing, and visualization.**

**Recommendation 11**

**That a single-major BA and BSc Honours Program in Information Systems be considered for development.**

**Recommendation 12**

**That a New Minor Program in Data Analytics be developed to address the growing importance of data analytics, to support interdisciplinary education and research, and existing expertise in the Department of COIS.**

**Recommendation 13**

**That the University administration facilitate a 3 to 4 year Equipment Maintenance Plan for the periodic replacement of equipment in computer labs and offices.**

**Recommendation 14**

*PQAC noted a number of recommendations referenced: revisions to curriculum (Rec #3, 4, 5, 6); requests for additional faculty (Rec #2, 6); and, developing new degree programs and minors or discontinuing degree programs or specializations (Rec #1, 10, 11, 12). Based on this observation, PQAC recommended:*

***That the department develop a plan for the future direction of computing. The plan should focus on offering quality degree programs with current faculty resources. The plan should:***

* ***simplify degree offerings which may include developing new degree programs or discontinuing existing degree programs;***
* ***determine what specializations and minors will be offered;***
* ***address the reviewers’ concerns with respect to the lack of depth and breadth in specific degree programs;***
* ***work within boundaries/limitations of current faculty resources in planning curriculum and degree offerings.***

**IMPLEMENTATION PLAN**

**\*** *The applicable Dean, in consultation with the Department Chair shall be responsible for monitoring the Implementation Plan. The reporting date(s) for submitting a follow-up Implementation Report is indicated below and is the responsibility of the Department in consultation with the Dean.*

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| Recommendation | Proposed Follow-UpIf no follow-up is recommended please clearly indicate ‘*No follow up report is required*’ and provide rationale. | Responsibility for Leading Follow-Up \* | Timeline for Addressing Recommendation |
| Recommendation 1That the program streamline curriculum by deleting some programs and restructuring of others: a) Discontinue Joint General Programs due to inadequate coverage of depth and breadth of Computer Science. b) Discontinue the BSc Computing Systems & Physics (Honours) due to low enrolment.c) Replace the BA and BSc Computing Systems Honours degrees and specialization options with the following: * BSc Computing Systems with Specialization in Computer Science (Honours)
* BSc Computing Systems with Specialization in Software Engineering (Honours)
 | *See Recommendation 14.*Responses to this recommendation should be included and addressed in the program’s response to Recommendation 14. PQAC noted that: (a) joint programs are unique to Trent; (b) there is student demand for a BA option, and; (c) discontinuing some of the program options may not be favourable for students entering via existing articulation agreements. | Chair - COIS Dean - Science  | Implementation DateSeptember 2016 Implementation ReportDue October 1, 2015  |
| Recommendation 2That 4 tenure track faculty members and 1 lab instructor be recruited immediately to address the shortage. | *See Recommendation 14.*Responses to this recommendation should be included and addressed in the program’s response to Recommendation 14. Tenure-Track Appointments*PQAC acknowledges that there are discipline-specific needs in the areas of faculty appointments that should be recognized in related future discussions. When budgets allow, additional tenure-track positions should be approved to enhance the faculty complement.*  | Dean - ScienceProvost | Implementation ReportDue October 1, 2015  |
| Recommendation 3That the Department: provide a course in Java or C++ programming; revise the title of the systems programming course to reflect the ‘language C’; for full coverage offer a second course in C programming; and, consider offering a course in Compiler construction and functional programming language. | The Department has indicated that it is planning on making changes.   | Chair - COIS | Implementation DateSeptember 2016 Implementation ReportDue October 1, 2015 |
| Recommendation 4That a 4th year Honours Project be included in the curricula of the single-major programs to involve students in experiential engagement in designing, implementing, researching and the evaluation of existing systems and identifying areas for future improvement of real or prototype systems.  | PQAC would like a report on the 4th year Honours project. How many students interested? How many enrolled? Reviewers indicated that this would only be possible with at least 3 or more tenure track faculty; PQAC requests that the program comments on this. | Chair - COIS | Implementation DateSeptember 2016 Implementation ReportDue October 1, 2015 |
| Recommendation 5That a cooperative (coop) education or internship program be introduced in the curricula so as to increase skills and experiential training in industry.  | The Department does have internship projects. The Dean recommended that the department continue to evolve its internship project courses with current resources. The report should indicate how the internship program is doing, and include enrolment numbers. | Chair - COIS | Implementation ReportDue October 1, 2015 |
| Recommendation 6That courses in Computer Ethics and Professional and Technical Writing be added to the curricula in order to further fulfill the UUDLES requirements. At least one tenure track faculty with expertise in relevant areas of Information Systems would be required. | PQAC recommends that the Dean discuss, with the Chairs, the possibility of developing a general writing course for science students.  | Dean - Science | Implementation ReportDue October 1, 2015 |
| Recommendation 7That admission requirements for the programs include a recommendation for high school Calculus and Vectors, Advanced functions so students coming into the program can better handle the Math requirements. |  | Chair - COISDean - Science | Implementation ReportDue October 1, 2015 |
| Recommendation 8That additional space be allocated for offices, graduate student work and laboratories, ideally located in close proximity to the COIS departmental office. | No follow up report is required.PQAC suggests that the department discuss the feasibility of using centrally maintained computer labs for teaching with IT. |   |   |
| Recommendation 9That undergraduate students be encouraged to revive the Student Computer Science Society in order to promote a sense of community, support and belonging among each other.  | No follow up report is necessary. |  |  |
| Recommendation 10That the COIS program engage relevant academic units (GEOG, ERS, BIOL, ARCH) in the university to examine complementary curriculum content, and future common curricular content, in the generic field of Geomatics, , GIS, remote sensing and image processing, and visualization.  | No follow up report is necessary.The department does currently collaborate with other academic units. |  |  |
| Recommendation 11That a single-major BA and BSc Honours Program in Information Systems be considered for development.  | See Recommendation 14Responses to this recommendation should be included and addressed in the program’s response to Recommendation 14.  | Chair - COISDean - Science | Implementation DateSeptember 2016 Implementation ReportDue October 1, 2015  |
| Recommendation 12That a New Minor Program in Data Analytics be developed to address the growing importance of data analytics, to support interdisciplinary education and research, and existing expertise in the Department of COIS. | *No follow up report is required.*Minor has been developed and will be made available to students. |  |  |
| Recommendation 13That the University administration facilitate a 3 to 4 year Equipment Maintenance Plan for the periodic replacement of equipment in computer labs and offices.  | *No follow up report is required.*PQAC suggests discussing this with the Dean. |  |  |
| Recommendation 14That the department develop a plan for the future direction of computing. The plan should focus on offering quality degree programs with current faculty resources. The plan should:* simplify degree offerings which may include developing new degree programs or discontinuing existing degree programs;
* determine what specializations and minors will be offered;
* address the reviewers’ concerns with respect to the lack of depth and breadth in specific degree programs;
* work within boundaries/limitations of current faculty resources in planning curriculum and degree offerings.
 | The Department should work closely with the Dean with respect to curriculum, new degree programs, and faculty resources. | Chair - COISDean - Science  | Implementation DateSeptember 2016 Implementation ReportDue October 1, 2015 |