

## Chemistry, Undergraduate and Graduate Program

### Cyclical Program Review – 2005 - 2013

#### Final Assessment Report and Implementation Plan

Reported to Joint-Committee on Quality Assurance: April 18, 2016

#### Program Description

The Department of Chemistry offers the following programs: BSc Chemistry (90 credits), Honours Major BSc Chemistry (standalone, combined with another science Major or combined with a Minor in one of forty subjects), Specialized Honours BSc Chemistry, Specialized Honours BSc Chemistry – Pharmaceutical and Biological Chemistry Stream, and Specialized Honours BSc Biochemistry.

The Graduate Program in Chemistry offers two degrees: MSc and PhD. These programs have been in existence since 1965. The master's program offers a Master's degree by Research Thesis and the possibility of obtaining a Master's Degree by course work. The Master's by course work option is primarily designed for chemists who are working in industry or government and wish to upgrade their chemical expertise and is offered as a part-time program only.

Program	Accepts 2014	Enrolment FTES 2014	Degrees Awarded 2014
BSc	179	478	Hons 19; 90-credit 33
Master's	19	27	7
Doctorate	5	28	9

#### Reviewers appointed by the Vice-Provost Academic:

Dr. John F. Honek, Professor, Department of Chemistry, University of Waterloo

Dr. Dietmar Kennepohl, Professor, Department of Chemistry, Athabasca University

Dr. Michael De Robertis, Professor, York University, Department of Physics and Astronomy

**Site Visit:** June 25 and 26, 2015

The reviewers met with Alice Pitt, Vice-Provost Academic, Barbara Crow, Interim Dean and Associate Dean, Faculty of Science, Professor Janse Van Rensburg. In addition they met with the Chemistry Chair, M. Yousaf, the acting Chair, Don Hastie, the Graduate Program Director, Gino Lavoie and the Undergraduate Program Director, Pierre Potvin. There was an opportunity to meet with Faculty members from the Chemistry Department, graduate and undergraduate students, Research Associates and several staff members and technicians.

The self-study document provided to the reviewers was informed by a student survey, enrolment data provided by the Office of Institutional Planning and Analysis, and a program retreat involving students, faculty, and technical and office staff. Included in the discussion were recommendations from previous program review and progress made towards addressing these recommendations. In addition, the reviewers were provided with an agenda of concerns from the Dean of the Faculty.

**Outcome:** The Joint-Committee on Quality Assurance concluded that the Decanal response adequately addressed the review recommendations. Progress on the recommendations will be included in the Follow-up Report due October 31, 2017. The next Cyclical Program Review will begin in September 2021.



## **Strengths:**

The suite of undergraduate programs provides good opportunities for students who wish to pursue various pathways. Many students currently in the graduate program completed the Specialized Honours program at York. Other programs prepare students for further studies in the area of medicine or provide the opportunity to combine chemistry with another field.

Program flexibility at the master's level meets the needs of professional development for those working in industry and government as well as those seeking to build research expertise for advanced study and research careers in government and industry. The PhD program emphasizes development of teaching skills in addition to strong theoretical knowledge and advanced research skills. The "the vast majority of graduate students ... have had published their research as peer-reviewed articles" (self-study), including in high ranking journals.

Graduates are employed in a variety of relevant professional and academic settings or move on to undertake further study, including post-doctoral fellowships.

The MSc (thesis) and the PhD provide laboratory-based activities, are research-intensive, and ensure active supervision throughout the course of study. Learning outcomes, for the most part, are aligned with degree and program expectations and with course requirements and appropriate evaluations.

Faculty members' research interests span a wide area of Chemical Sciences, and all supervise at least one graduate student. The review committee report found "strong evidence of novel discovery" as well as evidence of a "strong research output by faculty" based on grants, publications and patent applications.

Laboratory facilities are extensive and well-equipped for a variety of research activities.

## **Opportunities for Enhancement:**

The self-studies for the graduate and undergraduate programs and the review committee report identified opportunities for enhancement that were highly aligned. The review committee report provided a fulsome discussion of all aspects of the programs and the 'life of the Department' with observations and suggestions. A summary of recommendations for all programs was organized into four categories with several recommendations in each category. The overarching structure is reproduced below along with selected recommendations:

1. Enhancing the student experience:
  - a. Encourage social activities to build a sense of community
  - b. Guide and improve TA performance
  - c. Increase student opportunities for professional development and soft skills
2. Enhancing teaching and learning:
  - a. Consider hiring two alternate stream faculty members
  - b. Increase employment of learning outcomes (program and course)
3. Enrolment/Recruitment
  - a. Actively market chemistry programs
  - b. Increase retention
4. Other initiatives:
  - a. Expand use of co-op
  - b. Bring in alumni to provide career information
  - c. Combine cyclical review with CSC accreditation and add Biochemistry to accreditation roster

The review committee report encouraged increasing the co-op opportunities for students, and elaborated on recommendations 4 (b) and (c) to suggest that the department take steps to accredit (or reaccredit) its programs with the Canadian Society for Chemistry and explore opportunities to collaborate with the Association of the Chemical Profession of Ontario in order to take advantage of professional development opportunities. Increasing the opportunities for professional development was identified in the self-study as a priority for the programs.

The self-study pointed out that students are provided office space near their supervisors; however, common space for graduate students is very limited. In addition, students expressed interest in more training on instrument use and opportunities to contribute to development of laboratory experiments.

## **Implementation Plan**

The programs provided detailed discussion of each recommendation, including those not highlighted in this Final Assessment Report, commented on activities already underway, and identified appropriate resources within the university and beyond to support initiatives. The decanal implementation plan endorsed the programs' own plans and asked that future activities be "purposely articulated and, where appropriate, include clear, measurable outcomes." In response to the review committee's observation that numerous recommendations were identified in the self-studies for enhancement (particularly in the undergraduate self-study) but left unprioritized, making it difficult to see what direction might be taken, the programs noted that the imminent development of a Faculty strategic Plan would provide a sharpened sense of priorities and directions.

The decanal plan, which combines the departmental objectives, further identified responsible agents for each recommendation, the source for resources and a timeline. In particular, the decanal plan specifies several recommendations that require resources from the Dean's Office.

For example, the plan notes that a search is underway for one Alternate Stream appointment and that a second position will be included in the complement plan. In addition to efforts undertaken to recruit graduate students, the decanal plan commits to unspecified resources and the support of the dean's office (science recruitment officer, communications manager) in a redoubled effort to attract domestic undergraduate students. The plan specifies Bethune College as a partner for retention efforts as well as establishment of a plan with Departmental objectives and measurable outcomes as a necessary next step to be rolled out for 2016-2019.

Progress on all initiatives will be included in an 18-month report. In addition to the review committee's recommendations on enhanced employment of learning outcomes, this final assessment report notes that the graduate program outcomes in relation to category 6 of the Program Expectations (Awareness of the Limits of Knowledge) have not yet been satisfactorily articulated.

Alice J. Pitt, Vice-Provost Academic  
York University

<b>R 1.2</b>	<b>Guide and improve TA performance</b>
<b>Dept. Response:</b>	The Department will work together with the York Teaching Commons at York to provide better training for its Teaching Assistants. Making the TA training mandatory will be explored, and discussions to make training more specific to science TAs, and therefore more beneficial, will take place with the York Teaching Commons.
Who	Department (Chair, UPD, GPD), Teaching Commons staff
Resources	none
When	2015-2018
<b>R 1.3</b>	<b>Increase student opportunities for professional development and soft skills</b>
<b>Dept. Response:</b>	The Department agrees with the importance of professional development of our students and will continue to work to provide opportunities for our students in this area. Recently the Department hosted the ACS on Campus event where a series of seminars, primarily aimed at graduate students, including topics such as effective communication of research results through presentations and publications. Though this was a one-off event we anticipate that hosting these sorts of events, that have great benefit for our students, will continue.
Who	Department (Chair, UPD, GPD), Career Centre
Resources	Departmental budget
When	2015-2018
<b>R 1.4</b>	<b>Groom York undergraduates for graduate school and bring in industry mentors to illustrate career options</b>
<b>Dept. Response:</b>	The Department will continue its recent practice of inviting senior undergraduate students to the Departmental research seminars, especially those given by York faculty members. We will also consult with the local section of the Chemical Institute of Canada (CIC) to see how they can be of help in identifying potential industry mentors.
Who	Chair, UPD
Resources	Departmental budget
When	ongoing
<b>R 2.1</b>	<b>Hire two alternate stream faculty</b>
<b>Dept. Response:</b>	There is currently a search going on for one Alternate Stream faculty member and additional Alternate Stream faculty will be part of future hiring plans.
Who	Chair, Dean
Resources	Faculty budget
When	2015-
<b>R 2.2</b>	<b>Increase employment of learning outcomes (program and course)</b>
<b>Dept. Response:</b>	The Department is now enforcing the Senate requirements for course outlines that are supposed to include learning outcomes for each course. As these are acquired, we will integrate the learning outcomes into a curriculum map. The Department will further encourage instructors to measure learning outcomes through testing in the course.
Who	Chair, UPD
Resources	none
When	2016-18
<b>R 2.3</b>	<b>Actively pursue blended learning, including online and flipped</b>

<b>Dept. Response:</b>	The flipped classroom technique is currently used in 2 courses taught in the Department, Chem 2021 and Chem 3020, with plans to do more of this in Chem 2020. We anticipate that the new Alternate Stream appointment will be involved in implementing future pedagogical innovations
Who	Chair, UPD, faculty
Resources	none
When	2015-2017

<b>R 2.4</b>	<b>Collaborate more with library staff</b>
<b>Dept. Response:</b>	The Department currently includes library staff in the Graduate Student orientation and the library hosts a series of seminars for graduate students on how to use SciFinder and Reaxys this term. All graduate students have been notified of this and we anticipate that this will be a recurring event. For undergraduate students librarians are involved in presentations in the courses Chem 4000, Chem3000/3001 Chem 3070 and Chem 3071. We aim to expand the involvement of library staff in additional courses with an emphasis on courses involving assignments.
Who	UPD, GPD, faculty
Resources	none
When	2015-2017

<b>R 3.1</b>	<b>Secure chemistry service teaching for the Chemistry Department</b>
<b>Dept. Response:</b>	We agree entirely with this. All chemistry courses at York should be taught by members of the Department of Chemistry.
<b>Dean's Response:</b>	It is not clear that there is currently any service teaching in chemistry that is not taught by the Department. We will be vigilant to ensure this continues.
Who	Chair, Dean
Resources	None
When	Ongoing

<b>R 3.2</b>	<b>Actively market chemistry programs (e.g. website, paid visits, videos, community presence)</b>
<b>Dept. Response:</b>	<p>We agree with this recommendation and note that the Department is currently working to improve the Department's webpage. We also aim to have a greater use of social media in marketing the Department and its programs. We point out that the Graduate Program Director has been using twitter to communicate events and news. We are also working with the Faculty of Science to produce a high quality professional-looking one-page flyer that will promote the Graduate Program.</p> <p>The Department has recently (since June 2015) hosted 2 symposia, the New Journal of Chemistry Symposium and ACS on Campus. Both were advertised to neighbouring universities and drew an audience from outside of York. We anticipate continuing to host these types of events to raise the profile of the Department.</p> <p>We agree with the need to increase the community profile of the Department and note that chemistry faculty members have given talks at events hosted by the Toronto Public Library. We anticipate that this participation will occur on an ongoing basis. In terms of paid visits of potential grad students there are currently no funds to bring in potential students in a manner done by universities such as University of Toronto, Simon Fraser, Calgary and others.</p>

<b>Dean's Response:</b>	In addition to graduate recruitment efforts, the Department should redouble its efforts to attract domestic high school students as undergraduates. There are many activities that could be undertaken, ranging from workshops for teachers to on-campus events for students. FSc staff (e.g., science recruitment officer, communications manager) can help.
Who	Chair, UPD, GPD, Dean
Resources	TBD
When	ongoing
<b>R 3.3</b>	<b>Increase retention (e.g. background tutorials for math and chemistry, identifying students at risk)</b>
<b>Dept. Response:</b>	Increasing retention is a large focus of the Department. Currently much of the effort is being done at the first year level, but we aim to increase the capacity to do this at second and later years in the future.
<b>Dean's Response:</b>	Partnering with Bethune College, particularly for first year retention efforts, is key; establishing a plan with Departmental objectives and measurable outcomes should be a next step.
Who	Chair, UPD, faculty, Assistant Dean
Resources	TBD
When	2016-2019
<b>R 4.1</b>	<b>Expand use of co-op</b>
<b>Dept. Response:</b>	We agree with the importance of the co-op option for students and will continue to support this option for students.
Who	UPD, faculty, Dean's Office
Resources	TBD
When	Ongoing
<b>R 4.2</b>	<b>Bring in alumni to provide career information</b>
<b>Dept. Response:</b>	In terms of bringing in alumni to provide career information for students we currently do this (though not always organized by us) such as part of the Science50 chemistry event and the Celebrating #WomenInSTEM event, both within the past year. We agree with these events being important and plan to continue these activities.
Who	Chair, UPD
Resources	Departmental budget
When	ongoing
<b>R 4.3</b>	<b>Combine cyclical review with CSC accreditation</b>
<b>Dept. Response:</b>	The Department agrees completely and will proceed to use the review to reaccredit the programs mentioned.
Who	Chair
Resources	Departmental budget
When	TBD
<b>R 4.4</b>	<b>Accredit the Biochemistry program</b>
<b>Dept. Response:</b>	Additionally, we plan to apply for accreditation for the Spec Hon BSc Biochemistry program.

Who	Chair
Resources	Departmental budget
When	TBD