

PERIODIC PROGRAM REVIEW EXECUTIVE SUMMARY – CHEMISTRY (BSc)

The current Chemistry program at Ryerson grew from the Applied Chemistry and Biology program that was offered at the time Ryerson gained University status. This program itself developed over many years from the Laboratory Science program at the Ryerson Institute of Technology.

The Chemistry program is a four year BSc program with 41 courses. The first year of this program is common with other science programs, namely Biology, Medical Physics, and Contemporary Science. In the second year of the program, students begin their specialization in Chemistry with courses in most of the chemistry subdisciplines. Third and fourth year courses further develop students' skills in chemistry and allow them to intensify their training in one or two subdisciplines or broaden their experience in related sciences, such as biology, mathematics or physics. Students in the Chemistry – Applied Physics option take fewer chemistry courses and additional courses in medical physics and mathematics. Students take a total of six liberal studies courses (three upper and three lower), broadening their cultural and societal outlook, and also improving their communication skills. The Chemistry program, but not the Chemistry – Applied Physics option, is accredited by the Chemical Institute of Canada. Both the Chemistry program and the Applied Physics option have a Cooperative education option as well as an optional Specialization in Management Sciences. Students have the opportunity to obtain any minor offered by the University.

The goals of the Chemistry program are largely based on the scientific process. Graduates of the Chemistry program should be able to:

1) Knowledge:

Demonstrate the integrated nature of the essential facts, concepts, principles and theories in each of the five core areas of chemistry.

2) Scientific Inquiry:

Identify problems, formulate questions, select and interpret relevant and appropriate resources and data.

3) Experimental Design:

Devise methods to test original hypotheses with attention to detail.

4) Experimentation & Safety:

- a) Conduct standard laboratory procedures using appropriate synthetic methods and instrumentation;
- b) Demonstrate understanding of safe chemical handling and disposal; assess and manage risks of chemicals and procedures.

5) Analysis & Problem Solving:

Manipulate and critically evaluate data and experimental evidence in order to arrive at appropriate and defensible conclusions.

6) Communication and Collaboration:

- a) Decipher and communicate technical information clearly and concisely orally, in writing, and in visual form, for a range of audiences;
- b) Collaborate effectively and reliably with faculty and peers (listen, provide constructive feedback, contribute equitably and in a timely manner).

7) Autonomy and Awareness:

- a) Understand the limits of their own knowledge and recognize uncertainty and ambiguity; confidently exercise responsibility in decision making and the consequences of their decisions;

- b) Demonstrate curiosity and actively pursue a higher level of understanding. Interpret the societal impact of chemistry in everyday life, technology, and the environment.

8) Professional Conduct:

- a) Demonstrate ethical behaviour, accountability as well as personal and academic integrity;
- b) Demonstrate time and resource management.

An analysis of the accreditation requirements for Chemistry and mapping of our courses against the program goals indicated that while all the goals were supported by courses in the program, proficiency in knowledge in any of the subdisciplines, aside from analytical chemistry, is not reached. While the Chemistry program exceeds accreditation requirements in mathematics and computer science, it only just meets the requirements for hours of instruction in chemistry laboratory. In addition, the CMN 600 Science, Communication and Society course does not contribute in a meaningful way towards meeting the program goals. CHY 423 Environmental Science is the only required fourth year course, but it taught at an introductory level as a gateway into environmental science. Repositioning mathematics, computer science, communication and the environmental science course will create needed space for additional chemistry courses that will solidify students' knowledge in the subdisciplines as well as to allow for specialization in one or two subdisciplines. Employers value the analytical chemistry focus and skills obtained through the program; this area is one of the program's strengths. Future course offerings and program planning will place an emphasis on blending our traditional strengths (job preparedness, practical skills, soft skills and a strong sense of community) with our research strengths and faculty expertise, providing future graduates with unparalleled experiential learning opportunities. Future improvements to the program will seek to modernize course offerings to reflect changing demands from students and industry.

The Chemistry program at Ryerson has experienced consistent enrolment growth since its inception in 2005, and despite not having access to modern equipment, space or buildings, continues to produce highly skilled and uniquely trained students who can enter the workplace directly, or continue their education in professional programs or graduate work.

The Department has only enough faculty to meet the minimum required chemistry core and service teaching needs. Some PR courses have not been offered since the inception of the program due to lack of available faculty. The program needs an additional two faculty members to meet future demands with increased enrolment in science programs: one organic chemist for service and chemistry program teaching; and one analytical chemist for chemistry program and service teaching and to bolster our program strength with complementary faculty expertise.

The Department of Chemistry and Biology is physically located in the North East corner of Kerr Hall. The infrastructure is aging and the cost of renovations to improve existing space is high. This, coupled with the rising priority of a Science building, has rendered new renovations to improve laboratory space unlikely. The existing teaching labs are being used most mornings and afternoons each week, as well as during the evenings for CE teaching activities. Increased enrolment in the sciences and other programs requiring chemistry lab courses has put additional pressure on the availability of the teaching lab space. External reviewers noted in 2009 that "the age of the building, its physical state and the overall space associated with the Department of Chemistry and Biology has implications for the quality of Chemistry education taking place, and for the growth of the department's research profile." Aside from some renovations to one of the teaching labs, few changes have been made to the physical state of the chemistry

teaching and research space since then despite an increase in the number of students using the teaching labs and the increase in research activity. We have no room into which to grow. The Department has significant space needs for additional faculty offices, undergraduate and graduate laboratories. Immediate support of the university to facilitate the construction of a new science building is essential in order to maintain and nurture the competitive edge that students obtain pursuing our uniquely experiential learning-focused program.