

## University of Alberta Quality Assurance Suite of Activities

### Faculty of Science: Academic Program Reviews

#### Excerpted Reports 2017-2018

#### Department of Chemistry

<b>Programs Reviewed</b>	<ul style="list-style-type: none"><li>● Bachelor of Science in Chemistry</li><li>● Bachelor of Science in Chemistry (Honors)</li><li>● Bachelor of Science in Chemistry and Physical Science/Bachelor of Education (Secondary) - Combined Degree</li><li>● Master of Science in Chemistry</li><li>● Doctor of Philosophy in Chemistry</li></ul>
<b>Review Dates</b>	March 12-15, 2018
<b>Reviewers</b>	<ul style="list-style-type: none"><li>● Dr. Mark Workentin, Chair (Undergraduate), University of Western Ontario</li><li>● Dr. Adrienne Wright, Internal Member (Undergraduate), University of Alberta</li><li>● Dr. Erin Whitteck, External Member (Undergraduate), St. Louis University</li><li>● Dr. Susan Olesik, Chair (Graduate), Ohio State University</li><li>● Dr. Kevin B. Thurbide, External Member (Graduate), University of Calgary</li><li>● Dr. Cathy Adams, Internal Member (Graduate), University of Alberta</li></ul>

#### Outcome

The External Review Committee commended the Department of Chemistry for their world-class undergraduate and graduate programs, noting that University of Alberta boasts one of the top chemistry programs in Canada, one that is highly recognized for its research.

Undergraduate programs in chemistry expose students to cutting-edge discoveries while still imparting fundamental knowledge in the discipline. The faculty members involved in the delivery of the two programs are outstanding researchers and instructors in their fields. The excellence in

teaching in this department has been rewarded by a number of national teaching awards. Teaching faculty are supported in their mission by a robust and qualified support staff group and excellent, updated facilities and infrastructure.

The External Review Committee acknowledged the Department of Chemistry's continued excellence in advancing the instruction of graduate students both in the classroom and in research laboratories. It is truly uncommon to find a Faculty with exemplary performance in both teaching and research, but the External Review Committee was clear that the Department of Chemistry at the University of Alberta can claim that honor.

### **Program Strengths**

- Academic advising offered by the Department of Chemistry was highlighted as exceptional.
- The programs offered in the Department of Chemistry include many high impact practices, especially experiential learning opportunities in the form of laboratory-based learning, instrumental skill development and extensive and varied undergraduate research experiences.
- The learning environment for graduate students is excellent.
- Access to modern and advanced instrumentation is among the best in Canada.
- At a time when many universities are cutting back on experiential research opportunities, the Department of Chemistry provides access into the research culture as early as year two, with the opportunity for students to further enhance their research experience in years three and four. This model is outstanding and sets this program apart from most others in Canada.

### **Opportunities for Program Improvement and Enhancement**

The committee made several key recommendations:

- The graduate students would benefit from discipline-specific professional development.
- The Chemistry 502 course should be modified so that the goals and delivery of the course are similar across divisions.
- Significant number of faculty and staff may be retiring soon. Faculty renewal should be a focus before these retirements occur so that administrative, research and instructional excellence can be maintained.
- Students should be made more aware of mental health resources available on campus.
- The Department of Chemistry should develop an instrumentation replacement plan.
- Undergraduate program and course level learning outcomes should be developed to ensure these programs remain world class, relevant and produce chemistry professionals equipped to handle any new challenges and opportunities they may encounter.
- It is recommended that the Department of Chemistry lead a review of the undergraduate degree structures.

- The Department should take a lead in developing interdisciplinary undergraduate degree programs that are attractive to the diverse interests of today's student and that can also be accredited by the Canadian Society of Chemistry.

## Implementation Plan

In response, the Department made the following commitments:

- The Department of Chemistry will undertake a full review of the Chemistry 502 course.
- The Department of Chemistry will begin drafting program and course-specific learning outcomes.
- The Department of Chemistry will examine both the Honors and Specialization programs to build in more flexibility (i.e., student choice) and, hence, interdisciplinarity into both degrees, while maintaining the current academic rigor and extensive lab skills of the present programs. Proposed changes to the degree structures will be initiated by the Associate Chair (Undergraduate) and Assistant Chair (Student Services) through the Department of Chemistry Undergraduate Curriculum Committee.
- The Faculty of Science employs a half-time Psychologist, with an office centrally located near the Student Services Office in CCIS. This provides easy access to a mental health professional for our students. The Department often reaches out to students as well as faculty and staff via email to remind them of this service, as well as many others.
- The Department is in the process of developing a proposal for the CFI Innovation Fund that, if successful, will provide new NMR spectrometers, crystallographic instrumentation, and mass spectrometers. In addition, planning for the renovation of Chemistry 1st and 2nd floors, including the undergraduate chemistry labs, has been undertaken and discussions regarding financing of these renovations is ongoing.
- The Department of Chemistry, in concert with the Faculty of Science, continues to monitor faculty and staff renewal.
- In early 2019, the Department of Chemistry will poll the graduate students to see if there are common themes that current graduate students would like to receive training on. Once this information is collated, more specific professional development activities can be implemented.

## Department of Physics

<b>Programs Reviewed</b>	<ul style="list-style-type: none"> <li>● Bachelor of Science in Astrophysics, Geophysics, Mathematical Physics, and Physics</li> <li>● Bachelor of Science in Astrophysics, Geophysics, and Physics</li> <li>● Master of Science in Physics with specialization in Geophysics</li> <li>● Doctor of Philosophy in Physics with specialization in Geophysics</li> </ul>
<b>Review Dates</b>	April 17-19, 2018
<b>Reviewers</b>	<ul style="list-style-type: none"> <li>● Dr. Michael Roney, Chair (Undergraduate), University of Victoria</li> <li>● Dr. Michael Luke, Chair (Graduate), University of Toronto</li> <li>● Dr. Kristen Buchanan, External Member (Undergraduate), Colorado State University</li> <li>● Dr. Sarah Hughes, Internal Member (Graduate), University of Alberta</li> </ul>

## Outcome

The External Review Committee noted that the Department of Physics is composed of world-class researchers and offers laboratories with high-quality equipment, affording rare opportunities for graduate and undergraduate students to gain valuable research experience in the area of physics. Dedicated faculty members in the Department of Physics continue to accept undergraduate students, often several at a time, into their labs. The success of this environment is evident in the large number of undergraduate students who obtain publications or present at Science Research Days or conferences. The External Review Committee reported that this excellence exceeds the expectation of a typical undergraduate physics program.

The External Review Committee also recognized the excellence of the facilities offered by the Faculty of Science, and they singled out the Science Hardware Makerspace (SHACK) as well as the nanofabrication facility as world-class.

The External review Committee praised the Department of Physics for a robust, diverse graduate



program, where students are publishing, engaged and challenged by skilled faculty, as well as successfully earning funding.

### **Program Strengths**

- There are ample research opportunities available to graduate students led by engaged faculty members.
- The technical support staff who are in place in the machine and electronic shops at the University should be recognized as unique and extremely valuable resources to the Department of Physics' students.
- The graduate program continues to grow and attracts high-achieving Canadian and international students, as well as an increasing percentage of women.
- The Department of Physics participates in a very impressive amount of community engagement between open houses, physics nights, and the Observatory.
- Job placement statistics for graduates of these programs is high and speaks to the quality of the programs overall.
- The Department of Physics has invested an impressive amount of effort in recent years towards enhancing the delivery of its undergraduate programs and has successfully incorporated modern pedagogical techniques into its programs.

### **Opportunities for Program Improvement and Enhancement**

The committee made key recommendations:

- Elements of program structure, such as allowing minors in other disciplines and extending the Arts requirement, should be reviewed.
- Continue to seek ways of increasing the number of students in the Honors programs.
- Expand professional development efforts by drawing on program alumni.
- The Department should review the curriculum and pedagogy of its first-year algebra-based courses, with the aim of making them more attractive to non-physics students.
- The Department should review its PhD program; specifically, the number of courses in the program.
- The syllabi for the "core" graduate courses should be standardized, to ensure that certain key topics are always covered. Both this and the previous recommendation could be included in a Departmental Review of its graduate courses.
- The other research groups in the Department should follow the lead of the Geophysics group and ensure that each graduate student make a research presentation at least once per year.
- Develop Department-wide ethics and Professional Development (PD) options geared towards Physics students.

### **Implementation Plan**

In response, the Department made the following commitments:



- The Department of Physics will initially discuss recommended program structure and curriculum changes with its Undergraduate Curricula Committee.
- The Faculty of Science will work with the University of Alberta External Relations Unit to review ways in which alumni can be engaged directly with academic programs.
- The Department of Physics will be reviewing its PhD program in the fall of 2018 and welcomes the recommendation surrounding its core graduate courses.
- The Department of Physics is currently reviewing the development of additional PD options for students.
- The Department of Physics will include annual research presentations as a formal program requirement for both the MSc and PhD programs. This requirement will be enforced at the level of the individual research groups in the Department.