CHEM 401/402 and BIOC 401/402
Honours Research Handbook

The honours research courses give students experience in scientific research, and an appreciation for how research is performed. Participation in these courses gives students the opportunity to make more informed career choices. The experience includes many aspects of research besides performing experiments and analyses: drafting reports, presenting results orally, and responding to questions. Students take both courses in consecutive semesters, typically fall and winter.

CHEM/BIOC 401: Honours Research

In 401, students meet with the coordinator right away, and choose a research project and supervisor (usually a department faculty member) the first week of term. Students are free to consult with as many potential supervisors as they wish before making their decision. Some students discuss a project with a professor in advance of the Fall semester, but they cannot include summer work as part of their honours project. Once a supervisor is chosen and the coordinator is informed, 401 consists of the following:

1. **6-10 Hours of work per week**, including laboratory research, and written and oral presentation.

2. **Written progress report (10-15 pages).** A first draft is due for your supervisor 11 weeks into semester (for their advice), and three final copies (for the committee) are handed in to the coordinator 12 weeks into semester. (e.g. if the first day of classes is a Wednesday, the due dates are Wednesdays.)

3. **Oral presentation (10 minutes)** of the Report, before a 3-person committee, usually the day before the semester exam period.

4. **Fielding questions (30 minutes)** from the committee immediately after the presentation, related to your research and designed for assessment of your comprehension.

CHEM/BIOC 402: Honours Thesis

In 402, research work continues, leading to a written thesis and oral defense of the work. 402 consists of the following:

1. **6-10 Hours of work per week**, including laboratory research, and written and oral presentation.

2. **Written research thesis (25-40 pages).** A first draft is due for your supervisor 11 weeks into semester (for their advice), and three final copies (for the committee) are handed in to the coordinator 12 weeks into semester. (e.g. if the first day of classes is a Wednesday, the due dates are Wednesdays.)

3. **Oral presentation (15 minutes)** of the thesis, before a 3-person committee, anytime from 4 days before end of classes to 1 week into exam period (consult with the coordinator).

4. **Fielding questions (40 minutes)** from the committee immediately after the presentation, related to your research and designed for assessment of your comprehension.

5. **Corrected research thesis.** Three unbound copies, with committee-requested corrections made, are handed to the coordinator, which the department will convert (for free) into nice bound copies for posterity (for the student, the supervisor, and the department). This is due 5 days after the defense.

6. **Lab sign-out sheet.** The student must clean up their chemicals/computer files and have the sheet signed by the appropriate personnel. The signed form is also due 5 days after the defense.

CHEM401/402 and BIOC401/402: Grading Scheme

401	Lab skills, assessment by supervisor	10%
	Report, written	45%
	Report, oral presentation	20%
	Report, fielding questions	25%
402	Thesis, written	30%
	Thesis, results (largely supervisor-assessed)	30%
	Thesis, oral presentation	15%
	Thesis, fielding questions	25%

In grading the 401 and 402 reports, the Honours committee will take into consideration that student progress is often somewhat limited in 401 relative to 402, due to a training period for students new to research. The "results" category will reflect your in-lab research effort, talent, and accomplishments.

CHEM401/402 and BIOC401/402: Report Writing

There are two reports to write:

- Progress report (10-15 pages)
- Research thesis (25-40 pages)

The two reports will also serve to spread out the workload of writing a thesis, since much of the progress report (e.g. Introduction (largely a literature review) and Methods sections, plus some tables/figures) can be copied into the thesis.

Style tips: See the templates (separate MS Word files). All reports must be typed using a readable font size (12-point Times New Roman or Arial is common), double spaced. Headings and section titles should be bold and/or underlined, and it is best if they are numbered. Follow the reference style of a well-recognized journal in your area. Avoid quoting web pages, or plagiarizing figures from the internet. Diagrams, tables, and graphs are generally very useful in explaining results, and should be numbered consecutively (Table 1, Figure 1, ...) with descriptive captions so the reader can understand what information they are designed to present. The first page of the Introduction should be Page 1; all earlier pages should be labelled with roman numerals (i, ii, iii, ...). Consult an old thesis for more style syntax.

Suggestions:

- Start organizing your thoughts by preparing an outline that contains headings and ideas. Go back and fill in the details.
- The number of pages is limited so be careful about the amount you write. Know your audience -- assume your readers have some knowledge in the field but are not as expert as you. Write down only those details that would allow them to understand what you have done and to repeat the work if that were necessary.
- You may find it easier to finalize all the data into tables, graphs, and figures, before writing the text for the Results and Discussion section.
- Use figures, tables, and graphs where they are most useful for illustration and explanation.
- Subheadings may be helpful, especially in the Results and Discussion section(s) (but don't go crazy with this).
- Detailed calculations, or large numbers of graphs and tables, should be placed in Appendices. In that case, use only a few illustrative examples in the body of the report.
- Write clearly, in well-constructed, complete and grammatically correct sentences. Past-tense passive is preferred ("The flask was heated", rather than "I/We heated the flask", although the latter is becoming more common). Proofread carefully. One common problem is lack of agreement between subject and verb (The table suggests, or the values suggest).

CHEM401/402 and BIOC401/402: Report Writing (continued)

401: Progress report

Research companies love to see Progress Reports from their staff scientists to keep an eye on research progress. In 401, it will serve to:
1. Give you practice and feedback in scientific writing (useful in advance of the 402 Thesis);
2. Distribute the workload of writing a Thesis;
3. Allow the 401 committee to assess your scientific writing skills.

402: Research thesis

A Thesis represents new knowledge generated from academic research. The document has more in common with a scientific report than a published science journal article, although both styles are quite similar. (For instance, a thesis may have more details and a more general introduction than a journal article.) In 402, the Research Thesis serves to:
1. Gives you practice writing a full scientific report, including collecting data and forming conclusions;
2. Allow your supervisor to assess your results
3. Allow the 402 committee to assess your scientific writing skills.

The following table summarizes the sections expected in each report. Note that the template files are already set up with these for you.

Section	401 Progress	402 Research
Title page	yes	yes
Abstract, a summary		yes
Acknowledgements		yes
Table of Contents	yes	yes
List of Tables		yes
List of Figures		yes
List of Abbreviations	yes	yes
Introduction	yes	yes
Methods[a]	yes	yes
Results and Discussion	yes	yes
Conclusions[b]		yes
Future Work[c]	yes	
References	yes	yes
Appendix	optional	optional

[a] describes the experimental procedure, chemicals used, temperatures, calibrations, instruments …

[b] state what you believe the data tells you about your problem/hypothesis, with a brief summary of the data and how it led you to these conclusions

[c] describes what research will be done in 402