

**CHEM4710: Research Project in Chemistry or Biochemistry:
The University of Manitoba, Faculty of Science, Department of Chemistry**
Syllabus for CHEM4710 (2019/2020).

GENERAL COURSE DESCRIPTION:

CHEM4710 is a 6 credit hour research project course. You will carry out research as an independent member of a research group in the Department of Chemistry. The course counts for 6 credit hours, and it extends over both the fall and winter terms. Students in CHEM4710 are expected to begin work on the research project at the beginning of September 2019 and to maintain a steady level of work during the entire academic year.

On Friday March 29th, 2019 all available course projects will be made available to all students interested in or considering in taking CHEM4710 in Fall 2019 and Winter 2020. Each project will consist of a brief 1 page description. Students are encouraged to read all projects and arrange appointments with supervisors for a brief interview/discussion. Each student needs to meet with 3 potential supervisors. Following those meetings students should submit their preferred project choices to the course coordinator in order of preference (e.g. 1st choice: "The investigation of ...", 2nd choice: "Synthesis of ...", etc.). Project matching will commence after June 28th, 2019 and the project assignments will be e-mailed to the students and supervisors on August 2nd, 2019.

Students are expected to consult regularly with their advising professor to ensure that adequate progress is being made on the research project. Each student in CHEM4710 is expected to conform to university standards of laboratory safety at all times and will also meet the standards of the research group that they are working in with regard to experimental procedures, notebook keeping, and general laboratory behavior.

The role of the student is to be an active and productive member of the hosting research group. This is not just 'your' project, most projects are integrated in the larger research program underway in the research group. The CHEM4710 project is an excellent opportunity to participate in the "life" of the research group and to learn from the senior members. Your active participation in the group as part of the CHEM4710 experience can also give you a good impression of what graduate studies would be like. More importantly, a good performance in the group will also earn you a positive reference from your advisor for any future applications for graduate studies, other degrees or for entry into the workforce.

The role of your advisor is to help guide your entry into the world of research. This quite often is a markedly different experience than what you have experienced in typical teaching laboratories. The transition into independent research can be challenging in some cases. The role of the advisor is to help you, point you at relevant literature, describe the opportunities and pitfalls, while at the same time avoiding guiding you in minute detail. The success of your research project lies with your ability to work in the research lab in a self-motivated manner and to develop a measure of independence in your abilities. Although your advisor is available to provide guidance on the preparation of your research proposal talk, reports, and presentation, the responsibility for the completeness of these course requirements rests solely with the student.

The role of the project course is to provide students the opportunity to work on a research project in an academic research lab. This is an opportunity to develop practical lab skill beyond those that can be taught in the laboratory portion of an undergraduate course. The CHEM4710 course also provides the opportunity to develop other essential skills such as self-motivation and time management that allow you to be organized in your research. You will also be required to describe your results in a format that is more than a simple 'lab report' in both the written and oral presentation. A major part of the evaluation of your performance is on how well you develop these skills and not necessarily on the perceived success of your project. One meaningful result, generated in September, poorly reported on and described in a rambling talk will not rank the same as a series of carefully recorded experiments repeated several times and described in detail that nonetheless failed to work in the expected manner or at all.

I) INSTRUCTOR INFORMATION:

Course Coordinator:

Name: Dr. Mario Bieringer
Office: 520C Parker Building
E-mail: Mario.Bieringer@UManitoba.ca
Phone: (204) 474 6258

II) EVALUATION:

Written Progress Report (Evaluated by the course coordinator)	20%
Written Final Report (Evaluated by 2 readers)	40%
Oral Presentation (Evaluated by all faculty members in attendance)	20%
Research Effort (Evaluated by the research advisor)	20%

Final numerical scores will be converted to letter grades. As this is a senior level course, the marking scale will assume that F = less than 50%. Other scores will be scaled appropriately between D and A+ as described below.

Grade Point Value	Letter Grade	Numerical Score
4.5	A+	90.0 – 100
4.0	A	80.0 – 89.9
3.5	B+	75.0 – 79.9
3.0	B	70.0 – 74.9
2.5	C+	65.0 – 69.9
2.0	C	55.0 – 64.9
1.0	D	50.0 – 54.9
0.0	F	00.0 – 49.9

III) COURSE PARTICIPATION:

- Students are encouraged to attend the Friday Afternoon Departmental Seminars.
- Attendance of all Friday CHEM4710 course meetings (listed in the table below) is mandatory. These meetings take place in Parker 539 at **1:30 pm**.

CHEM4710 Course Meetings	Date	Presenter
Orientation Meeting	Friday, September 13 th , 2019	Mario Bieringer
Library and literature searches	Friday, October 18 th , 2019	Marie Spears
Academic Integrity	Friday, November 22 th , 2019	Loie Gervais
Graduate Studies in Chemistry	Friday, January 10 th , 2020	t.b.d.
Academic writing & peer review	Friday, February 14 th , 2020	Mario Bieringer
Effective oral presentations	Friday, March 6 nd , 2020	Mario Bieringer

IV) IMPORTANT DATES:

The dates below are fixed and no extensions are possible.

Milestone	Due date
Project descriptions available	Friday, March 29 th , 2019
Provide project preferences to course coordinator	Friday, June 28 th , 2019
Students receive project assignments	Wednesday, August 2 nd , 2019
Signed research contract	Friday, September 27 th , 2019
Written progress report due	Friday, December 6 th , 2019
Title and abstract for oral presentations due	Friday, March 20 nd , 2020
Oral presentations	Saturday, March 28 th , 2020
Written Final report	Monday, April 13 th , 2020

- **Project Descriptions** – Available Thursday March 29th, 2019
Project descriptions will be made available no later than March 29th, 2019. Students should read all project descriptions and arrange for a minimum of 3 meetings with project supervisors. Supervisors must be full time faculty members in the Department of Chemistry. Please note that supervisors cannot promise projects to students.
- **Project Preferences** – Due Friday June 28th, 2019
Students should submit their project preferences by June 28th, 2019 by e-mail to the course coordinator (Mario.Bieringer@UManitoba.ca). The forms for this submission are part of the project description booklet. Students submitting their project requests after June 28th, 2019 may only be able to choose from a smaller (i.e. remaining) set of available projects.
- **Project Assignments** – Available Wednesday August 2nd, 2019
Students and supervisor will be informed regarding their projects on August 2nd, 2019. It should be noted that every effort will be made to match students with their highest priority choices. However, this will not always be possible because multiple students may apply for the same project. Students applying for projects after 28th of June may do this up to the late registration deadline, however it is strongly encouraged that students start meeting with supervisors early on and submit their preferences as early as possible.
- **Signed Contract** – Due Friday September 27th, 2019 (to be provided to Mario Bieringer)
This is a binding contract between the student and the supervisor. The contract clearly defines the responsibilities of the student and supervisor equally. The signed contract should be submitted to Mario Bieringer (520c Parker Bldg.) or alternatively to the Chemistry Department Office (360 Parker Bldg.)
- **Written Progress Report** – Due Friday December 6th, 2019 (to be provided to Mario Bieringer)
The formal Progress Report will be handed in to the course coordinator by electronic mail for marking (Mario.Bieringer@UManitoba.ca).
The report should consist of:
 - a description of the goal(s) of the research project,
 - a detailed survey of the relevant literature that puts the project in context,
 - a description of the planned methods for the research project,
 - a summary of your research results during the Fall term including experimental data.

The progress report should be about 2000 – 3000 words in length with double-spaced pages and will include any relevant figures and references (which are not included in the word count). It should conform to one of the formats described below for the Final Report. You should have your research supervisor review and approve your report before handing it in to the course coordinator. It is essential that the report makes the project clear to a scientifically literate but non-expert reader.

This Progress Report can be thought of as a template for the first draft of your Written Final Report and will already include many of the essential elements (Introduction, Results, Methods and References). It is usually rather straightforward to then update this existing document to include the results generated in the Winter term and discuss the overall results and conclusions of the project. Therefore, it is well worth the effort to ensure that the progress report is as complete as possible as this effort will pay off at the end of the course in March. Electronic reports must be received by e-mail (or in person on a USB-stick) before 4:30 pm on Dec 6th, 2019 to be considered for credit in the course.
- **Title and Abstract for oral presentation** - Due Friday March 20th, 2020
The Title and Abstract must be e-mailed to Mario Bieringer (Mario.Bieringer@UManitoba.ca) by Friday March 20nd, 2020 before 4:30 pm. It is important to meet this deadline in order to create a presentation schedule on time for the oral presentation day.
- **Oral Presentations** - Saturday March 28th, 2020
You will be required to give a 15 minute oral presentation summarizing your research project. The presentation will be followed by 5 minutes for questions. The presentations will be moderated by the course coordinator who

will strictly follow the time limits. An oral presentation normally consists of an introduction, a brief description of relevant methods, results and discussion, and conclusions; the last slide is typically an acknowledgment of the advisor and assistance provided by others during the project. It is essential that students prepare and practice their presentations to effectively communicate their project within these time limits. There will be a scoring penalty for exceeding the 15 minute time limit on the presentation. The audience will consist of all professors involved in teaching CHEM4710, as well as all students in the course, plus other students or faculty who wish to attend the presentations. All members of the audience will be allowed to ask questions.

The final presentations are open to all members of the university community as well as the public and will be advertised on campus. Partners, parents as well as other family and friends are particularly welcome to attend. The use of PowerPoint (or equivalent software) is now the standard for scientific presentations. You should plan to present your oral presentation using the computer that is provided in the room – or with your own laptop if you choose.

Each CHEM4710 advisor, including the course coordinator, will be involved in evaluating your talk. Other CHEM4710 students as well as other faculty members present will also be invited to provide input. However, the majority of the weighting will be given to the evaluations provided by the CHEM4710 advisors.

- **Final Report** - Due Monday April 13th, 2020 (16 days after the oral presentations)

This is a major part of the evaluation for the project course. It will be marked by two readers. One reader will be close to your research sub-discipline and will be chosen by your supervisor, the second reader will be a faculty member from the Department of Chemistry who is not an expert in your sub-discipline. You will be asked to provide the course coordinator with **up to three printed copies** on the due date. The course coordinator will distribute the reports to the two readers, the third copy will be kept for a course archive. Each reader will give your report a score out of 20 points. It must be emphasized that the report has to be comprehensible to the general scientifically literate reader, and this will be taken into account in marking it. The report must show that you understand the context of the project as well as the actual experiments that you have done. Although there are no minimum or maximum length requirements for the final report, the typical length is 6000 – 8000 words with double-spaced pages and including figures and references (which are not included in the word count). However the exact length will depend on the style of reporting that is specific to the sub-discipline that your project falls in.

The final report must be a formal piece of scientific writing, with Introduction, Results, Discussion, Conclusion and Experimental (Methods) sections. You may find it more effective if the Results and Discussion sections are combined. The report should also include the relevant figures and references as needed to make the report complete and clear. It should follow the style conventions of an appropriate scientific journal, the American Chemical Society (ACS) journals provide good templates to follow. Stylistic rules are found on journal Web pages and students are encouraged to consult the journal (i.e. J. Am. Chem. Soc.; J. Org. Chem. or J. Phys. Chem., Biochemistry) most appropriate to their project. Another useful resource is the ACS Style Guide which is available online and in the library and can offer useful information on formatting and referencing. Consult your advisor before beginning to write, to determine an appropriate approach. Students should have a draft of the report completed by early-March. Advisors are urged to provide constructive comments on their students' draft reports before the final version is submitted.

Written reports should be reasonably free of typographical errors and be checked thoroughly for spelling and grammar. Frequent spelling or grammatical errors detract from the readability of your proposal, report or presentation, generate an impression of sloppiness with the audience, and will often result in a lower grade. The same applies to inconsistent formatting of text and figures in the report and references. Therefore, you are strongly advised to use the spelling and grammar checking functions on your word processing software. In addition, you will find the formatting and document handling features of the word processing software very useful. You are also strongly encouraged to use the "ACS 1996" template for formatting your ChemDraw structures. You should consider asking other members of your research group or another student in the project course to help proofread your documents. Your supervisor will be very willing to provide feedback on the content of your report, and this will be more meaningful on a report free of errors.

The target audience, for your proposal, oral presentation and formal reports, is a student at approximately your stage in the Chemistry or Biochemistry program who may not be familiar with the specifics of your research project. The use of acronyms and shorthand notations should be kept to a minimum or fully explained. The

formal report should attempt to describe in as much detail as possible all of the work you have done during the course of the project. However, in your oral presentation - where you have limited time - you may wish to provide a summary of the most significant results that you generated.

- **Conference Opportunities**

- **The 2020 Western Canadian Undergraduate Chemistry Conference**

All students are urged to present the results of their CHEM4710 project at the 'Western Canadian Undergraduate Chemistry Conference' (WCUCC). This annual conference will take place in early May in one of the universities west of Ontario. Date and place will be communicated at a later point in time. The format of oral presentations is identical to that used in CHEM4710, so you will already have a talk prepared by the time the course is complete. It is a superb opportunity for you to start some professional networking, and there are cash prizes for outstanding presentations. Interested students need to pre-register in January or February for this conference. There are some travel funds available for students (or groups of students) that intend to present at this conference.

- **103rd Canadian Chemistry Conference and Exhibition**

The 103rd Canadian Chemistry Conference and Exhibition (CSC-2020) is the national conference for chemists in Canada with up to 2000 delegates from all over Canada and a significant number of international speakers. In 2020 the conference will be held in Winnipeg and will provide an excellent opportunity to highlight your research and to network with globally leading researchers. CHEM4710 students are encouraged to present their research at the CSC-2020. The CHEM4710 project provides an excellent base for presenting a poster at that event. Note that conference registration is expected between the 1st week of January and mid February 2020.

V) ACADEMIC INTEGRITY POLICIES:

Academic Dishonesty:

The University of Manitoba treats plagiarism and cheating as serious academic offenses.

- The complete documentation regarding cheating, plagiarism and fraud be accessed in the calendar at: http://umanitoba.ca/student/resource/student_advocacy/cheating_plagiarism_fraud.html
- Additional documentation is available on the Faculty of Science website <http://umanitoba.ca/science/undergrad/resources/webdisciplinedocuments.html>