Biochemistry 4F09, 4T15, and Health Sciences 4R12: Senior Thesis
Course Outline
2015 - 2016

Course Coordinator
Dr. Ishac Nazi
Email: nazii@mcmaster.ca
Ext. 20242
Office – HSC 4H30F (by appointment only)

Instructional Assistant
Shari McCollin
Email: biochemistryadvisor@mcmaster.ca
Ext. 22495
Office – HSC 1H6 (Monday – Friday 11:00 – 12:30)

Course Description
The Department of Biochemistry and Biomedical Sciences considers research to be a vital component of an undergraduate education in Biochemistry. These courses offer students the opportunity to gain valuable experience with cutting-edge research. These courses are full year research projects undertaken in a laboratory of a member of the Department of Biochemistry and Biomedical Sciences. Assessment in this course is based on laboratory work, two oral presentations and a final thesis report. Students may not receive remuneration for the coursework, but may be compensated for any time that the supervisor wishes to employ the student beyond completion of the course requirements.

Four tutorials will be held throughout the course of the year. These tutorials are optional but recommended. These tutorials will focus on presentation skills and report writing. You will have the opportunity to get feedback on your presentations from other students in the courses. The dates and locations of the tutorials will be announced.

Biochemistry 4F09 – students are expected to spend an average of 18 hours per week, over two terms, in the lab. Oral presentations will last 10 minutes with 5-10 minutes of questions.

Health Sciences 4R12 – students are expected to spend an average of 24 hours per week, over two terms, in the lab. Oral presentations will last 15 minutes with 5-10 minutes of questions.

Biochemistry 4T15 – students are expected to spend an average of 30 hours per week, over two terms, in the lab. Oral presentations will last 15 minutes with 5-10 minutes of questions.

How to Find a Supervisor
Students are responsible for arranging a suitable project, location, and agreement of a supervisor using the department’s application process. Students interested in taking Biochemistry 4F09, 4T15, Health Sci 4R12 must complete the thesis/research course application procedure found on the Biochemistry website (http://fhs.mcmaster.ca/biochem/undergraduate/forms_and_procedures.html). Click on the thesis/research course tab. Please do NOT contact the researchers directly as you will not receive a response. All students must go through this departmental application process. For questions please contact Shari at biochemistryadvisor@mcmaster.ca
Grade Breakdown

<table>
<thead>
<tr>
<th>Item Graded</th>
<th>Percentage of Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Form</td>
<td>5%</td>
</tr>
<tr>
<td>Mid-Year Lab Performance</td>
<td>15%</td>
</tr>
<tr>
<td>Oral Presentation 1</td>
<td>10%</td>
</tr>
<tr>
<td>Thesis</td>
<td>25%</td>
</tr>
<tr>
<td>Oral Presentation 2</td>
<td>15%</td>
</tr>
<tr>
<td>Year-End Lab Performance</td>
<td>30%</td>
</tr>
</tbody>
</table>

Dates and Deadlines

<table>
<thead>
<tr>
<th>Item Due</th>
<th>When? (all items due by 1pm)</th>
<th>Where?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Form</td>
<td>Monday, September 21, 2015</td>
<td>Submit to HSC 1H6 or <a href="mailto:biochemistryadvisor@mcmaster.ca">biochemistryadvisor@mcmaster.ca</a></td>
</tr>
<tr>
<td>Acknowledgement of Previous Work</td>
<td>Monday, September 21, 2015</td>
<td>Submit to HSC 1H6 or <a href="mailto:biochemistryadvisor@mcmaster.ca">biochemistryadvisor@mcmaster.ca</a></td>
</tr>
<tr>
<td>Initial Meeting Form</td>
<td>Monday, September 21, 2015</td>
<td>Email to <a href="mailto:biochemistryadvisor@mcmaster.ca">biochemistryadvisor@mcmaster.ca</a></td>
</tr>
<tr>
<td>Oral Presentation 1</td>
<td>December 2-4, 2015</td>
<td>Upload to Avenue by 9 am the day before you present</td>
</tr>
<tr>
<td>Oral Presentation Review</td>
<td>Monday, December 7, 2015</td>
<td>Uploaded to Avenue to Learn</td>
</tr>
<tr>
<td>Undergraduate Thesis Day Brochure Information</td>
<td>Monday, March 28, 2016</td>
<td>Email to <a href="mailto:biochemistryadvisor@mcmaster.ca">biochemistryadvisor@mcmaster.ca</a></td>
</tr>
<tr>
<td>Final Thesis Report</td>
<td>Friday, April 1, 2016</td>
<td>Project Supervisor – hard copy or electronically, based on your supervisor’s preference.</td>
</tr>
<tr>
<td>Oral Presentation 2</td>
<td>Monday, April 11, 2016</td>
<td>Upload to Avenue by 9 am on Friday, April 8, 2016</td>
</tr>
</tbody>
</table>

Course Requirements

Safety Form
All safety training MUST be completed prior to the beginning of lab work. The safety form can be found here [http://fhs.mcmaster.ca/biochem/documents/ThesisandResearchSafetyForm2015.pdf](http://fhs.mcmaster.ca/biochem/documents/ThesisandResearchSafetyForm2015.pdf) under thesis and research courses. This form is worth 5% of your final grade. The form must be fully completed for you to receive 5%. Late forms will lose 1% of the final grade per day. It is the responsibility of the supervisor to ensure that students have all of the required safety training as well as any site specific training that may be needed.

All students, regardless of project type, must complete Technical WHMIS, Office WHMIS, Fire Safety (hospital or campus, depending on the location of your supervisor’s lab/office), Asbestos Awareness, Ergonomics, Slips, Trips, and Falls, Violence and Harassment Program and AODA.
If you project involves you working in a wet lab (i.e., using a pipette or chemicals) for any period of time you must also complete Biosafety (relevant to the level of your lab) and Chemical Handling and Spills.

If your lab or supervisor’s office is in a hospital you need to complete FHS Code Awareness.

Please note that you have already completed some of this training for Biochemistry 2L06 and will probably only need to do updates. If you are unsure of your training status please go to the Mosaic main page and click the Health and Safety Link, then click training summary. You can also visit the safety office, HSC 1J11, to ask for a print out of your training record. Please hand in all completed tests to the safety office.

Training is primarily available online at the following links:

<table>
<thead>
<tr>
<th>Safety Training</th>
<th>Course Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory WHMIS (update)</td>
<td>FHSWHM (FHSWUP)</td>
</tr>
<tr>
<td>Office WHMIS</td>
<td>OFFICE</td>
</tr>
<tr>
<td>FHS Code Awareness</td>
<td>FHSCDA</td>
</tr>
<tr>
<td>Hospital Fire Safety (update)</td>
<td>FHSFSF (FHSFUP)</td>
</tr>
<tr>
<td>Campus Fire Safety</td>
<td>FIRETR</td>
</tr>
<tr>
<td>Asbestos Awareness</td>
<td>ASBEST</td>
</tr>
<tr>
<td>Ergonomics</td>
<td>ERGON</td>
</tr>
<tr>
<td>Slips, Trips, and Falls</td>
<td>SLPTRP</td>
</tr>
<tr>
<td>Chemical Handling and Spills</td>
<td>CHEMHS</td>
</tr>
<tr>
<td>Violence and Harassment Program</td>
<td>VHPW</td>
</tr>
<tr>
<td>AODA</td>
<td><a href="https://pinjap01.mcmaster.ca/accessibility/">https://pinjap01.mcmaster.ca/accessibility/</a></td>
</tr>
<tr>
<td>Biosafety</td>
<td><a href="https://biosafety.mcmaster.ca/biosafety_training_bsl_update.htm">https://biosafety.mcmaster.ca/biosafety_training_bsl_update.htm</a></td>
</tr>
</tbody>
</table>

http://mosaic.mcmaster.ca

Acknowledgement of Previous Work

If a student has previously worked in the lab in which they will be completing Biochemistry 4F09/4T15/Hth Sci 4R12 they must submit an acknowledgement of previous work by the deadline above. Please write a brief paragraph outlining the work that was previously completed. This work cannot be included in any student evaluations or reports without clearly acknowledging that the work was completed outside of their current course.

Initial Meeting Form

Students must arrange to meet with their supervisor to discuss the research project, course requirements, work schedule and their expectations of one another. The student and supervisor should agree to the terms discussed and sign the Initial Meeting Form. This form can be found here: [http://fhs.mcmaster.ca/biochem/documents/InitialMeetingForm.pdf](http://fhs.mcmaster.ca/biochem/documents/InitialMeetingForm.pdf).

Laboratory Performance

The supervisor will complete an evaluation of the student at the end of each term. The results of the evaluation and any comments should be shared with the student. After the mid-term evaluation, the supervisor and the student should sit down to discuss the progress to date and any areas in need of improvement. To ensure the greatest success with their project, students will be expected to spend an adequate number of hours in the laboratory each week. Problem-solving, creativity, innovation, and good experimental technique are the qualities of a good scientist. Students are encouraged to explore alternative interpretations of data or to suggest what line of investigation should be next. Safety in any
laboratory setting is first and foremost. Before performing any protocol, students need to be familiar with the materials, reagents, and possible hazards involved in the experiment. Students must be site-specific trained on all equipment used in the lab.

Lab performance will be evaluated by the supervisor based on the following criteria:

- **Familiarity with relevant literature**
  - Reading and applying concepts learned from research articles
- **Initiative and work habits**
  - Willingness to take on experiments and complete them within the timeframe of the course
- **Progress**
  - Ability to adopt good research practices
- **Data analysis and interpretation**
  - Ability to interpret and troubleshoot data and research
  - Ability to choose appropriate controls
- **Time management**
  - Viable experimental timeline, proper pacing, ensuring all research is not packed into the final weeks
- **Communication skills**
  - Clarity and level of engagement during meeting
- **Other transferable skills**
  - Punctuality, professionalism, lab conduct including maintaining a clean lab area, keeping an up-to-date lab notebook, contributing to lab jobs

**Oral Presentation 1**
The first presentation is a closed forum. Students will be divided into sections and will present to a panel of faculty advisors and their peers. Students must attend ALL presentations in their section, before and after the break. Biochemistry 4F09 presentations will be 10 minutes long with 5-10 minutes of questions afterward. Health Sci 4R12 and Biochemistry 4T15 presentations will be 15 minutes long with 5-10 minutes of questions afterward. Students are encouraged to ask questions of their peers.

This presentation should emphasize:

- **Project objective(s)**
- **Background information to put the research into context within the field**
- **Research plans**
- **Methods used**
- **Research progress to date (if available)**
- **Future work planned**

This presentation should focus on the bolded topics above. All presentations must be created on PowerPoint. Presenters may not use notes and any work completed prior to the start of the course must be acknowledged as such. A laptop and projector will be in each presentation room for use. One copy of the presentation must be uploaded to Avenue to Learn (late penalty, 10%/hour). Please bring a copy of your presentation on a USB drive in case of technical difficulties. If you wish to present a version of your presentation that differs from the one uploaded, please arrive to the presentation room early to upload it onto the computer in the room. If you plan to use any videos during your presentation, please plan on arriving to the presentation room early to verify that they are working correctly.

* 4 *
Students will be evaluated based on the following criteria:

- Understanding of the background
- Understanding of the research problem and its importance
- Knowledge of the experimental approach
- Experimental progress made
- Ability to interpret/analyze results
- Ability to answer questions
- Overall presentation
  - Flow of presentation, clarity and quality of slides, references, grammar and technical language

**Oral Presentation Review**

When not presenting at Oral Presentation 1 (December) each student will be asked to review the other student presentations and provide constructive feedback. Students will upload their completed reviews as a Word or pdf file to the Avenue to Learn dropbox by the date above. This must be submitted before your Oral Presentation 1 mark will be released to you. A sample review form will be available on Avenue to Learn. Students can print out the form to fill in or type comments during the presentation. Please upload typed comments, not photographs of your hand written comments. Comments will be distributed to the presenters so that they can apply the feedback to their next presentation. The identity of the reviewers will be kept anonymous.

You will be asked to comment on the following:

- Write down 2 questions you have pertaining to the research presented
- Comment on the overall flow and content delivery of the presentation
- Were there any slides that were unclear or that you didn’t understand after they were presented?
- Identify at least 2 good aspects and 2 weak aspects of the presentation. Give suggestions about how to improve the weak aspects

**Undergraduate Thesis Day Brochure Information**

Please send the title of your second presentation, the authors, your abstract (~250 words), a biography (no more than 200 words) and a school-appropriate head shot (no selfies) as a Word Document (not pdf) to biochemistryadvisor@mcmaster.ca. The information will be added to our Undergraduate Research Symposium brochure. The authors normally include yourself, your supervisor, and any graduate students or laboratory technicians that helped you with your research. An example will be sent out in March. If you have any questions or concerns, please email biochemistryadvisor@mcmaster.ca.

**Thesis Report**

The report should be submitted to the supervisor by the deadline above. If the student would like a 1-2 day extension it must be worked out between themselves and the supervisor directly. The deadline for the supervisor to submit the grade to the course coordinator cannot be changed so the supervisor must be willing to mark the report in a condensed timeframe.

Below are report guidelines which could be followed by each student. Aside from the page length and overall formatting, the remainders of the guidelines are suggestions to aid in constructing the overall flow of the report. The report should be a continually evolving document, meaning that the student should be working on sections of the report throughout the course. Please do not leave the report for the last minute. Students should consult their lab supervisor for specific guidelines about their report.
**Formatting Guidelines**

- 8.5 x 11 inch paper
- Times New Roman, font size 12, double spaced with 1-inch margins on all sides
- Maximum length – 20 pages. This is not a challenge to write 20 pages, it is the maximum length. This length encompasses all sections from Abstract to Discussion but not References to Figures (see below)
- All pages should be numbered

**Report Sections**

<table>
<thead>
<tr>
<th>Title Page</th>
<th>Should include the title (no more than 2 lines), authors (student name first, supervisor name last, other contributors in between), name of institution, date of submission, and course name.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>Should be clear and concise while summarizing your main finding(s). This section should not exceed 300 words.</td>
</tr>
<tr>
<td>Introduction</td>
<td>Should place your finding in the context of the field. This should not be a long history of the field. Diagrams are extremely useful in this section and should be your own creation, not copied directly from another source.</td>
</tr>
<tr>
<td>Materials and Methods</td>
<td>Should be concise and easy to follow so that another student could repeat your experiments. This section should include information such as buffers used (including concentrations), equipment used, cell lysis methods used, centrifuges used, and primer sequences etc. Guidelines from other lab courses (2L06) may be helpful for this section. This section should be very well referenced.</td>
</tr>
<tr>
<td>Results</td>
<td>Should describe data presented in figures and tables. Ensure that you do not overanalyze or interpret the data in this section.</td>
</tr>
<tr>
<td>Discussion</td>
<td>Designed to interpret the data. This section should include troubleshooting, future experiments, controls that should have been used and what the data means to the field as a whole, when relevant. Ensure that you do not overanalyse or overstate the significance of your data.</td>
</tr>
<tr>
<td>References</td>
<td>Should be cited throughout the text by number, i.e., (1). The references should be consistent with the style used in the lab.</td>
</tr>
<tr>
<td>Abbreviations</td>
<td>Any abbreviations used in the text should be written out in long form the first time they are used in the text. This section should contain all abbreviations used in the report.</td>
</tr>
<tr>
<td>Tables</td>
<td>Should contain a title and short description of the table. Tables normally have the title above the table.</td>
</tr>
<tr>
<td>Figures</td>
<td>Should have titles and captions describing the experiment in enough detail to allow readers to understand the figure without additional text. The figures should be of high quality and include a scale bar when relevant.</td>
</tr>
</tbody>
</table>

The report will be graded using the following criteria:

- Understanding of problem and background information
  - Understanding the context of the problem within the field
- Results
- Interpretation and analysis of results
- Problem Solving
  - If problems were encountered, how were they approached and resolved? Was the troubleshooting proposed feasible and logical?
- Clarity and Overall Impression
  - Flow of ideas, smooth transition between concepts, referencing style, scientific language used etc.

**Oral Presentation 2**
The second presentation is open to the public; graduate students, friends and family are welcome to attend. Students will be once again divided into sections and will present to a panel of faculty advisors and their peers. Students must attend **ALL** presentations in their section, before and after the break. Biochemistry 4F09 presentations will be 10 minutes long with 5-10 minutes of questions afterward. Health Sci 4R12 and Biochemistry 4T15 presentations will be 15 minutes long with 5-10 minutes of questions afterward. Students are encouraged to ask questions of their peers.

All presentations must be created on PowerPoint. Presenters may not use notes and any work completed prior to the start of the course must be acknowledged as such. A laptop and projector will be in each presentation room for use. One copy of the presentation must be uploaded to Avenue to Learn (late penalty, 10%/hour). Please bring a copy of your presentation on a USB drive in case of technical difficulties. If you wish to present a version of your presentation that differs from the one uploaded, please arrive to the presentation room early to upload it onto the computer in the room. If you plan to use any videos during your presentation, please plan on arriving to the presentation room early to verify that they are working correctly.

Students will be evaluated based on the following criteria:
- Understanding of the background
- Understanding of the research problem and its importance
- Knowledge of the experimental approach
- Experimental progress made
- Ability to interpret/analyze results
- Ability to answer questions
- Overall presentation
  - Flow of presentation, clarity and quality of slides, references, grammar and technical language

**University Policies**
**Missed Work or Student Absence**
If you are absent from the university for a minor medical reason, lasting fewer than 3 days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form ([http://mcmaster.ca/msaf/](http://mcmaster.ca/msaf/)). Absences for a longer duration or for other reasons must be reported to the Associate Dean of Science office, with documentation, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to nazii@mcmaster.ca Please note that the MSAF may not be used for term work worth 25% or more, nor can it be used for the final examination.


**Academic Integrity**

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g., the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g., the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations

**Avenue to Learn**

In this course we will be using Avenue to Learn. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster email accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

**Course Modifications**

The instructors and the university reserve the right to alter this outline if necessary. The instructors and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

**Student Accessibility**

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone (905) 525-9140 x28652 or email [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.