The Directed Research courses provide students with the opportunity to carry out full time research in a molecular biology/biochemistry laboratory. The end result will be an honours thesis and an oral defense. Students will submit a research proposal at the end of the second week of classes. They are expected to complete their lab work by the last day of classes and to submit a thesis and defend it during the exam period. The grade for MBB 481-5 is based on the thesis and will reflect the quality of the writing, the demonstration of an understanding of the research project and the ability to clearly document research results. The grade for MBB 482-5 encompasses the research performance component of the Directed Research course and takes into consideration the quality of the research, the motivation of the student and their general intellectual involvement in the project. The grade for MBB 483-5 will reflect the quality of the oral presentation, the student’s understanding of the research project in the context of the research field, their ability to clearly describe research results and to answer questions.

Prerequisites: MBB 308, MBB 309W and MBB 331, enrollment in the MBB or Biological Physics Honours Program, a minimum cGPA and udGPA of 3.0 and permission of the MBB department. Note that students cannot hold an NSERC or VPR USRA while taking MBB 481/2/3, nor should they be enrolled in additional courses.

- Find a faculty member willing to supervise you in this course.
- In consultation with your supervisor, fill out the Letter of Intent (LOI) form (next page) describing the research goal(s) and outlining possible experiments for your proposed project.
- You and your supervisor will recruit two other faculty members to serve on a committee, which will determine your grade in the course. At least one member of the committee must be an MBB faculty member.
- Sign this cover page and obtain signatures from your supervisor and other committee members.
- Submit the signed cover page, LOI and a copy of your advising transcript to the MBB office. You will be registered for these courses once the application has been approved by the Chair of the MBB Departmental Undergraduate Curriculum Committee (DUCC).

Student: ___________________________ (print and sign name)
Student Number: ___________________ E-mail address: ___________________________
Faculty Supervisor*: _______________________________ (print and sign name†)
Committee member*: _____________________________ (print and sign name†)
Committee member*: _____________________________ (print and sign name†)
DUCC Chair _______________________________ Date: ______________

*Committee members: By signing this form you indicate that you approve of the LOI and agree to serve as supervisor/committee member. This entails providing feedback on the research proposal, evaluating the thesis and participating in and grading the oral defense, which will be held during the final exam period. If you will not be available during this time you must inform the student, who may wish to find another committee member. In some cases the oral defense may be deferred until the first week of classes for the following semester, but this should be established before the application is finalized.

† or email confirmation to the student, the supervisor, the MBB Undergraduate Program Assistant (mbbugrad@sfu.ca) and the DUCC Chair (mbb_ducc@sfu.ca)

Revised: March 11, 2020
### Background (Why is this research important?)


### Research Question (What question are you trying to answer?)


### Scientific approach (How will you attempt to answer this question?)

Resize sections as needed within a single page. Use 11 pt font size.

Revised: March 11, 2020
Registration in MBB 481/482/483: In the semester preceding your Directed Research semester you will find a supervisor who is an MBB faculty member, MBB associate or adjunct faculty member. The supervisor may be a member of another department pending approval by the DUCC Chair. You and your supervisor will recruit two other faculty members to serve on a committee, who will assess your performance and determine your grade in the course. At least one member of the committee should be MBB faculty. Your prospective supervisor will suggest ideas for your research project and help you to prepare a Letter of Intent (LOI) using the form provided. The LOI is a brief description of the background for the project, the question you are planning to address and the methods you will use to try to answer this question. Email the LOI to your committee members, who will read and approve this document and sign the application form. Submit the signed application form, LOI and transcripts to the MBB office, ideally by the last day of exams of the preceding semester, for approval by the DUCC Chair. Once your application is approved you will be registered in these courses.

Course plan: Your supervisor will outline expectations regarding lab work. Typically, a 15 unit Directed Research course means working full-time on your project (35-40 hours per week). You should keep a careful record of your experimental work. You will likely attend lab meetings at which you may be asked to present your plan and progress. Your grade for MBB 482 will be based on your lab performance. Students are required to take the lab facilities tour and the complete set of SFU safety workshops; these are typically scheduled in the second week of each semester.

Within the first few weeks of the semester students should arrange with their committee a time and place for the oral thesis defense, which typically occurs during the final exam period.* Email this information to the MBB Undergraduate Program Assistant (mbbugrad@sfu.ca). Further information regarding defense scheduling can be found at the MBB Honours Program website.

Research proposal: By the end of the second week of classes you should have completed a research proposal that is emailed to the committee and to mbbgrad@sfu.ca. The proposal, prepared in consultation with your supervisor, describes background information, the research question, your hypothesis, specific aims to test the hypothesis, the scientific approach and the expected outcome (maximum of 5 pages of double-spaced text, plus figures and references). It may be helpful to include a timeline of experimental goals through the semester. Sample proposals are available in the MBB office. The proposal is not graded but you should receive feedback from your committee members by the end of week 4. You are encouraged to seek feedback if it is not provided.

Honours thesis: Lab work should be completed by the last day of classes† but you may begin at any time during the semester to write your thesis starting with the background. The thesis builds on your Research Proposal and is typically organized as Abstract, Introduction (including hypothesis and aims), Methods, Results and Discussion/Conclusions. It may include a prospectus (future experiments). More detailed information on thesis preparation can be found at the MBB Honours Program website. The thesis should be emailed to committee members 3 working days before your thesis defense. Your grade for MBB 481 will be based on your thesis.

Thesis defense: You will give a 30-minute presentation on your research to your committee and to interested members of the department/public. This talk typically follows the outline of your thesis (intro, methods, results, discussion). Your presentation will be followed by questions from your committee. Your performance in this thesis defense will constitute your mark for MBB 483. At the end of the defense you will receive 3 grades:

- MBB 481-5 Honours Thesis – final written report
- MBB 482-5 Research Performance – quality of research, motivation, intellectual involvement
- MBB 483-5 Honours Thesis Defense - oral presentation and discussion

*In some circumstances the supervisor or committee members may not be available during the exam period. In this case the defense can be scheduled no later than the fifth day of classes of the following semester provided this is acceptable to all parties.
†The intention of directed research courses is to educate students and provide hands-on experience in a research setting. While it is desirable to achieve all research goals this is not always possible in the 13-week time frame due to the unpredictable nature of research. Nonetheless, the laboratory component of the course is expected to end by the last day of classes and students should write their thesis with the results they have obtained to that point. If desired, students can request a short extension to their research term from the DUCC Chair (mbb_ducc@sfu.ca). Students may opt to continue their research on a volunteer or paid basis or through MBB 498-3, with the consent of their supervisor.

Revised: March 11, 2020