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Change to Program/Graduate Diploma Academic Requirements Proposal Template

The following information is required for all proposals involving a change to program/graduate diploma academic requirements, including admission requirements. To facilitate the review/approval process, please use the headings below (and omit the italicized explanations below each heading).

1. Program/Graduate Diploma: MSc and PhD, Biology

2. Effective Session of Proposed Change(s): 2019-20

3. Proposed Change(s) and Rationale

The description of and rationale for the proposed change(s) should provide information with respect to each of the following points. Please provide:

a) A description of the proposed change(s) and rationale, including alignment with academic plans.

About 8 years ago, the Department of Biology introduced a Graduate Seminar Series that was a mandatory degree requirement. It is folded into the Research Progress Evaluation 'courses' in the winter term, which is a non-credit pass/fail course for MSc years 1 & 2 (BIOL 6021 & 6022), and PhD 1-4 (BIOL 7021-7024). In addition to their annual research progress report and meeting each April, MSc students must give one presentation in the Graduate Seminar Series and PhD must give 2 presentations at the Graduate Seminars. Students are expected to attend ~70% of talks unless they have a documented scheduling conflict. A faculty member is assigned to instruct/manage the course and Faculty of Science sometimes invites outside speakers to address the group.

The learning objective was to provide students with training in speaking skills and provide a student-friendly forum for students to learn of each other's research.

The seminar format was initially a standard 15-min conference style presentation. Two years ago, the Department changed the format to the 3 Minute Thesis format to better develop speaking skills for a general audience and allow students to better understand the research being presented. The seminar series has 5-6 meetings (one-hour each) in the winter term.

A core question is whether the giving one (MSc) or two (PhD) short seminars during the Graduate Seminars should be a mandatory degree requirement. Biology graduate students already receive much training in communication skills through their course work and research evaluations and there are now many communication skills training opportunities on campus for graduate students.

Mandatory Requirements:

Biology MSc students must take 6 credits of graduate courses, including a mandatory 'critical skills' course in their field of speciality. Biology graduate courses include training in speaking and writing skills.

Biology students must present a short research seminar at two supervisory committee meetings in their first year, and at one meeting per year thereafter. They also present a research seminar at the thesis defense, followed by questions from the examining committee. Ph.D. students also have a preliminary examination in their second year which includes an oral presentation and answering questions from the examining committee.

Other Opportunities:

Many Biology supervisors run weekly lab meetings that include student presentations and discussions.

Many Biology students present their research at regional, national and international conferences

The Association of Graduate Students in Biological Sciences runs its own conference each spring that includes poster presentations by graduate students, and which requires discussing the poster with judges.

Graduate students are encouraged to attend the weekly Department of Biology seminars which feature invited researchers from other departments and Universities.

The Department of Biology has recently produced a Professional Skills checklist to guide graduate students on the many skills they can build during their degree program, and what opportunities exist both within and outside the Biology department.

Faculty of Science runs a Let's Talk Science program which provides graduate students with an opportunity to speak to laypersons and high school students about research

FGS now offers a 3MT training class and competition and other communication workshops.

Teaching Commons now offers many workshops related to effective communication as a Teaching Assistant.

In terms of student relations, the AGSBS is a very active student group that fosters student interaction and mentoring. In addition, the open lab environment of Life Sciences Building and newly renovated Farqharson facilitates inter-lab communication and collaboration.

b) An outline of the changes to requirements and the associated learning outcomes, including how the proposed requirements will support the achievement of program/graduate diploma learning objectives.

Learning outcomes for MSc and PhD are attached here. Removal of the Graduate Seminars as a degree requirement will not alter learning outcomes.

c) An overview of the consultation undertaken with relevant academic units and an assessment of the impact of the modifications on other programs/graduate diplomas. (*Where and as appropriate, the proposal must include statements from the relevant program/graduate diplomas confirming consultation/support*.)

Biology Graduate Committee (18 Sept 2018) unanimously supported removing the Graduate Seminars as a degree requirement.

A motion to discontinue the graduate seminars as a Biology MSc and PhD degree requirement was passed by Dept. of Biology on 6 Nov 2018.

d) A summary of any resource implications and how they are being addressed. (*Attention should be paid to whether the proposed changes will be supported by a reallocation of existing resources or if new/additional resources are required. If new/additional resources are required, the proposal must include a statement from the relevant Dean(s)/Principal.*)

The faculty member normally assigned to run the seminar series could instead teach a 1.5 credit graduate course, increasing the breadth of courses available to our MSc students in a given year.

e) A summary of how students currently enrolled in the program/graduate diploma will be accommodated.

Starting in 2019-20, students would not longer be required to present seminars at a dedicated Graduate Seminar series.

4. Calendar Copy

Using the following two-column format, provide a copy of the relevant program/graduate diploma requirements as they will appear in the graduate Calendar.

Existing Program/Graduate Diploma Information (change from)	Proposed Program/Graduate Diploma Information (change to)
The Graduate Program in Biology offers programs leading to the Master of Science degree (by research thesis) and the Doctor of Philosophy degree (by research dissertation). Details of each program are described below. **AREAS OF RESEARCH** **Research in the Biology graduate program is focused on several broad areas including cell and molecular biology; population biology; vertebrate, invertebrate and plant physiology and animal behaviour. This focus ensures that within each area there is a critical mass of interacting people and shared resources to produce a strong research environment. Within the research areas, faculty members work on a diversity of research problems, the range of which can best be seen by consulting the detailed descriptions on the Biology website.** **MASTER OF SCIENCE PROGRAM ADMISSION REQUIREMENTS** ***At the master's level, students work closely with a supervisor and their research is supported by that supervisor. Thus, no student is accepted into the program unless a faculty member agrees to supervise that student.*** **Graduates with a four-year bachelor's degree in biological science or its equivalent, with at least a B+ average in the last two years of study, may**	**The Graduate Program in Biology offers programs leading to the Master of Science degree (by research thesis) and the Doctor of Philosophy degree (by research dissertation). Details of each program are described below.** **AREAS OF RESEARCH** **Research in the Biology graduate program is focused on several broad areas including cell and molecular biology; population biology; vertebrate, invertebrate and plant physiology and animal behaviour. This focus ensures that within each area there is a critical mass of interacting people and shared resources to produce a strong research environment. Within the research areas, faculty members work on a diversity of research problems, the range of which can best be seen by consulting the detailed descriptions on the Biology website.** **MASTER OF SCIENCE PROGRAM ADMISSION REQUIREMENTS** ***At the master's level, students work closely with a supervisor and their research is supported by that supervisor. Thus, no student is accepted into the program unless a faculty member agrees to supervise that student.*** **Graduates with a four-year bachelor's degree in biological science or its equivalent, with at least a B+ average in the last two years of study, may**

be admitted as candidates for the Master of Science degree. Each candidate selects a faculty supervisor on the basis of their mutual research interests and a supervisory committee (usually consisting of the supervisor and one other faculty member with similar research interests) is appointed by the graduate program to supervise and monitor the student's progress.	**be admitted as candidates for the Master of Science degree. Each candidate selects a faculty supervisor on the basis of their mutual research interests and a supervisory committee (usually consisting of the supervisor and one other faculty member with similar research interests) is appointed by the graduate program to supervise and monitor the student's progress.**
QUALIFYING YEAR **Graduates lacking the necessary undergraduate preparation may qualify for admission as undergraduate special students in the Faculty of Science. These admissions are dealt with by the undergraduate Admissions Office. Students are advised to take the equivalent of at least three, and up to five full courses. Students are advised to consult with potential graduate supervisors in selecting the courses to be taken, and are advised to have at least a C average before attempting such a program. *Note:* Successful completion of a year as a Special Student does not guarantee admission to the graduate program.**	**QUALIFYING YEAR** **Graduates lacking the necessary undergraduate preparation may qualify for admission as undergraduate special students in the Faculty of Science. These admissions are dealt with by the undergraduate Admissions Office. Students are advised to take the equivalent of at least three, and up to five full courses. Students are advised to consult with potential graduate supervisors in selecting the courses to be taken, and are advised to have at least a C average before attempting such a program. *Note:* Successful completion of a year as a Special Student does not guarantee admission to the graduate program.**
MSc Degree by Research Thesis	**MSc Degree by Research Thesis**
Candidates for the MSc degree by research thesis must fulfil the following requirements:	**Candidates for the MSc degree by research thesis must fulfil the following requirements:**
1. Courses **a) All entering student plan a research program with their supervisor at the start of their degree studies. Progress in research is monitored by the supervisory committee through meetings with the student and by a progress report consisting of a written paper and attendance at the graduate seminar series and one presentation during the degree program. Satisfactory progress in research results in credit for Biology 6021 3.0/6022 3.0: MSc Research Evaluation and a statement of the student's progress in the student's record. In the event of failure to achieve satisfactory progress, the student will normally be required to withdraw from the program.** **b) In addition to MSc Research Evaluation, each MSc student must take a minimum of 6 credits from Biology graduate courses including one of Biology 5038 1.5: Current Topics in Molecular and Cellular Biology, Biology 5086 1.5: Critical Skills in Ecology and Evolution, or Biology 5100**	**1. Courses** **a) All entering student plan a research program with their supervisor at the start of their degree studies. Progress in research is monitored by the supervisory committee through meetings with the student and by a progress report consisting of a written paper ~~and attendance at the graduate seminar series and one presentation during the degree program.~~ Satisfactory progress in research results in credit for Biology 6021 3.0/6022 3.0: MSc Research Evaluation and a statement of the student's progress in the student's record. In the event of failure to achieve satisfactory progress, the student will normally be required to withdraw from the program.** **b) In addition to MSc Research Evaluation, each MSc student must take a minimum of 6 credits from Biology graduate courses including one of Biology 5038 1.5: Current Topics in Molecular and Cellular Biology, Biology 5086 1.5: Critical Skills in Ecology and Evolution, or Biology 5100**

1.5: Critical Skills in Animal Physiology. MSc students in the Graduate Diploma in Neuroscience may take Biology 5146 3.0: Fundamentals in Neuroscience I in lieu of Biology 5038 1.5, Biology 5086 1.5 or Biology 5100 1.5.
c) Students may be required to take up to two full undergraduate courses (or equivalent) in biological science if this is necessary to strengthen the student's background.

2. Thesis and Oral Examination
Candidates must conduct a laboratory or field research project and report the results in appropriate thesis form. The research and thesis should demonstrate the candidate's independence, originality, and understanding of the area of investigation. After the formal submission of the thesis, an oral examination is held, normally centering on the thesis and matters related to it. The thesis should be of a quality normally associated with published material. The total length of the thesis should not exceed 100 pages unless previously authorized by the supervisory committee. Prior to submission to the graduate Faculty, the thesis must be presented to, and approved by, a majority of the program members of the examining committee.

NORMAL TIME LIMITS
Full-time candidates should normally complete all requirements for the MSc degree in biology within two years of full time study. Subsequent years will be permitted only as a part-time student.

DOCTOR OF PHILOSOPHY PROGRAM ADMISSION REQUIREMENTS

At the PhD level, students work closely with a supervisor, and their research is supported by that supervisor. Thus, no student is accepted into the program unless a faculty member agrees to supervise that student.

Graduates from a recognized university with a master's degree or equivalent in biological sciences, with at least a B+ average, or with a medical degree, may be admitted as candidates (PhD I) in a program of study and research leading to the PhD degree. Each candidate selects a faculty supervisor on the

1.5: Critical Skills in Animal Physiology. MSc students in the Graduate Diploma in Neuroscience may take Biology 5146 3.0: Fundamentals in Neuroscience I in lieu of Biology 5038 1.5, Biology 5086 1.5 or Biology 5100 1.5.
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DOCTOR OF PHILOSOPHY PROGRAM ADMISSION REQUIREMENTS

At the PhD level, students work closely with a supervisor, and their research is supported by that supervisor. Thus, no student is accepted into the program unless a faculty member agrees to supervise that student.

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basis of their mutual research interests and a supervisory committee (usually consisting of the supervisor and two other faculty members with similar research interests) is appointed by the graduate program to supervise and monitor the student's progress.	**basis of their mutual research interests and a supervisory committee (usually consisting of the supervisor and two other faculty members with similar research interests) is appointed by the graduate program to supervise and monitor the student's progress.**
Graduates with an honours bachelor's degree, or equivalent, in one of the biological sciences, who have at least a B+ standing at the undergraduate level may be considered for admission to the PhD program. Normally, however, such graduates must first register as candidates for the MSc degree. MSc students may request advancement in status to candidates (PhD 1) for the PhD degree, without completing the requirements for the MSc degree.	**Graduates with an honours bachelor's degree, or equivalent, in one of the biological sciences, who have at least a B+ standing at the undergraduate level may be considered for admission to the PhD program. Normally, however, such graduates must first register as candidates for the MSc degree. MSc students may request advancement in status to candidates (PhD 1) for the PhD degree, without completing the requirements for the MSc degree.**
Their progress during the first year must be deemed excellent by their supervisory committee and the Graduate Program Director. Candidates wishing to make this change must pass the PhD preliminary examination (see below) within 20 months of registering for the MSc degree.	**Their progress during the first year must be deemed excellent by their supervisory committee and the Graduate Program Director. Candidates wishing to make this change must pass the PhD preliminary examination (see below) within 20 months of registering for the MSc degree.**
DEGREE REQUIREMENTS	**DEGREE REQUIREMENTS**
All Candidates for the PhD degree program must fulfil the following requirements: **1. Courses** **a) All entering students plan a research program with their supervisor at the start of their degree studies. Progress in research is monitored by the supervisory committee through meetings with the student and by a progress report consisting of a written paper and attendance at the graduate seminar series and two presentations during the degree program. Satisfactory progress in research results in credit for Biology 7021 3.0/7022 3.0/7023 3.0/7024 3.0: PhD Research Evaluation and a statement of the student's progress in the student's record. In the event of failure to achieve satisfactory progress, the student will normally be required to withdraw from the program.** **b) Students may be required to take a maximum of 6 credits of graduate courses (or equivalent) in biological sciences, if this is deemed necessary to strengthen the student's background. Students who transfer internally**	**All Candidates for the PhD degree program must fulfil the following requirements:** **1. Courses** **a) All entering students plan a research program with their supervisor at the start of their degree studies. Progress in research is monitored by the supervisory committee through meetings with the student and by a progress report consisting of a written paper ~~and attendance at the graduate seminar series and two presentations during the degree program~~. Satisfactory progress in research results in credit for Biology 7021 3.0/7022 3.0/7023 3.0/7024 3.0: PhD Research Evaluation and a statement of the student's progress in the student's record. In the event of failure to achieve satisfactory progress, the student will normally be required to withdraw from the program.** **b) Students may be required to take a maximum of 6 credits of graduate courses (or equivalent) in biological sciences, if this is deemed necessary to strengthen the student's background. Students who transfer internally**

from the MSc to PhD program must have completed the 6 credit course requirements for the MSc. **c) Students may be required to take a maximum of two full undergraduate courses (or equivalent) in biological sciences, if this is necessary to strengthen the student's background.**	**from the MSc to PhD program must have completed the 6 credit course requirements for the MSc.** **c) Students may be required to take a maximum of two full undergraduate courses (or equivalent) in biological sciences, if this is necessary to strengthen the student's background.**
2. Preliminary Examination **Candidates (PhD II) must satisfactorily pass a preliminary examination before advancing in status to candidates (PhD III). The objectives of this examination are to determine whether:** **a) the Candidate has adequate background and intellectual ability to pursue independent research in the field approved by the supervisory committee;** **b) the proposed research is suitable for a PhD research program; and,** **c) the candidate has demonstrated aptitude for conducting the proposed research by means of adequate progress and productivity. During the two to three hour oral examination, based on a substantial written proposal and progress report, students must demonstrate adequate knowledge and understanding of the proposed research field, and the broader areas of knowledge related to the field. The examination will be conducted by the student's supervisory committee plus two other faculty members from within the program.**	**2. Preliminary Examination** **Candidates (PhD II) must satisfactorily pass a preliminary examination before advancing in status to candidates (PhD III). The objectives of this examination are to determine whether:** **a) the Candidate has adequate background and intellectual ability to pursue independent research in the field approved by the supervisory committee;** **b) the proposed research is suitable for a PhD research program; and,** **c) the candidate has demonstrated aptitude for conducting the proposed research by means of adequate progress and productivity. During the two to three hour oral examination, based on a substantial written proposal and progress report, students must demonstrate adequate knowledge and understanding of the proposed research field, and the broader areas of knowledge related to the field. The examination will be conducted by the student's supervisory committee plus two other faculty members from within the program.**
For students entering the program with a Master's degree, the examination must be held within 18 months after the student becomes a candidate (PhD I). For students converting from a master's to a PhD program, the examination must also be held within 20 months of first registering in the master's program. The examination in this case is conducted by the student's supervisory committee plus three other faculty members from within the program. If the preliminary examination fall within two months of the annual progress reports, the student is exempt from such a report that year.	**For students entering the program with a Master's degree, the examination must be held within 18 months after the student becomes a candidate (PhD I). For students converting from a master's to a PhD program, the examination must also be held within 20 months of first registering in the master's program. The examination in this case is conducted by the student's supervisory committee plus three other faculty members from within the program. If the preliminary examination fall within two months of the annual progress reports, the student is exempt from such a report that year.**
3. Dissertation and Oral Examination **Candidates must prepare and submit a suitable dissertation based on original research carried out under the supervision of a supervisory committee. The research should demonstrate**	**3. Dissertation and Oral Examination** **Candidates must prepare and submit a suitable dissertation based on original research carried out under the supervision of a supervisory committee. The research should demonstrate**

the candidate's independence, originality, and understanding of the area of investigation at an advanced level. After the formal submission of the dissertation, an oral examination is held, normally centering on the dissertation and matters related to it. The total length of the dissertation should not exceed 200 pages unless previously authorized by the supervisory committee. Prior to submission to the graduate Faculty, the dissertation must be presented to, and approved by, a majority of the program members of the examining committee.	**the candidate's independence, originality, and understanding of the area of investigation at an advanced level. After the formal submission of the dissertation, an oral examination is held, normally centering on the dissertation and matters related to it. The total length of the dissertation should not exceed 200 pages unless previously authorized by the supervisory committee. Prior to submission to the graduate Faculty, the dissertation must be presented to, and approved by, a majority of the program members of the examining committee.**
NORMAL TIME LIMITS **Candidates may expect to spend, on the average, between three and five years to complete the requirements for the PhD degree.**	**NORMAL TIME LIMITS** **Candidates may expect to spend, on the average, between three and five years to complete the requirements for the PhD degree.**

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Learning Outcomes for Biology MSc and PhD (from 2015 Cyclical Program Review)

Master of Science in Biology Degree Level Expectations and Program Map	Level of Learning Outcomes (R: reinforces BSc outcomes, P: professional level)										
Core Competencies	**Assessment**	**Committee Meeting I (Term 1)**	**FGS Research Proposal (Term 2)**	**Research Progress Evaluation I (Term 2)**	**Graduate Student Seminars -attendance Terms 1 & 2**	**Graduate Courses**	**Thesis Research**	**Committee Meeting II (Term 4)**	**Graduate Student Seminars -presentation (Year 2)**	**Research Progress Evaluation II (Term 5)**	**Thesis Writing and Submission**	**Thesis Defense**
A. Depth and Breadth of Knowledge												
A1. Demonstrate a broad understanding of the important and recent concepts and methodologies within a particular area of biology, including knowledge from other disciplines where appropriate.	seminars, literature reviews, group discussion, Research Progress Evaluation, thesis, thesis defense			R		R				P	P	P
B. Research and Scholarship												
B1. Carry out publication-quality research to answer an important biological question, using appropriate methodological, experimental and statistical approaches.	Research Progress Evaluation, thesis defense	R	R	R			R	R	P	P	P	P
B2. Gather, organize, synthesize and critically evaluate information from scientific literature.	seminars, literature reviews, Research Progress report, thesis	R	R	R		R		R	P	P	P	P
B3. Present research goals, methods, results and interpretation in the form of a Master's thesis.	thesis approval for defense, thesis defense			R					R	P	P	P
C. Level of Application of Knowledge												
C1. Identify or validate a research question and experimental design through a critical review of recent scientific literature	Research Progress Evaluation	R	R	R					P	P	P	P
D. Professional capacity/autonomy												
D1. Demonstrate the interpersonal skills, professional responsibility, integrity and independent learning required for employment or continued research and education in Biology or a related discipline	course seminars, course group discussions, student seminar, Research Progress Evaluations			R	R	R	R			P	P	P
D2. Successfully conduct biological research in a safe and ethical manner	Research Progress Evaluation						R			P	P	P
E. Level of Communication Skills												
E1. Speak and write with high effectiveness; communicate biological concepts and data clearly to peers, the general public and a scientific audience, orally and in writing.	course seminars and papers, student seminar series, Research Progress Evaluation, thesis	R	R	R	R	R		R	R	P	P	P
F. Awareness of limits of knowledge												
F1. Describe, analyze and discuss the methodological and conceptual limitations of research findings in the field of study.	literature reviews, thesis				R	R			R		P	P

To cease as of 2019-20

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Core Competencies - PhD Biology	Assessment	Committee Meeting I (Term 1)	FGS Research Proposal (Term 2)	Research Progress Evaluation I (Term 2)	Graduate Student Seminars - attendance & 2 presentations	Graduate Courses (Year 1, optional)	Thesis Research	Committee Meeting II (Term 4)	Research Progress Evaluation II (Term 5)	Committee Meetings (Years 3-5)	Research Progress Evaluations(Years 3-5)	Dissertation Writing and Submission	PhD Thesis Defense
A. Depth and Breadth of Knowledge													
A1. Demonstrate in depth and advanced understanding of the important and recent concepts and methodologies within a particular field of biology, including knowledge from other disciplines	student seminars, Research Progress Evaluation, thesis, thesis defense			R		R			R		P	P	P
B. Research and Scholarship													
B1. Carry out advanced research and answer novel questions in biology, by developing and applying appropriate methodological, experimental, and statistical techniques.	Research Progress Evaluation, thesis defense	R	R	R			R	R	R	P	P	P	P
B2. Gather, organize, synthesize and critically evaluate information from scientific literature.	seminars, Research Progress report, thesis	R	R	R		R		R	R	P	P	P	P
B3. Present research goals, methods, results and interpretation in the form of a doctoral thesis that is high enough caliber to merit publication	thesis approval for defense, thesis defense			R				R	R	R	R	P	P
C. Level of Application of Knowledge													
C1. Identify a novel and important research question and appropriate methodology through a critical review of recent scientific literature	Research Progress Evaluation	R	R	R				R	R	P	P	P	P
C2. Develop new methodologies and experimental designs, as necessary, to advance the field of study	Thesis research						R				P	P	P
D. Professional capacity/autonomy													
D1. Conduct independent biological research with integrity, applying professional standards of safety and ethical behaviour.	group discussions, Research Progress Evaluations			R		R	R		R		P	P	P
E. Level of Communication Skills													
E1. Speak and write with excellence; explain complex biological concepts and data effectively to the general public and to a scientific audience.	Research Progress Evaluation, student seminars	R	R	R	R	R		R	R	P	P	P	P
F. Awareness of limits of knowledge													
F1. Critically reflect on the methodological and conceptual limitations of one's own research, and that of peers.	Research Progress Evaluation, student seminars				R	R				P	P	P	P

To cease as of 2019-20