



FOR APPROVAL

PUBLIC

OPEN SESSION

TO: UTSC Academic Affairs Committee

SPONSOR: William Gough, Vice-Principal Academic and Dean
CONTACT INFO: 416-208-7027, vpdean@utsc.utoronto.ca

PRESENTER: Mark Schmuckler, Vice-Dean Undergraduate
CONTACT INFO: 416-208-2978, vdundergrad@utsc.utoronto.ca

DATE: April 25, 2019 for May 2, 2019

AGENDA ITEM: 2

ITEM IDENTIFICATION:

Category 2 Certificate: Certificate in Biological Sciences Research Excellence

JURISDICTIONAL INFORMATION:

University of Toronto Scarborough Academic Affairs Committee (AAC) “is concerned with matters affecting the teaching, learning and research functions of the Campus” (*AAC Terms of Reference, Section 4*). Under section 5.6 of its terms of reference, the Committee is responsible for approval of “Major and minor modifications to existing degree programs.”

The AAC has responsibility for the approval of Major and Minor modifications to existing programs as defined by the University of Toronto Quality Assurance Process (*UTQAP, Section 3.1*). Category 2 Certificates follow the protocols for the approval and closure of minor modifications [*Policy on Certificates (For Credit and Not-for-Credit), February 25, 2016*].

GOVERNANCE PATH:

1. UTSC Academic Affairs Committee [For Approval] (May 2, 2019)

PREVIOUS ACTION TAKEN:

No previous action in governance has been taken on this item.

HIGHLIGHTS:

The Department of Biological Sciences at the University of Toronto Scarborough (UTSC) is proposing a new Category 2 Certificate: Certificate in Biological Sciences Research Excellence.

Category 2 Certificates are for-credit and are offered in conjunction with an undergraduate program. Completion of the Certificate is recorded on the students' academic transcript.

The Department of Biological Sciences is committed to providing undergraduate students with an education that exposes them in a meaningful way to primary research, and to the creative application of scientific knowledge. It currently offers three levels of directed research courses – BIOB98H3/B99H3, BIOC99H3 and BIOD98Y3/99Y3. These courses give students the opportunity to demonstrate their dedication to learning through research experiences, however, they do not fulfill core program requirements in many undergraduate programs in the Biological Sciences; hence, students registered in such courses earn only degree level credits.

The proposed Certificate will acknowledge the exceptional efforts of students who commit to research experiences at these three levels and recognize students committed to gaining research experience throughout their undergraduate program. The Department is committed to maintaining broad access to these research opportunities, in line with their vision of training scientists who will be well equipped for both graduate study and research careers.

There are a number of benefits to formalizing the Department's research experience courses as a Category 2 Certificate. First, a research certificate would be an attractive recruiting tool and a way to highlight available opportunities; and formal recognition of the completion of research-focused courses will be attractive to students. Second, it may encourage more students to take advantage of the research experience courses that the Department offers. Third, the proposed Certificate will differentiate Biological Sciences as a place for experiential learning since it will be one of the few departments that offer three levels of research opportunity courses.

There is strong student interest in completing multiple research opportunity courses. The Department anticipates that 7-10 students are likely to complete the proposed Certificate in the first year of its introduction, based on the current number of students in BIOD98Y3/D99Y3 that have also completed BIOB98H3. However, given the considerable interest from both current and prospective students in research opportunities, the Department anticipates a large increase in the demand for the proposed Certificate in future years.

The proposed Certificate was developed within the Department of Biological Sciences with extensive input from its faculty. The Department has also consulted with UTSC

liaison librarians. This proposal has been reviewed by the Dean's Office, the Office of the Vice-Provost, Academic Programs, and the UTSC Campus Curriculum Committee.

FINANCIAL IMPLICATIONS:

There are no net financial implications to the campus operating budget.

RECOMMENDATION:

Be It Resolved,

THAT the proposal to introduce a new (Category 2) Certificate in Biological Sciences Research Excellence, as described in the proposal dated March 29, 2019 and recommended by the Vice-Principal, Academic and Dean, William Gough, be approved effective as of Fall 2019 for the 2019-20 academic year.

DOCUMENTATION PROVIDED:

1. Proposal to introduce a new Certificate in Biological Sciences Research Excellence, dated March 29, 2019.

University of Toronto Proposal to Create a Certificate in Conjunction With an Undergraduate Program

Proposed certificate name: E.g., Certificate in Human Resources Management (Faculty of Arts & Science)	Certificate in Biological Sciences Research Excellence (University of Toronto Scarborough)
Undergraduate degree(s) the certificate will be offered in conjunction with:	Honours Bachelor of Science (BSc)
Academic unit:	Department of Biological Sciences
Faculty/academic division:	University of Toronto Scarborough (UTSC)
Dean's office contact:	Annette Knott, aknott@utsc.utoronto.ca
Version date:	March 29, 2019

1 Summary

The Department of Biological Sciences at the University of Toronto Scarborough (UTSC) is proposing a new Category 2 Certificate, titled: Certificate in Biological Sciences Research Excellence.

The Department currently offers three levels of directed research courses – BIOB98H3/B99H3, BIOC99H3 and BIOD98Y3/99Y3 – which were created in response to significant student interest in research opportunities. These courses serve as exemplars of the Department's commitment to experiential learning, and they give students the opportunity to demonstrate their dedication to learning through research experiences. These courses do not, however, fulfill core program requirements in many undergraduate programs in the Biological Sciences; hence, students registered in such courses earn only degree level credits.

To acknowledge the exceptional efforts of students who commit to research experiences at these three levels, the Department is proposing the Certificate in Biological Sciences Research Excellence. Training in biological research requires sustained opportunities to engage with research projects in multiple sub-disciplines. This Certificate will recognize students committed to gaining research experience throughout their undergraduate program. The Department is committed to maintaining broad access to these research opportunities, in line with their vision of training scientists who will be well equipped for both graduate study and research careers.

2 Effective Date

Fall 2019

3 Academic Rationale

The Department of Biological Sciences at the University of Toronto Scarborough (UTSC) is proposing a new Category 2 Certificate, titled: Certificate in Biological Sciences Research Excellence.

Students and faculty recognize the value of early research experiences in biology. Hence, the Department is committed to providing undergraduate students with an education that exposes them in a meaningful way to primary research, and to the creative application of scientific knowledge.

In Biological Sciences, an important means by which this goal has traditionally been achieved is through providing all students in the Department’s programs access to upper year courses that expose them to primary research and application of scientific knowledge. Programs in the Biological Sciences are built so that students do not need to complete an independent research project in order to prepare for professional schools, graduate programs or the work force. Some students complete a 4th year thesis project course where they engage in an independent research project (over 8 months) within the PI’s research lab, giving them a chance to interact directly with a faculty member, or early-career scientist such as a graduate student and/or postdoctoral fellow. The Department considers this value added to their degree and not a requirement for an exceptional learning experience. In addition, over the years the Department has added two more research opportunity courses: a B-level course (credit/no credit) and a C-level team research course (see table below for summary and brief description of available courses).

Table 1. Research Opportunity Courses in Biological Sciences.

Course Code	Who the Student Regularly Interacts With	Activity of the Student	Evaluation of the Student	Course Prerequisites/Other Requirements
BIOB98/99H3 Supervised Introductory Research in Biology (0.5 FCE)	1. Faculty member who has agreed to act as course instructor. 2. Graduate student, postdocs, or RA from instructor’s research group.	Aiding in a scientist’s ongoing research project (72 hours minimum)	Credit/No Credit	At least 4.0 credits; enrolled in a Biological Sciences program. BIOB99H3 is taken if students are interested in completing a second project at the B level

<p>BIOC99H3 Biology Team Research (0.5 FCE)</p>	<p>1. A teaching assistant and several other undergraduate students that comprise a <i>team</i>. 2. Faculty member who has agreed to act as course instructor.</p>	<p>Team activity to plan a research project and, in some cases, pursue aspects of the project using the faculty member's research infrastructure.</p>	<p>Evaluation of term work by the teaching assistant and course instructor. Individual written reports. Team presentation to TA and instructor. Numerical grade.</p>	<p>Completed Biology Core (BIOB10H3, BIOB11H3, BIOB34H3, BIOB38H3, BIOB50H3, BIOB51H3 and one of BIOB12H3, BIOB32H3, BIOB33H3 or BIOB52H3 enrolled in a Biological Sciences program; and have at least 10.0 full credits; cumulative GPA of at least 3.0.</p>
<p>BIOD98/99Y3 Directed Research in Biology (1.0 FCE)</p>	<p>1. Faculty member who has agreed to act as project supervisor. 2. Faculty member acting as 4th-year project coordinator.</p>	<p>Independent research project (field or lab-based) using the faculty member's research infrastructure. Students also attend several lectures / training sessions given by the 4th-year project coordinator.</p>	<p>Term work effort by course instructor. Final research paper by 1st and 2nd faculty readers. Oral presentation to Department. Numerical grade.</p>	<p>Satisfactory completion of at least 13.5 credits, of which at least 4.0 credits must be B-or C- level BIO courses. BIOD99Y3 is taken by students who have completed BIOD98Y and wish to take a second Directed Research course.</p>

There are a number of potential benefits to formalizing the Department's research experience courses as a Category 2 Certificate.

First, there is considerable interest among prospective students in research opportunities, as demonstrated at recruitment events where questions are raised frequently. A research certificate would be an attractive recruiting tool and a way to highlight available opportunities; and formal recognition of the completion of research-focused courses will be attractive to students. Second, it may encourage more students to take advantage of the research experience courses that the Department offers. Third, the proposed Certificate will differentiate Biological Sciences as a place for experiential learning since it will be one of the few departments that offer three levels of research opportunity courses.

The Department remains committed to maintaining the widest possible accessibility to research opportunity courses. As such participation in the research certificate is not a gateway to increase access to 4th year research opportunities. It recognizes that many students discover their interest in, and talent for research over the course of their degree. With the design of the proposed Certificate, the Department will provide recognition and encouragement for those committed to expanding their educational experience through research opportunity courses.

4 Need and Demand

Demand for the 4th year research courses, BIOD98Y3 and BIOD99Y3, typically is high with enrolment of ~36-45 students per year since 2016. Of these students, 15% had previously completed BIOB98H3, suggesting there is student interest in completing multiple research opportunity courses. In addition, there is anecdotal evidence communicated by PIs that several students taking BIOD98Y3/D99Y3 have previously volunteered in research projects within their labs in lieu of formal completion of BIOB98H3. The Department anticipates that with the launch of the proposed Certificate, enrolment in BIOB98H3 is likely to increase, due to significant interest in a formal recognition of students' research efforts.

The Department anticipates that 7-10 students are likely to complete the proposed Certificate in the first year of its introduction, based on the current number of students in BIOD98Y3/D99Y3 that have also completed BIOB98H3. However, given the considerable interest from both current and prospective students in research opportunities observed at faculty mix and mingle and recruitment events, the Department anticipates a large increase in the demand for the proposed Certificate in future years.

5 Admission Requirements

Students must be enrolled in a Major or Specialist program offered by the Department of Biological Sciences. These programs are:

- Specialist Program in Conservation and Biodiversity (HBSc)
- Specialist Program in Human Biology (HBSc)
- Specialist Program in Integrative Biology (HBSc)
- Specialist Program in Molecular Biology and Biotechnology (HBSc)
- Specialist (Co-operative) Program in Molecular Biology and Biotechnology (HBSc)
- Major Program in Biology (HBSc)
- Major Program in Conservation and Biodiversity (HBSc)
- Major Program in Human Biology (HBSc)
- Major Program in Molecular Biology, Immunology and Disease (HBSc)
- Major Program in Plant Biology (HBSc)

6 Program Requirements

1. Students must complete at least 2 of the research courses currently offered by the Department of Biological Sciences (see Table 1), one of which must be BIOD98Y3. Students must obtain a grade of A- or higher in any of the research courses that provide a numerical grade (BIOC99H3, BIOD98Y3, BIOD99Y3) in order to be eligible for the Certificate.
2. At the completion of the research project associated with BIOD98Y3, students who have completed the required two courses, and have achieved the minimum grade requirements for BIOD98Y3, must provide an overall summary of their research to the Department to receive the Certificate. Students will be provided with feedback on these summaries by a member of the faculty appointed to this task.
3. All students must engage in at least one consultation with the liaison librarian for the Department of Biological Sciences in order to develop their skills in literature mining and using an evidence-based approach to study design and data analysis. A statement from the liaison librarian about this component is listed below.

Certificate in Biological Sciences Research Excellence Library Statement

The library commits to supporting students enrolled in the proposed Certificate in Research Excellence in Biological Sciences in order to ensure that they have the opportunity to develop excellent information literacy and literature research skills. The liaison librarian for Biological Sciences invites each student to meet to discuss their specific information needs and receive a personalized tutorial on how to find, evaluate, organize, and use the resources necessary for their individual work as a *requirement for completing the Certificate*. The tutorials will be a minimum of one hour and the students will have the option to book additional time as needed. The liaison librarian's capacity will be reviewed based on growth of enrolment numbers.

Students should book an appointment as early as possible using the **Book a research appointment form**:

<https://utsc.library.utoronto.ca/content/book-research-appointment>

The Certificate is linked to completion of the undergraduate program and hence would extend over 4 years of study typically.

7 Calendar Copy

CERTIFICATE IN BIOLOGICAL SCIENCES RESEARCH EXCELLENCE

The Certificate in Biological Sciences Research Excellence will recognize students' research accomplishments in experiential, research-based learning experiences throughout their undergraduate programs.

Enrolment Requirements

Students must be enrolled in any Major or Specialist program offered by the Department of Biological Sciences.

Certificate Requirements

1. Students must complete a minimum of 1.5 credits as follows:

BIOD98Y*

and any one of the following courses:

- BIOB98H3

- BIOB99H3

- BIOC99H3*

- BIOD99Y3*

*Note: students must obtain a grade of A- or higher in these courses in order to be eligible for the Certificate.

2. All students must engage in at least one consultation with the liaison librarian for the Department of Biological Sciences in order to develop their skills in literature mining and using an evidence-based approach to study design and data analysis.

3. Upon completion of the specified courses in component 1 (above), students must provide an overall summary of their research accomplishments to the Department in order to receive the Certificate.

8 Consultation

There has been extensive consultation within the Department, including with the Curriculum Committee.

The Department has consulted with liaison librarians, Sarah Guay and Angela Hamilton, at UTSC in order to develop a component of this certificate that will allow students to consult with the librarians during their research experiences. The goal is to promote students' ability and confidence in navigating scientific databases and using an evidence-based approach to study design. The liaison librarians have been enthusiastic about developing this requirement and have provided the statement that is incorporated under "Program Requirements" above. We look forward to a productive collaboration.

There has been consultation with the Dean's Office, and the proposal has been reviewed by the Office of the Vice-Provost, Academic Programs.

9 Resources

No additional resources are required.

The proposed Certificate will not affect any existing agreements with other institutions.

10 Oversight and Accountability: Review

The certificate will be housed in the Department of Biological Sciences and will be aligned to its cyclical review process.

11 UTSC Administrative Steps

Administrative Steps Required	Date
Departmental Curriculum Committee	June 21, 2017
Campus Curriculum Committee	April 16, 2019

12 UTQAP/Formal Governance Process

Levels of Approval Required	Date
<ul style="list-style-type: none">• Decanal Sign-Off	February 22, 2019
<ul style="list-style-type: none">• Provost Office Sign-Off	March 13, 2019
UTSC Academic Affairs Committee	May 2, 2019
Submission to Provost's Office	
AP&P – reported annually	

Appendix A: Proposed Learning Outcomes

Certificate Expectations	Certificate Learning Outcomes	How the Design/Structure Supports the Certificate Expectations
<p>Depth and Breadth of Knowledge</p> <p>Depth of Knowledge: is attained through a progression of introductory, core and specialized courses. Specialized courses will normally be at the C and D levels.</p> <p>Breadth of Knowledge: students will gain an appreciation of the variety of modes of thinking, methods of inquiry and analysis, and ways of understanding the world that underpin different intellectual fields.</p>	<p>Students will develop skills and understanding of how research is carried out, including core skills in data collection, analysis and reporting.</p>	<p>Students are required to complete both an introductory level (2nd or 3rd year) as well as advanced level (4th year) research course in order to deepen and broaden their knowledge of methodologies in biological research. At each level, projects are designed to introduce students to the skills sets appropriate for the course level.</p> <p>Students will be encouraged to participate in research projects in different labs within the Department for each of their research courses. This will provide them with exposure to a variety of research topics, and encourage them to apply their knowledge of fundamental concepts learned from other, lecture-based, courses that are requirements of their undergraduate degree program.</p>
<p>Knowledge of Methodologies</p> <p>Students demonstrate, and expand on, their knowledge of different methodologies and approaches relevant to their area of study. They are able to apply different methodologies in addressing questions that arise</p>	<p>The unique design of three levels of research opportunities beginning in second year and running through third and fourth year will provide students with different levels of methodology acquisition.</p> <p>Upon completion of the certificate students will be well equipped with a strong understanding of how to apply different methodologies correctly and to enter the next stage of the life in the work force,</p>	<p>The requirement that the students complete an introductory level (either BIOB98/99H3 or BIOC99H3) along with BIOD98/99H3 supports the scaffolded development of research methodologies. Each level will build knowledge that is used in the next level and importantly will provide students with useful skill sets in upper year biology courses.</p> <p>For example: Students in BIOB98H3 will develop the ability to run simple experiments in the area of study of the principle investigator. However, the core understanding of how to test an experimental question will be applicable to all areas of research.</p>

<p>in their area of study</p>	<p>professional school or graduate school.</p>	<p>Students in BIOC99H3 will develop and expand on the methodologies and more importantly, since it is a team research project, expand on their ability to design from the initial stages, appropriate use of techniques. Specific methodologies used will be determined by the individual principal investigator that students work with.</p> <p>BIOD98/D99Y represents the capstone experiences in which students hone their independent knowledge of methodologies while working on an independent research project under the supervision of a primary investigator in the Department.</p>
<p>Application of Knowledge</p> <p>Students are able to frame relevant questions for further inquiry. They are familiar with, or will be able to seek the tools with which, they can address such questions effectively</p>	<p>Students, through laboratory work, group interactions, written and oral presentations and final summary of their research courses, will be able to discuss their work, explain the tools used, and frame their progress.</p>	<p>In BIOB98H3 the students begin to understand the application of knowledge through simple experimentation and simple dissemination of their findings to the laboratory they work in.</p> <p>In BIOC99H students also develop basic understanding of simple experimentation and learn to present the work as a group in poster and oral presentations.</p> <p>In the capstone course BIOD98Y/D99Y, students will develop all aspects of scientific inquiry, with dissemination through a major paper and oral presentation to the Department.</p>
<p>Awareness of limits of knowledge</p> <p>Students demonstrate an awareness of the limits of their own knowledge and their appreciation of the uncertainty, ambiguity, and limits to our collective knowledge and how these might influence analyses and interpretations</p>	<p>Students will know how to develop hypothesis-driven research questions. Within the development of the research hypothesis and experimental design students will know how to address and present limitations of experimental setup and data analyses.</p>	<p>The Certificate requirements explicitly emphasize development of these skills. For example, as part of the written paper that students must submit in order to be eligible for this Certificate, they will be required to provide a summary of their research accomplishments, which includes statements of hypotheses tested, as well as the limitations of their studies. This summary is completed and submitted to the Department following completion of BIOD98Y3.</p> <p>In addition, written requirements for each of the research courses in 3rd and 4th year will independently assess development of student awareness of the limits of knowledge. Faculty mentors in the research courses take on the important role in aiding development of these skills</p>

		through one-on-one mentoring interactions.
<p>Communication skills</p> <p>Students are able to communicate information, arguments and analyses clearly, both orally and in writing</p>	<p>Students will develop strong communication skills, through reading and critical analysis of research papers, application of experimental design, and written and oral presentations.</p>	<p>Students in BIOB98/B99H3 are introduced to scientific expectation through interaction with the principal investigator laboratory group. In BIOC99H this is expanded as students have tutorials where they present and discuss their work. In BIOD98Y students are expected to enhance scientific communication skills through writing, and receiving feedback from mentors on a research paper. Students also present their work orally to the Department at the end of BIOD98Y.</p> <p>As a capstone to the experience, students write a scholarly summary of their scientific experiences at the end of BIOD98Y, which is submitted to the Department to be eligible for the Certificate.</p>
<p>Autonomy and professional capacity</p> <p>The education students receive achieves the following broad goals: It expands on the skills and knowledge students need to become informed, independent and creative thinkers It reinforces the awareness gained in the undergraduate degree that knowledge and its applications are influenced by, and contribute to, society It contributes to learning as a life-long endeavour</p>	<p>Students will be able to design and execute experiments and critically analyze research data. They will also be able to navigate the scientific literature to aid study design, data analysis and proper referencing practices in written papers. These skill sets are the backbone of scientific inquiry.</p> <p>The completion of the research opportunity courses provides students with the building blocks to develop into well-rounded scientists providing them with the knowledge and understanding of what a career in research requires. Moreover, it provides scientific literacy that will allow students to be educated consumers of scientific information throughout their lives.</p>	<p>The development of independent research skills is emphasized in all of the 2nd, 3rd and 4th year research experience courses. In addition, through engaging with the liaison librarian, students will become proficient in navigating the scientific databases, finding appropriate publications to inform their study design and data analyses, and building a bibliography for their thesis papers. This will constitute authentic learning experiences that will instill a sense of belonging to the scientific community.</p>