Interdisciplinary Neuroscience New Program Proposal
BSc Specialized Honours Degree in Neuroscience
Faculty of Science & Health
York University

April 2019

Supplementary Documentation

Appendix B: Student Survey Analysis

2900 students who had been admitted by mid-February 2014 to any program in the Faculty of Science or the Faculty of Health for the September 2014 class were sent a survey consisting of the following 5 questions:

1. How interested are you in an undergraduate program in Neuroscience? (scale 1 to 5) (continue if interest is 3 or more)

2. To what extent are you *more* interested in Neuroscience than the program to which you have currently applied? (scale 1 to 5)

3. To what extent are you interested in a minor in Neuroscience, i.e. a smaller set of courses that would complement your undergraduate program? (scale 1 to 5)

4. Are you *more* likely to accept admission to a neuroscience program than to the program you've applied to at York? (scale 1 to 5)

5. If you were to study at the graduate (MSc) level at York to what extent are you interested in a graduate diploma in Neuroscience? (scale 1 to 5)

1167 (40%) responded and of those 965 answered the first question at 3 or higher and hence were asked to continue the survey. Here we analyse the data this survey provides.

Key Findings

In general terms the survey indicates that good students (as determined by high school average) are interested in neuroscience (65% of those in the >90% range) and that 30% of such students are more likely to accept an offer of admission to a neuroscience program than to the program they applied to. Also, 30% of students who applied to a program as their second or higher choice are more likely to accept an offer of admission to neuroscience. The survey clearly indicates strong interest amongst students, and also that such a program would attract net new students, i.e. ones who would not normally have come to York.

Question 1

As can be seen from the bar charts below, 101 and 105 admittees were roughly equally interested in neuroscience with around 60% being "very" or "somewhat" interested (Figure 1.1).

This expression of interest is broken down according to choice of program at York, the student's high school average, and the program they applied to in subsequent charts.

Admittees to a program of their first choice were somewhat less interested in neuroscience than those admitted to a second, third or fourth choice program (Figure 1.2). The level of interest amongst higher choice applicants is of particular interest since neuroscience represents a way of attracting these students to York.

Figure 1.1: General interest level in neuroscience

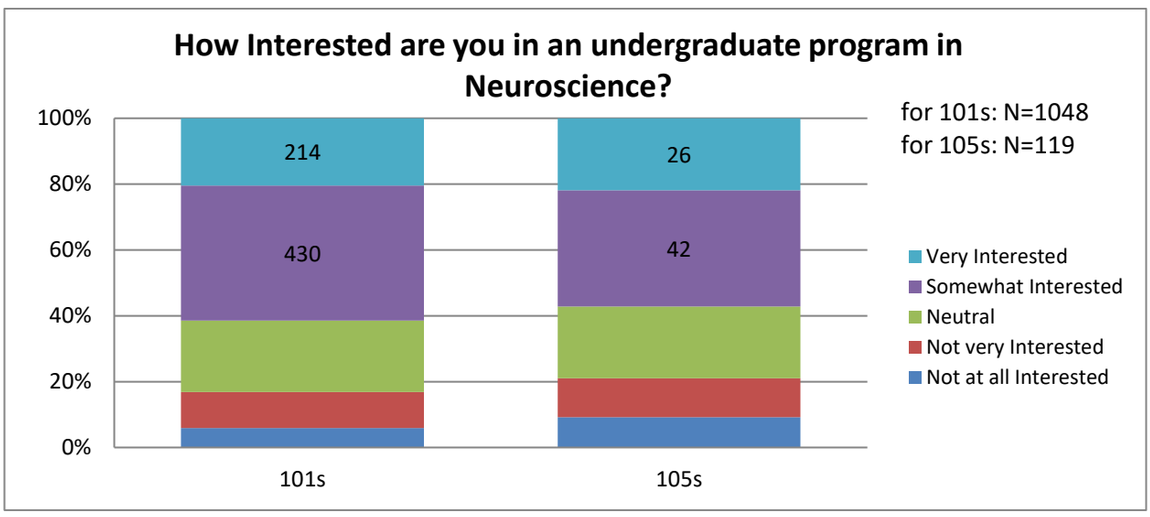
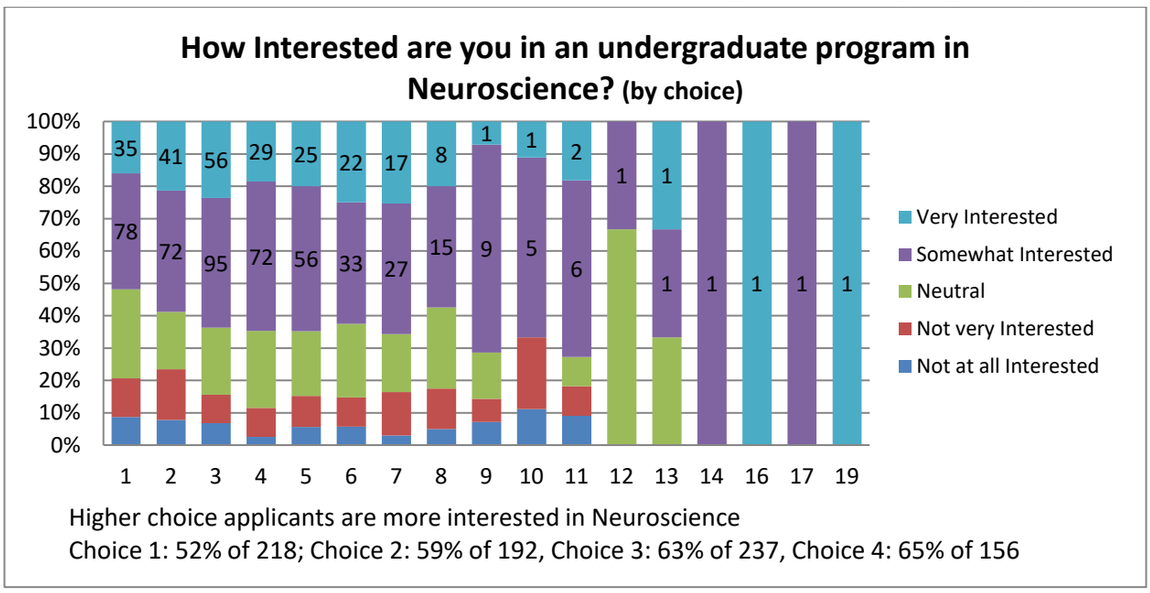
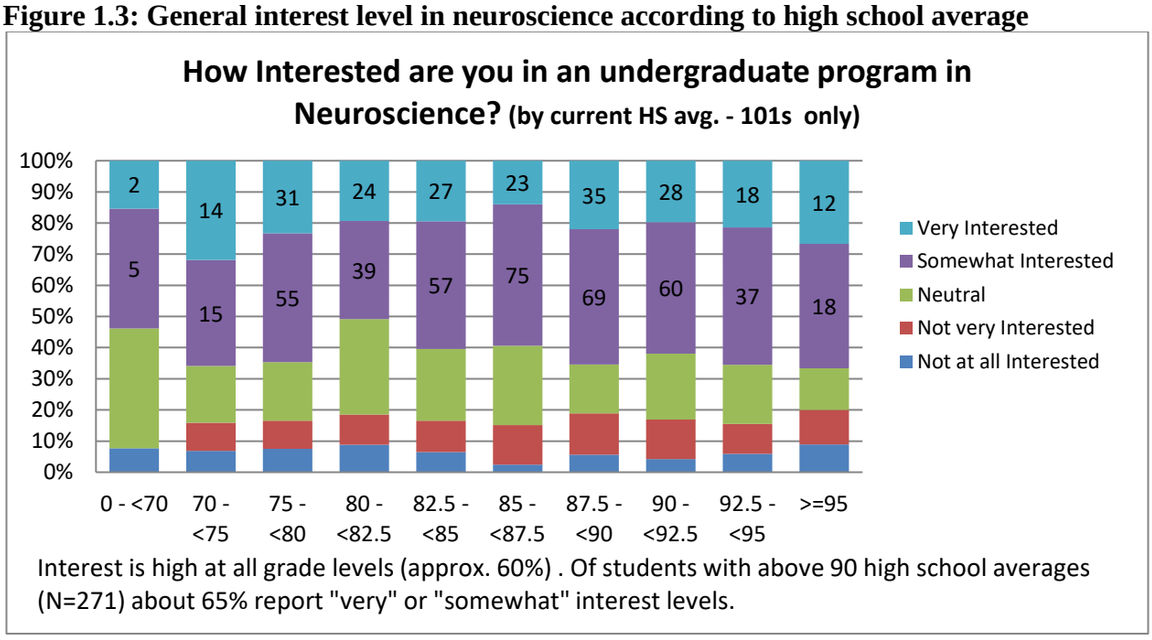


Figure 1.2: General interest level in neuroscience according to choice of program (1st, 2nd, 3rd etc.)



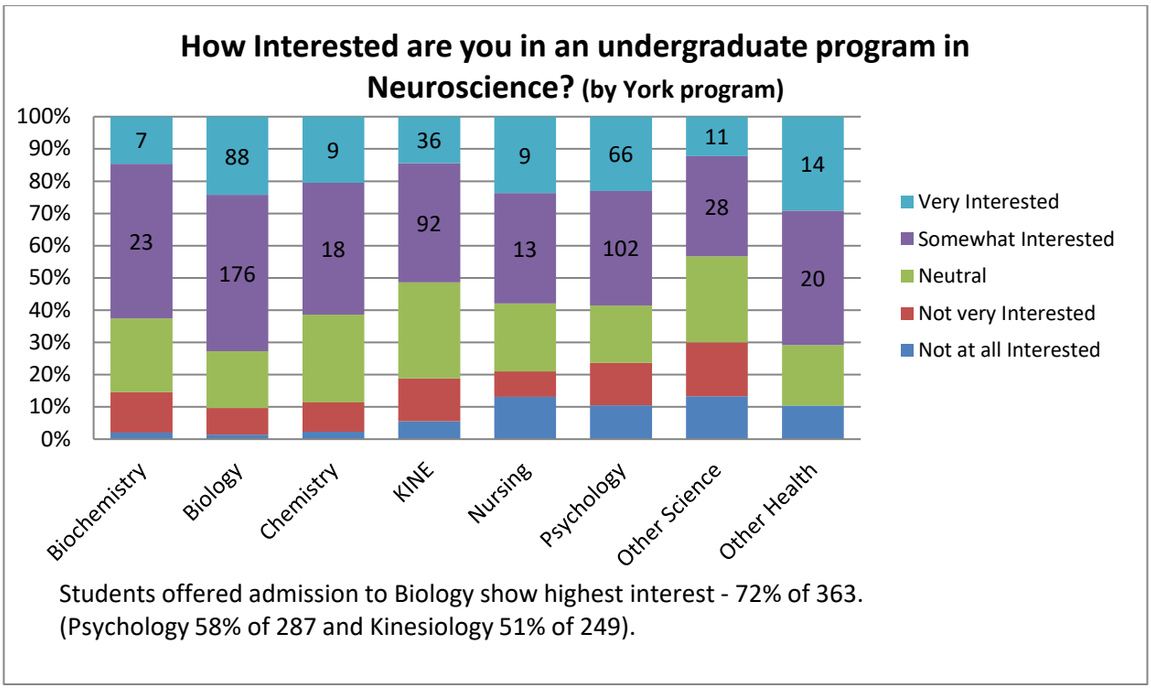
Although strong at all grade levels, interest in neuroscience is strongest amongst high performing students as can be seen in the Figure 1.3. The data here uses the student's current average which typically consists of a few (perhaps 3) final marks if the student is taking semester courses or mostly midterm marks if the courses are not semester.

Figure 1.3: General interest level in neuroscience according to high school average



When considered according to which program the student has been admitted to (Figure 1.4) we see that biology admittees are most interested in neuroscience – about 72% of 363. The lowest level of interest is amongst kinesiology admittees – about 51% of 249 students. Note that chemistry and biochemistry students are equally interested – about 60%.

Figure 1.4: General interest level in neuroscience according to program admitted to.



Question 2

Question 2 asked students if they were more interested in neuroscience than the program they had applied to. Only students who had answered question 1 at 3 (neutral) or higher were expected to continue with the survey. A total of 853 students answered this question.

When examined according to program choice (Figure 2.1) we see that about 26% of those admitted to their 1st choice program are “very” or “somewhat” more interested in neuroscience. This percentage increases to around 50% for those admitted to their 5th or 6th choice programs. At choices 3, 4, 5, 6 and 7 there are 528 admittees and of these 223 (42%) are more interested in neuroscience than the program they applied to.

This can be interpreted to mean that York might better convert such higher choice admittees if they had been admitted to a neuroscience program. It also suggests that internal poaching of students from existing programs to neuroscience will likely be limited.

Figure 2.1: More interest in neuroscience according to choice.

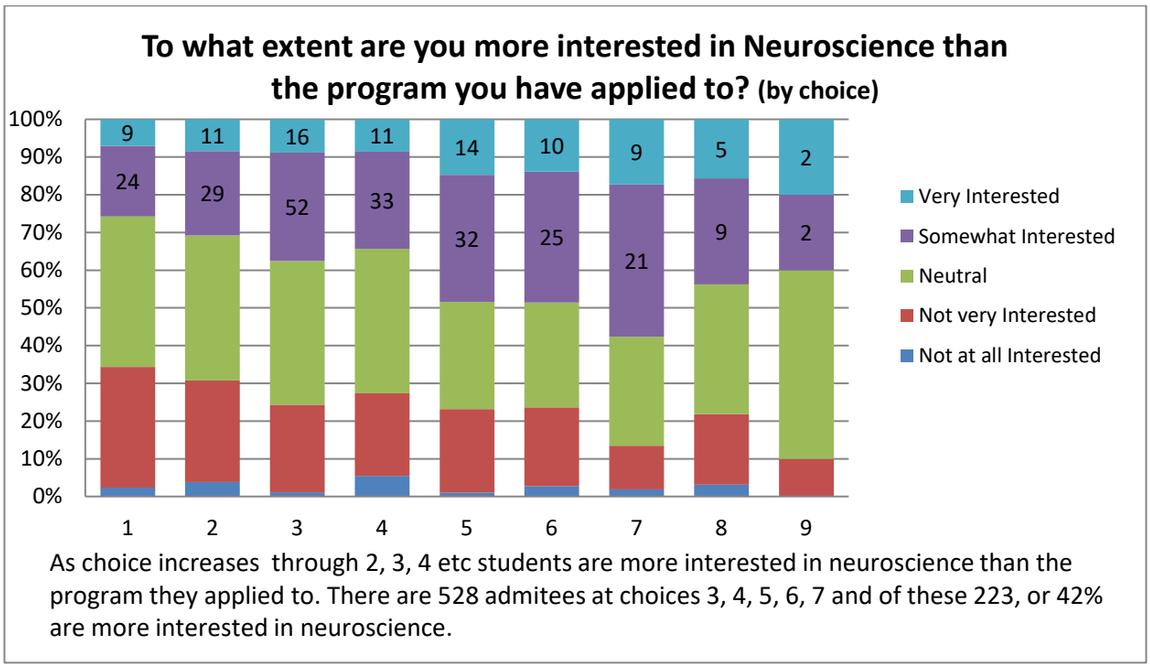


Figure 2.2 examines this question according to the high school average of the student. Generally around 40% are more interested in neuroscience than the program they applied to across the spread of high school performance. However, in the 95+ group (36 students) this rises to 50%. Note that there are 220 students with averages of 90 or better and 93 of those are more interested in neuroscience.

Figure 2.2: More interest in neuroscience according to high school average.

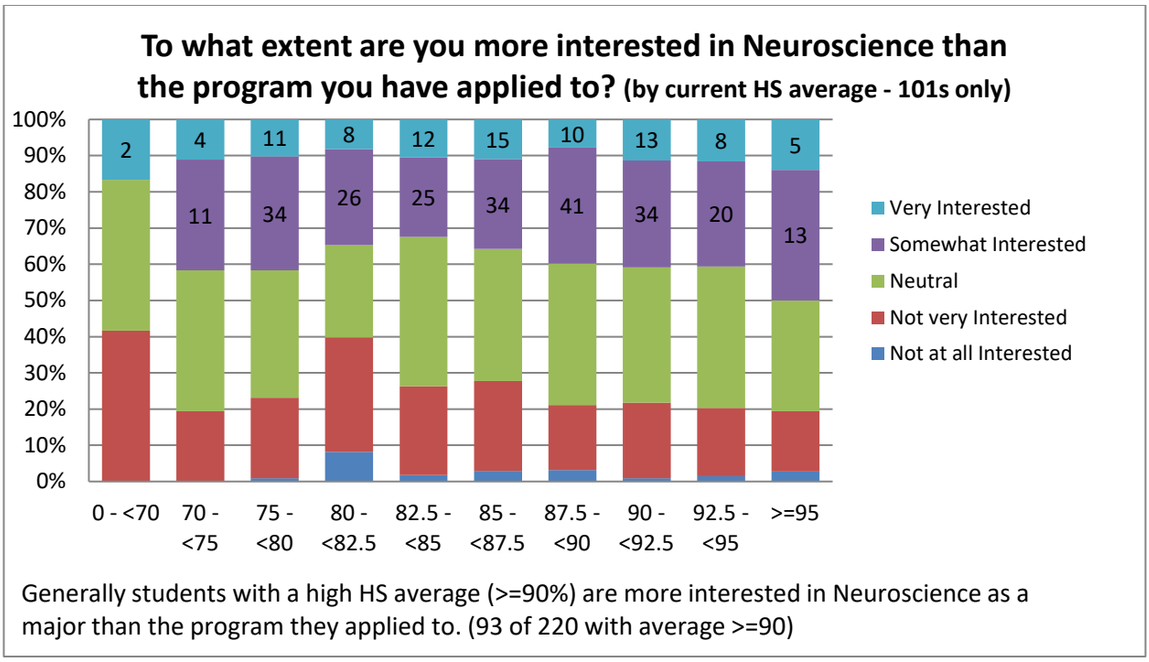
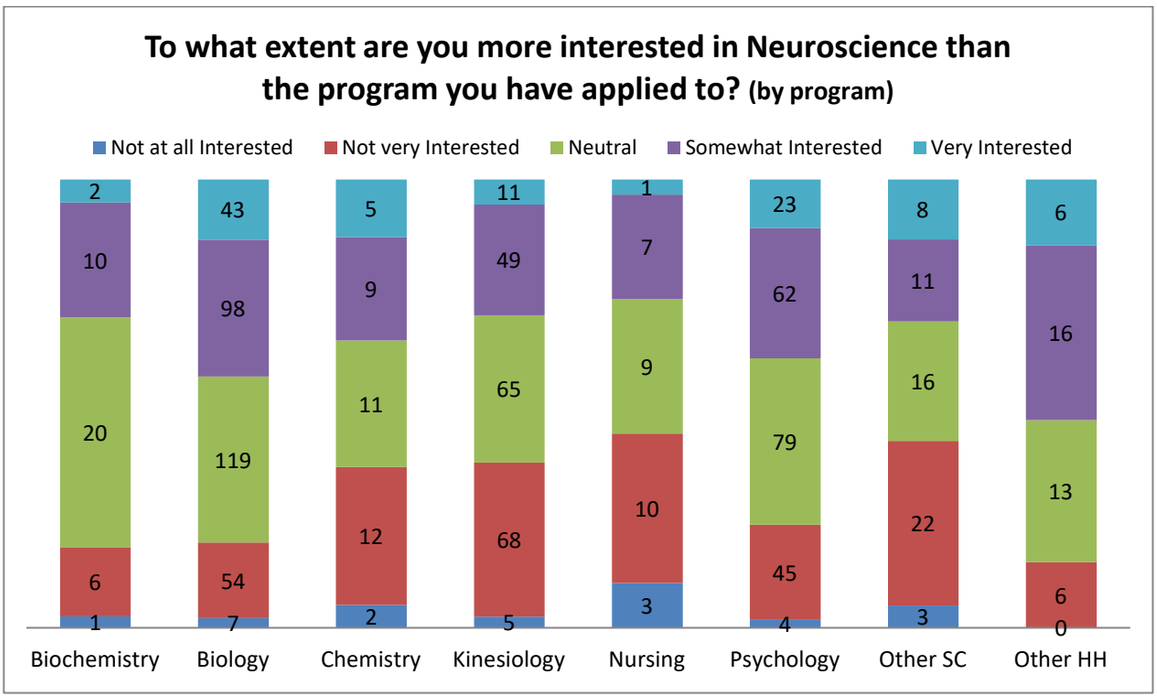


Figure 2.3 examines this question according to the program the respondent has been admitted to. 44% of 321 biology admittees are "very" or "somewhat" more interested in neuroscience than biology; 30% of 198 kinesiology admittees are "very" or "somewhat" more interested in neuroscience than kinesiology; and 40% of psychology are "very" or "somewhat" more interested in neuroscience than psychology.

Figure 2.3: More interest in neuroscience - according to program.



Remember that the respondents span all choice values, i.e. the 44% of biology admitees will include 3rd, 4th ad 5th choice (etc.) applicants.

Question 3

Question 3 asked student if they were interested in a minor in neuroscience. The minor was described as a smaller set of courses that would complement an undergraduate program. It was not made clear that at York major minor combinations are typically different subjects, nor if combinations such as a biology major with a neuroscience minor would be permitted. So this question should be interpreted as an expression of interest in say a stream consisting of a smaller set of courses than a major. A total of 846 students answered this question.

There is strong interest in such an option at all choices, as can be seen in Figure 3.1. At higher choice levels some 80%, of respondents are “very” or “somewhat” interested in a neuroscience “minor”! Besides the implications for recruitment this data suggests that any new (specialized) neuroscience courses are likely to be also in demand by non-neuroscience majors. It may be feasible that non-laboratory (resource intensive) courses be open to some non-neuroscience majors.

Figure 3.1: Interest in a minor - according to choice.

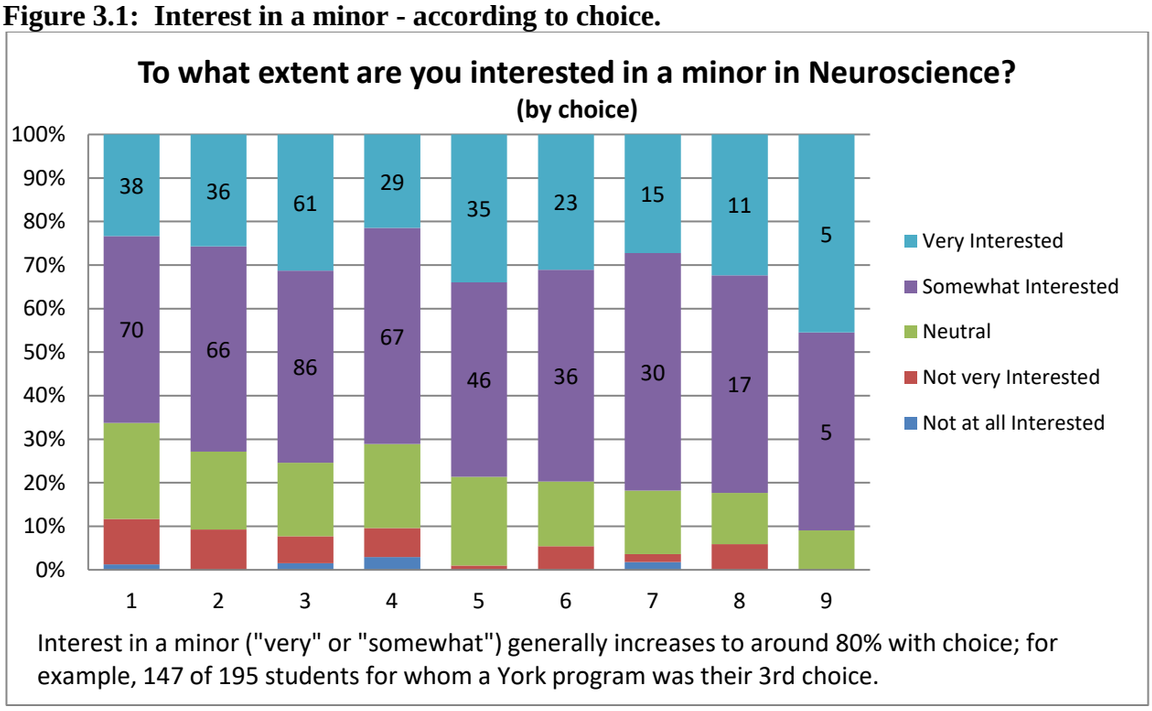


Figure 3.2: Interest in a minor - according to high school average.

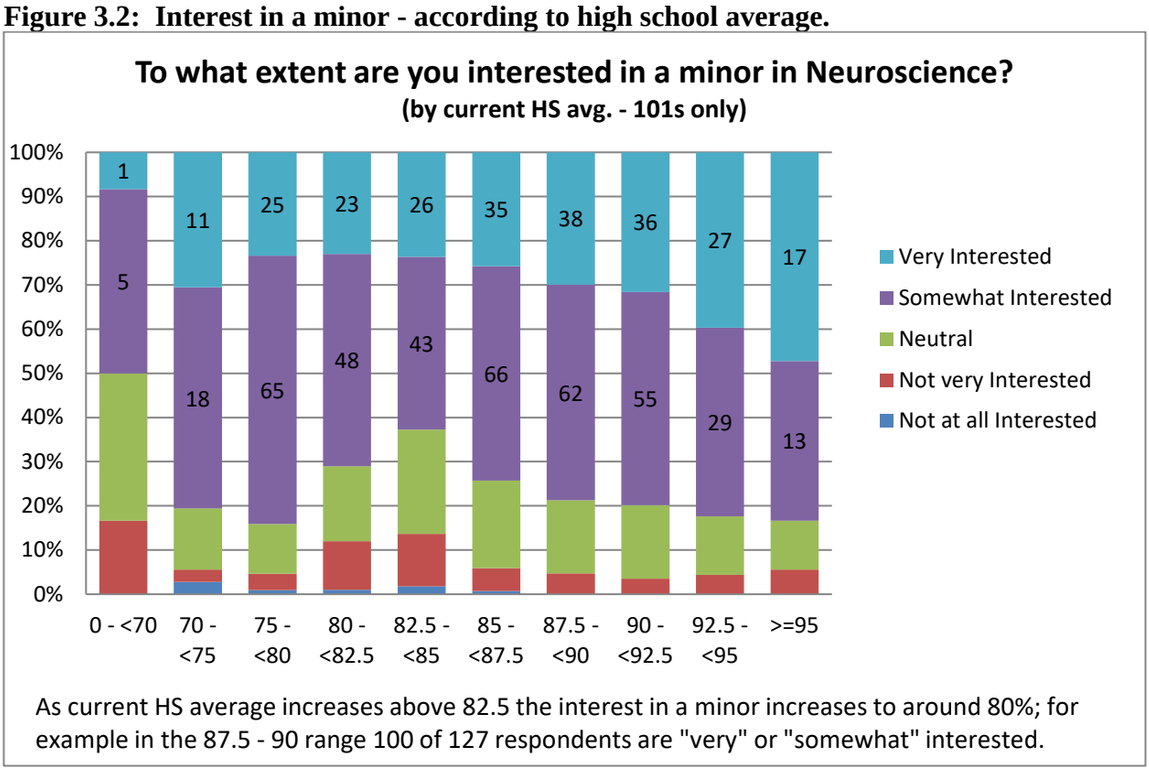
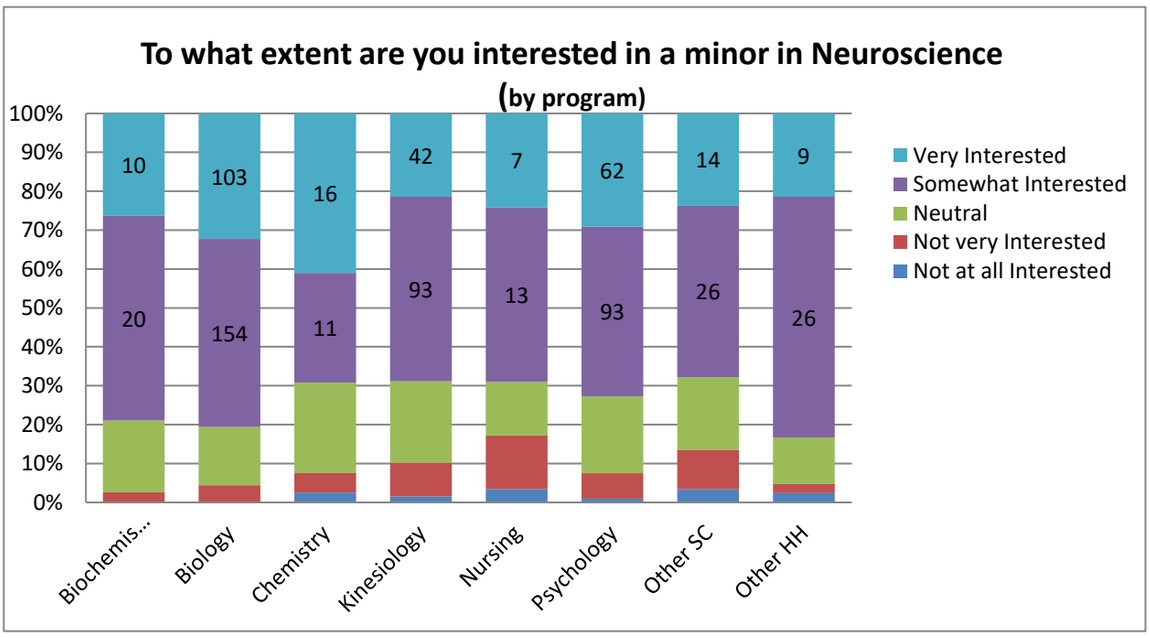


Figure 3.2 (above) shows similar results for interest in a “minor” according to high school average. Generally, interest at the “very” plus “somewhat” is in the 80% range.

Students who have been admitted to the biology or biochemistry programs indicate interest in the minor at the 80% level, whereas the other larger programs are at the 70% level. This is shown in Figure 3.3. It is interesting to note that students outside of biology, psychology and kinesiology indicate a high level of interest in a minor.

Figure 3.3: Interest in a minor - according to program.



Question 4

This question asks if the student is *more* likely to accept admission to a neuroscience program than to the program they had applied to at York. The question is pertinent to the recruitment objective, particularly for non-first choice applicants; it is also pertinent to the possibility of poaching students from other programs who would come to York anyway.

Figure 4.1 shows the data according to the admittees choice. For those admitted to a program of their 1st choice about 21% respond that they are “very” or “somewhat” more likely to accept admission to a neuroscience program. This increases to about 28% for 2nd and 3rd choice admittees, 31% for 4th choice and 40% for 5th choice. This is a promising result in terms of restricted poaching and recruitment efficacy.

Figure 4.1: More likely to accept - according to choice.

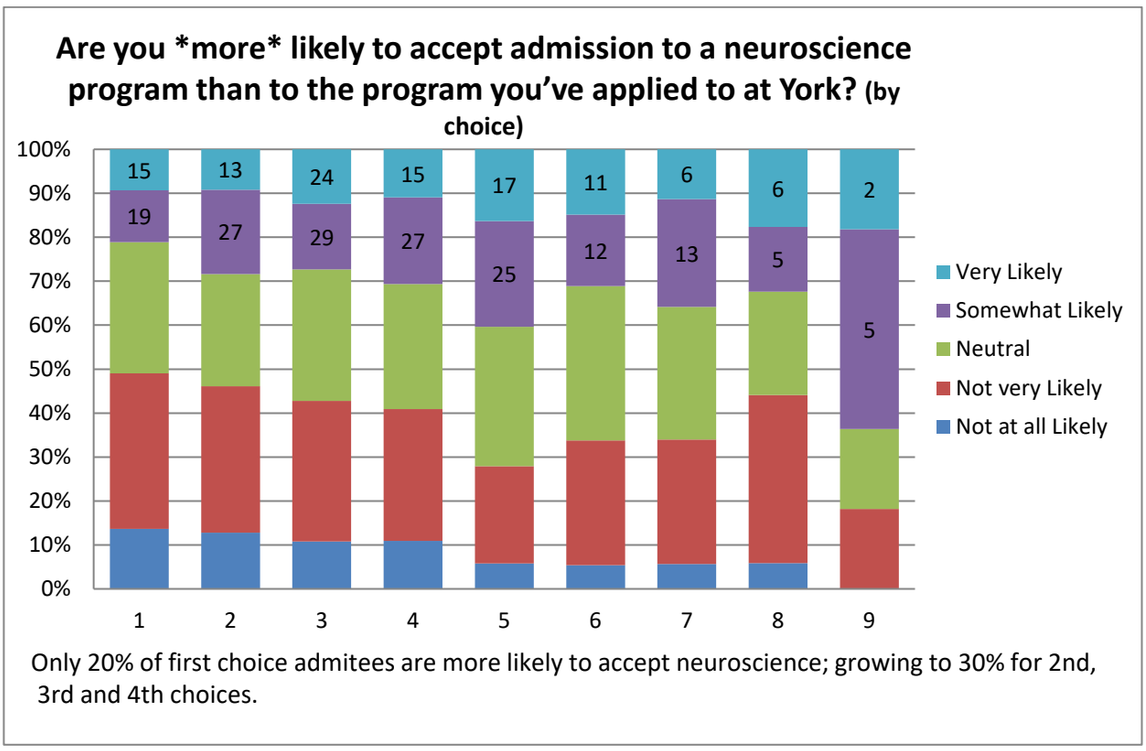


Figure 4.2: More likely to accept - according to current high school average.

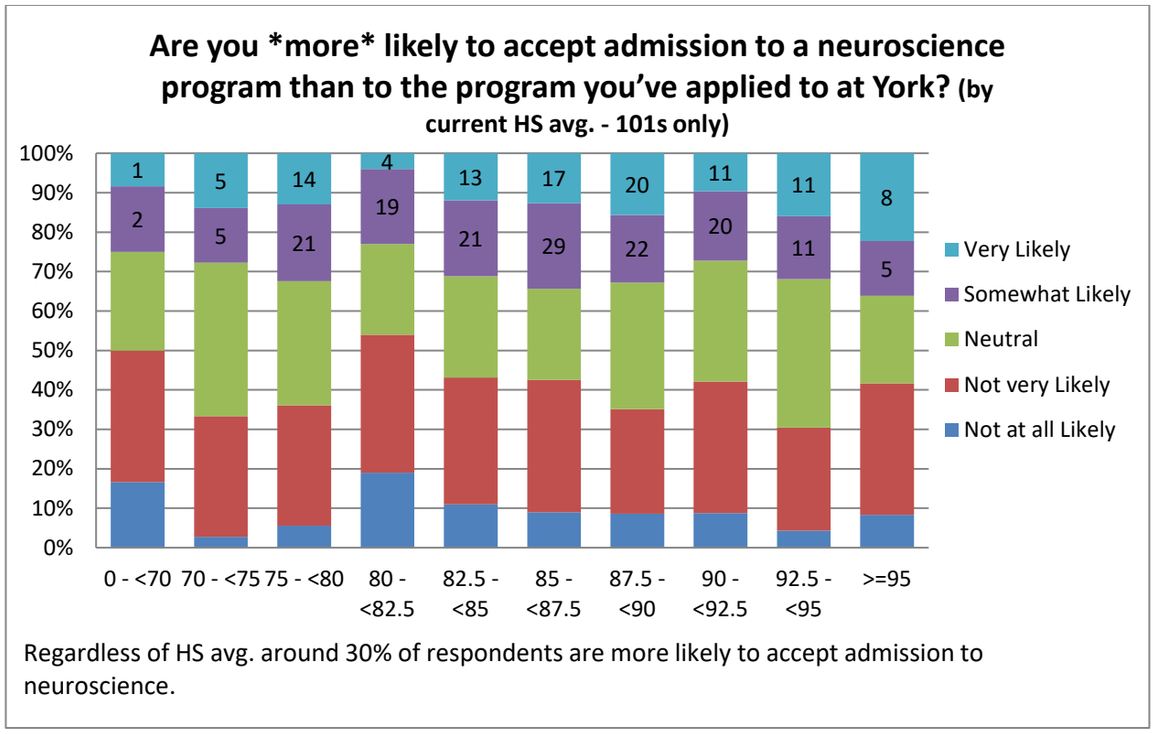
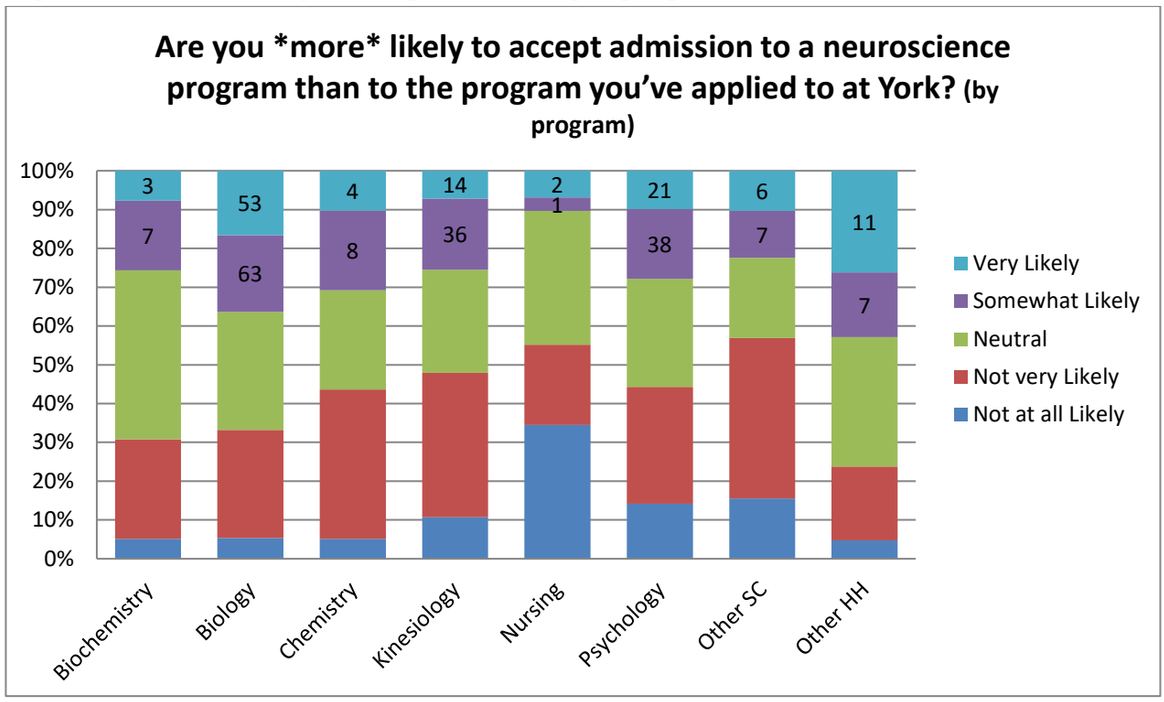


Figure 4.2 (above) shows the responses to this question according to current high school average. In general responses in the "very" plus "somewhat" range do not vary with high school average. However, although the numbers are small, it is interesting to note that "very" likely to accept responses do increase in the above 90% range.

Around 37% of respondents admitted to biology report being "very" or "somewhat" more likely to accept admission to neuroscience. This can be seen in Figure 4.3a. For psychology and kinesiology the figures are about 28% and 25% respectively.

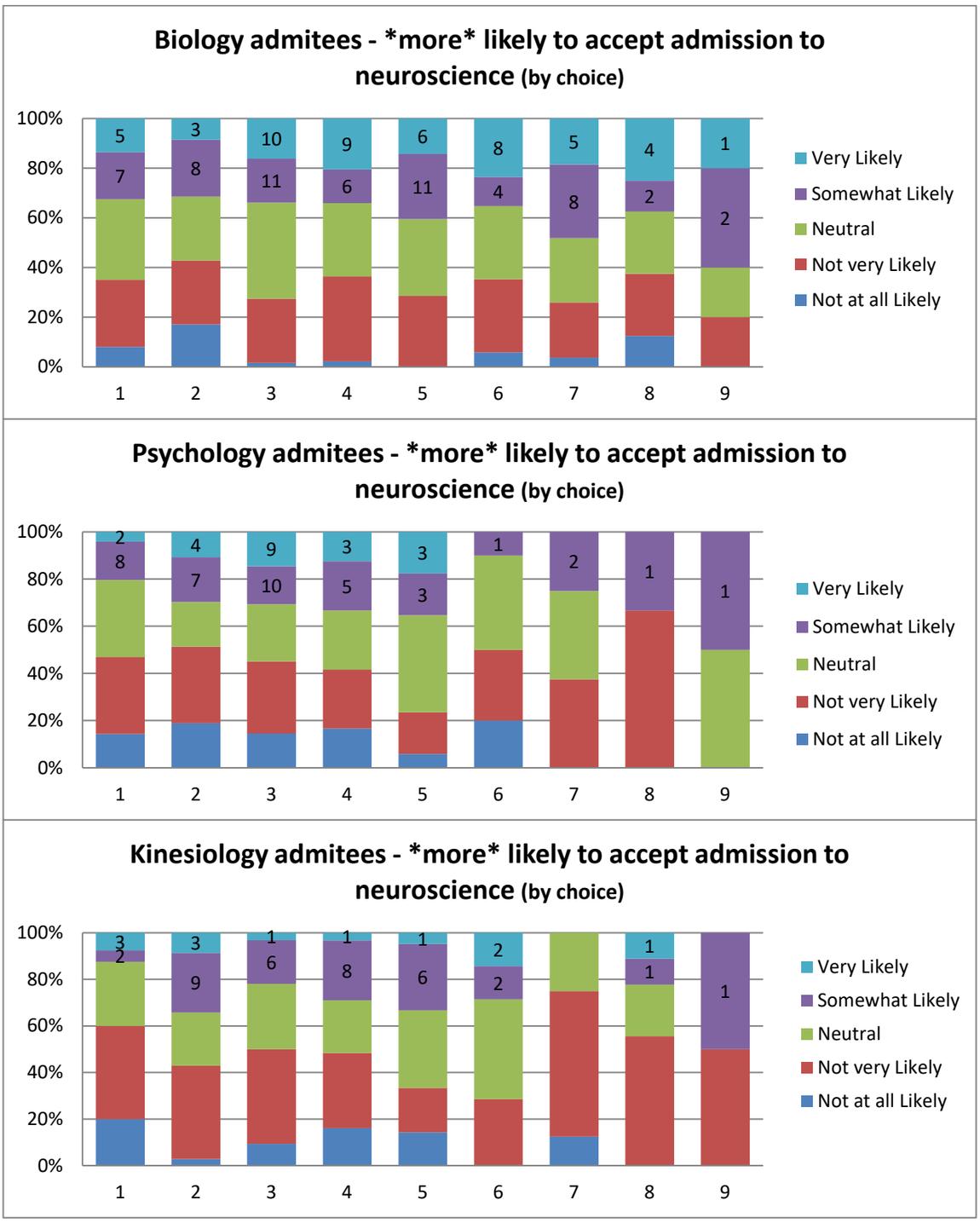
Figure 4.3a: More likely to accept - according to program.



To better understand to what extent "poaching" is likely to occur the data for these three programs – biology, psychology and kinesiology – is examined separately according to choice. The charts of Figure 4.3b show the results.

For biology around 30% of 1st choice admittees are "very" or "somewhat" more likely to accept admission to neuroscience. This increases to around 40% for 5th choice admittees. For psychology admittees around 20% of 1st choice admittees report being "very" or "somewhat" more likely to accept admission to neuroscience and this increase to around 36% through to 5th choice admittees. For kinesiology the figures are around 11% for 1st choice increase to around 32% through to 5th choice admittees.

Figure 4.3b: For Biology, Psychology and Kinesiology admittees - more likely to accept according to choice.



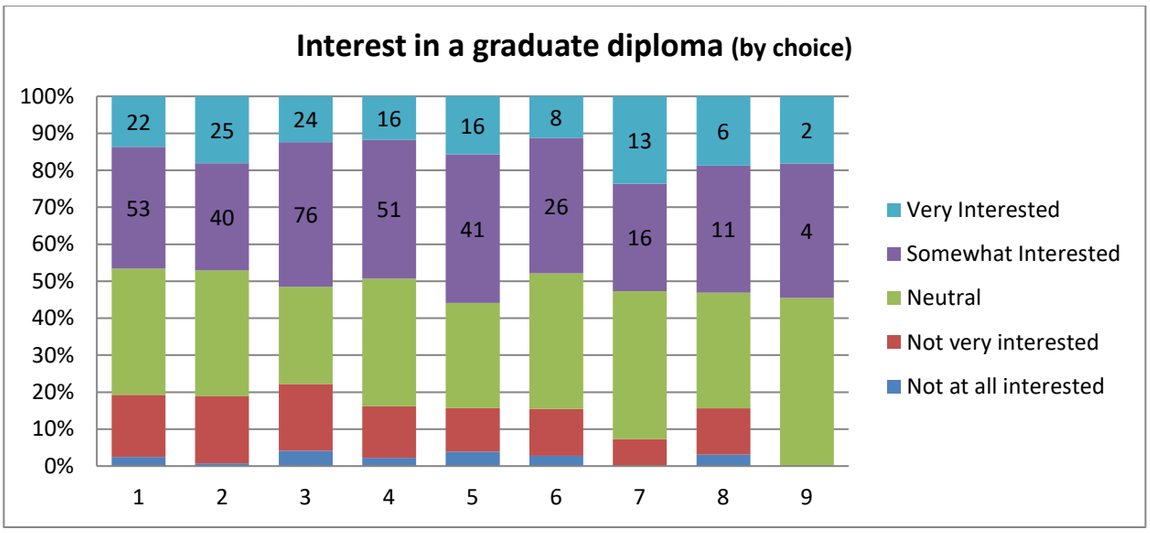
Although some "poaching" is to be expected, the data indicates that the recruitment objective is also attainable. Students who place their chosen program at York fairly low in their choice (e.g., above 5th choice) and who often accept their offer at a lower conversion rate are more likely to accept an offer of admission to a neuroscience program.

Question 5

This question asks to what extent, if the student was to study at the graduate level, are they interested in a graduate diploma in neuroscience. The definition of a "graduate diploma" was not provided and hence the responses should be taken as a general expression of interest in graduate level studies in neuroscience.

Figure 5.1 shows around 15 to 20% of respondents are "very" interested in graduate-level neuroscience. A further 35% or so are "somewhat" interested.

Figure 5.1: Interest in graduate neuroscience study - according to choice.



Figures 5.2 and 5.3 show responses to the same question according to high school average and York program to which the respondent has been admitted.

Roughly 15% are “very” interested across the range of high school averages and around 35% are “somewhat” interested.

Around 18% of biology and psychology admittees are “very” interested compared with around 9% of kinesiology admittees. Around 40% of biology admittees are “somewhat” interested compared with around 35% of psychology admittees and 30% of kinesiology admittees.

At this early stage in their post-secondary education there appears to be strong interest in neuroscience as a field of graduate-level study.

Figure 5.2: Interest in graduate neuroscience study - according to high school average.

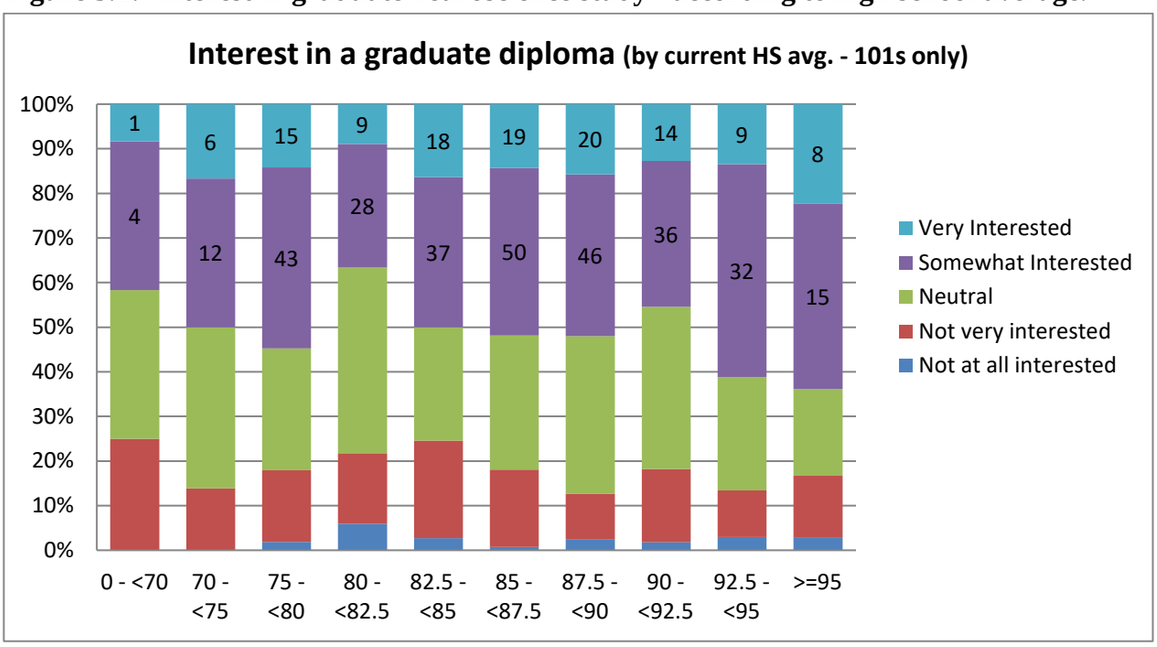
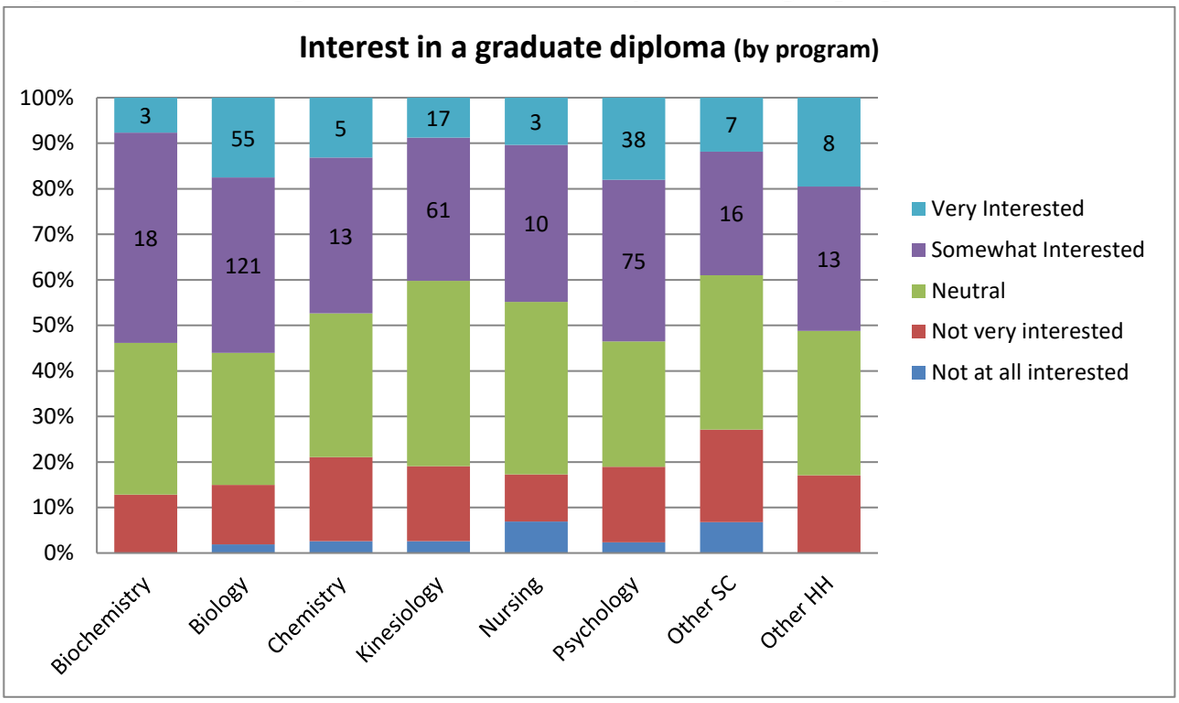


Figure 5.3: Interest in graduate neuroscience study - according to program.



Appendix C –New Course Proposals Summary and Details

Seven new course proposals are attached. Efforts have been made to design these courses in such a way to contribute to and fulfill program level objectives. In an effort to differentiate the proposed new courses within the Neuroscience degree from potentially similar courses/degrees offered by other universities, and become an attractor for high quality students, technology enhanced learning and experiential education were included where appropriate. There is one support statement provided from Learning Technology Services for all the new courses.

Overview

1. NRSC 1001 1.00 ***Frontiers of Neuroscience***

Introduces the breadth of research directions of faculty members at York University within the field of neuroscience. Familiarizes students with professionalism, research ethics, and explores neuroscience related facilities and organizations in the wider community.

2. NRSC 2000 3.00 ***Fundamental Molecular and Cellular Neuroscience***

Survey of the key areas of neuroscience including a historic perspective, gross anatomy and histology of the nervous system, development of the nervous system, molecular and cellular neuroscience, and neurological disorders. Introduces methodologies of research and experimentation in neuroscience.

3. NRSC 2100 3.00 ***Systems, Behavioural, and Cognitive Neuroscience***

Explores the structure and function of the human brain. Topics include the organization of the central nervous system, the function and neural basis of sensory and movement systems, consciousness, language, thought and memory.

4. NRSC 2200 3.00 ***Neuroscience Techniques***

Provides students with an overview of and exposure to experimentation techniques and methodologies in the fields of systems and cognitive, cellular and molecular, and computational and theoretical neuroscience. These could include any of the following: EEG, fMRI, behavioural methods such as psychophysics and eye/body tracking, electrophysiology, patch and dynamic clamp, transgenic mouse technology, molecular imaging, neuronal coding and communication, neuronal networks, and brain-machine interfaces.

5. NRSC 3000 3.00 ***Molecular and Cellular Basis of Perception and Cognition***

Explores the molecular, structural and cellular basis of complex brain functions focussing on perception, learning and memory. Discuss technological advances in areas of genome engineering, optogenetics, imaging and animal models used in the field. Examples of human neurological disease conditions are used whenever appropriate to exemplify the consequences of sensory deficiencies in the nervous system.

6. NRSC 4000 6.00 & NRSC 4002 6.00 ***Neuroscience Capstone Experience***

A Capstone neuroscience research project under the supervision of a neuroscience core/affiliated faculty member. An individual or team-based intensive research project engaged in a laboratory, or in the community (industry, hospital), leading to the creation of an original piece of research, final written paper, as well as an oral presentation to the neuroscience community at York.

health | YORK UNIVERSITÉ UNIVERSITY

New Course Proposal Form
Faculty of Health Curriculum Committee

School/Department: Biology, Psychology, Kinesiology, and Health Science

Course Number Information:

Faculty: HH **Rubric:** NRSC (i.e. HLST) **Course #:** 1001 **Weight:** 1.0 (i.e. 3.00, 6.00 or 0.00)

Effective Session for Change: **Term:** Fall/Winter (i.e. Fall, Fall/Winter, Winter) **Year:** 2020 (i.e. 2017-18, 2018)

Course Title: The official name of the course as it will appear in the Undergraduate Calendar.

Frontiers of Neuroscience

Short Title: **Maximum 40 characters**, including punctuation and spaces. The short title appears on any documents where space is limited (transcripts and lecture schedules).

Frontiers of Neuroscience

Brief Course Description: For editorial consistency, verbs should be in the present tense and begin the description; e.g., "Analyzes the nature and extent of...," rather than "This course will analyze..." or “This course analyzes…”.

This is the official description of the course as it will appear in the Undergraduate Calendar. The course description should be carefully written to convey what the course is about. If applicable, include information regarding the language of instruction if other than English.

Introduces the breadth of research directions of faculty members at York University within the field of neuroscience. Familiarizes students with professionalism, research ethics, and explores neuroscience related facilities and organizations in the wider community.

- **List course(s) where applicable:**

Integration†:		Course Credit Exclusions*:	
Prerequisites:		Cross-listed to:	
Corequisites:			

†Integrated courses are graduate courses integrated (taught with) 4000-level undergraduate courses

*Course credit exclusion is a formal status accorded to pairs of courses that are recognized as having sufficient overlap in content to warrant specifically excluding students from obtaining credit for both.

- Include the following information only if the course is: limited to a specific group of students; closed to a specific group of students; if there is any additional information necessary for students to know before enrolling (notes); if the course includes experiential education, and whether the students will work with a community partner and/or if it will involve going off-campus.

Open to:	Honours and Specialized Honours BSc students
Not open to	
Notes:	This course is expected to be completed within the first 30 credits of study but if needed students can be given the opportunity to enroll in this course if they have not yet completed 60 credits.

- **Science Course:**

	YES	NO
Denotes courses in KINE or PSYC to count as science credit for BSc degree programs	X	

Expanded Course Description

- Please provide a detailed course description that effectively conveys what this course is about. Please ensure that this description includes but is not limited to: 1) course topics/theories; 2) course learning objectives; 3) course learning outcomes; and 4) a description of any experiential education (EE) and/or technology-enhanced learning (also referred to as eLearning) activities.

Term	Definition
Course Learning Objectives	Statements of the overall learning and teaching goals for the course and represent what the instructor would expect students to learn and retain in the course. They articulate what the teacher plans to achieve in the course.
Learning Outcomes	Statements of what the student will achieve by the end of the course. They provide a framework for assessment by stating what you expect the learners to be able to demonstrate after completing the course. A succinct learning outcome specifies the tasks students are expected to be able to perform and the level of competence expected for the tasks.
Experiential Education (EE)	The blending of theory/course work with concrete experience. Effective EE activities require students to reflect on and demonstrate their understanding of the relationship(s) between theory/course work and concrete experience.
Structured Reflection	Structured reflection is any planned activity or exercise that requires students to refer back and critically examine the concrete experience in light of existing theory and/or what is being covered in the course.
Technology-Enhanced Learning (eLearning)	The use of technology to support students' interaction: with and access to the content; to course learning activities; and with other students and faculty members in order to develop knowledge and skills

Refer to the last page of the course proposal for resources on course learning objectives and outcomes, experiential education and technology-enhanced learning.

1) Neuroscience is an exciting and wide-ranging discipline, many of the topics will not be introduced in any technical depth until upper year courses.

This course has been designed to expose students to a sampling of research topics in neuroscience. It is organized around a series of invited talks by individual researchers and research groups, a number of laboratory tours, and other events that will introduce students to specific research directions in neuroscience, issues related to professionalism and ethics in science, and opportunities to become engaged with different research and technical groups and events related to neuroscience.

Formally, the course will consist of 12 one-hour presentations spread over two terms. The first presentation will describe the logistics of the course, provide information about the neuroscience degree, and answer student's questions about the neuroscience degree. The remaining 11 presentations will be invited talks by researchers (or research groups), and/or representatives of other groups associated with neuroscience such as research ethics, the Ontario Brain Institute, and the Krembil Neuroscience Centre.

In addition to these 12 formal meetings, a set of extracurricular events will also be organized including research lab tours, visits to off-campus labs and facilities, etc.

This course is offered on a pass-fail basis only.

2) Course Learning Objectives:

- Introduce students to the main areas of study in neuroscience
- Present a variety of different research directions in the field of neuroscience
- Facilitate discussions between students and researchers and other members of the (York) neuroscience community
- Provide information about the purpose and function of research ethics

3) Expected Learning Outcomes: Students who have passed this course will be expected to be able to

- Recognize the main areas of study in neuroscience.
- Identify five different research directions in neuroscience and describe one briefly.

- Describe the research activities of one neuroscientist at York and/or a research member of community organization (e.g. neuroscience research center).
- Explain the purpose and function of research ethics

4) Experiential education is described in more detail in the next section.

Experiential Education/Technology-Enhanced Learning

EE remains a top priority for York University and the Faculty of Health as it offers a range of benefits for students related to academic performance, civic engagement and employability (for more information on the benefits of EE for students and course directors, please go to: **http://health.yorku.ca/experiential-education/faculty/**. Course directors are invited to integrate EE into their course where possible, but it is understood that some EE strategies may not be feasible in every course.

Course proposals with EE must be reviewed by Andra Petro, EE Coordinator (apetro@yorku.ca) prior to the submission of the proposal to the Faculty of Health Curriculum Committee.

• ***Please indicate (X) if the course uses any EE and/or technology-enhanced learning?***	***YES***	***X***	***NO***	
• ***If NOT, please outline some of the reasons EE or technology-enhanced learning could not be incorporated the course.***				
• ***If YES, please indicate (X) whether your course will include one or more of the following types of EE and technology-enhanced learning. Refer to York's Common Language for Experiential Education for complete definitions and further details.***				
X	***Classroom based (e.g. guest speakers, role playing, visual media, case studies, simulations, workshops and laboratory, course-based research etc.)***			
X	***Community based (e.g. community-based learning; community-based research; community service learning)***			
	Work focused (e.g. placement/practicum)			
Please outline how you plan to engage students in reflection (critically examining a concrete experience) around the EE activities described above.				

Experiential education:
In class, students will choose one in-class presentation by a guest speaker and write and hand in a one-minute paper answering the question “What was the most important concept they learned from the guest speaker?”, and/or “What would they like to learn more about?”. Although potentially not requiring students to engage in deep reflection, this one-minute paper is an opportunity for students to examine their experiences in terms of what they have learned so far and to identify potential areas for further exploration both in the course and throughout their time in the neuroscience degree program.

In community, as part of the organized series of extracurricular events, students (in groups) will interview 2 different neuroscientists from the community of neuroscientists at York and in the GTA. Questions posed could be “what type of neuroscience research questions he/she is trying to answer, how they go about answering their research questions, what have they discovered”. Then students will be asked to choose one interview and write a critical reflection paper describing: What (what did they learn about the research direction), so what (why does this research direction matter to them and to the field of neuroscience), and what now (identify at least one belief/attitude/action that they think they could apply, do better, or do differently as a result of what they learned about the neuroscience research). The community-based elements of this course will help students begin to understand the place and purpose of research in neuroscience while also exposing them to the current context of how research is conducted in the field.

Technology enhanced learning:
The learning management system (Moodle) will be used to build a forum for the cohort of students to engage together online. The Moodle course will be the space where students submit their one-minute paper and their reflection paper, ask questions, and coordinate off campus visits. Online mini quizzes using multiple-choice questions will formatively evaluate the students’ knowledge of the main areas of study in neuroscience and research ethics. If applicable, recordings using lecture capture technology of the monthly presentations can be made available for students. Students will also have access to Adobe connect or Zoom (video conferencing software) to hold their interviews with the neuroscientists.

Instruction/Course Format

- ***Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.)***

  - Offered every year.

- ***Number of School/Department members currently competent to teach the course.***

Many (any core or affiliated neuroscience faculty members).

- ***Instructor(s) likely to teach the course in the coming year.***

Any faculty member associated with the Neuroscience program could be the course director. But we recommend that the faculty member who becomes the Neuroscience program coordinator takes on the responsibility of being the course director.

- ***An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved. This information is required to indicate whether an effective length of term is being maintained.***

  - Twelve 1-hour presentations once a month of which the student must attend 10
  - 4 extra-curricular events distributed over the two terms of which students must engage in 2.

- ***In absence of scheduled contact hours, please provide an indication of the estimated time students are likely to spend engaged in learning activities required by the course.***

Estimated time to engage in learning activities will probably be about 5 hours a month.

- ***In the absence of scheduled contact hours, please indicate how the course design encourages student engagement and supports students in achieving the learning objectives.***

This course seeks to engage students in the broader culture of neuroscience with specific emphasis on research initiatives within the University (and elsewhere in Ontario) and to build a cohort of interested students. Students will be exposed to a set of organized presentations (approximately one hour in length) that will focus on research directions of faculty and groups within the university potentially outlining connections between their research, and where the students will learn more about the neuroscience field being discussed in the curriculum. Presentations may also be provided by outside researchers, outside professional groups, and relevant outside volunteer organizations.

Student engagement will be encouraged through the Moodle site, monthly presentations, and extracurricular activities on and off campus. The extra-curricular events will vary from term to term but are likely to include tours of specific research labs at York and other locations, and tours of hospital sites of particular interest to neuroscience students. Learning outcomes will be achieved by attending and contributing the 1-minute paper, engaging in critical reflection, and completing the mini-quizzes online.

Evaluation:

1. ***Please provide a detailed description of the basis of evaluation for the proposed course, including the type and percentage value of each assignment.***

Evaluation is on a pass/fail basis.

Students must achieve 15 points in order to obtain a pass. Points are assigned as follows:

- 1 point is assigned for attendance at each presentation of which the student must attend 10 (for a maximum of 10 points)
- 2 points are assigned for attending at least 2 extra-curricular activities
- 1 point for handing in a one-minute paper
- 2 points for their critical reflection (0 assigned for below benchmark, 1 for reaching benchmark, 2 assigned for mastery (see for definitions of critical reflection http://health.yorku.ca/experiential-education/faculty/#squelch-taas-tab-content-1-6)
- 1 bonus point is assigned for assisting in hosting a speaker. Hosting includes introducing the speaker, organizing questions afterwards, thanking the speaker, and publishing (with approval by the course director) an on-line summary of the speaker's comments.

2. If the course is to be integrated (i.e., graduate/undergraduate), please list the additional evaluation requirements for graduate students.

n/a

3. If the proposed course is employs technology-enhanced forms of delivery (i.e., non "face-to-face", please identify how the integrity of learning evaluation will be maintained (will "on-site" examinations be required, etc.)

n/a

Other Resources:

1. Please provide a statement regarding the adequacy of physical resources (equipment, space, etc.). As well, please indicate if any other resources are required. Approval of a new course will be considered only if adequate resources are available to support the course.

Lecture hall to host the presentations for about 60-70 students will be required.

2. If there is a technology-enhanced component to the course, a statement is required from the Learning Technology Services indicating whether resources are adequate to support the course. Requests for

statements can directed to Rob Finlayson (rfinlays@yorku.ca). Please note, it will take two weeks to get a statement of support.

Course Rationale:

1. ***How will the course contribute to the educational objectives of the School/Department and of the Faculty?***

An educational objective of both Faculties is to create a high impact experience for their students in the upper years. The goal of this course is to raise awareness and to present students with a wide introduction to ongoing research initiatives in neuroscience and ultimately create the opportunity for that high impact experience. Much of the neuroscience content is expanded on explicitly in third-and-fourth year courses across the Kinesiology & Health Science, Biology, and Psychology programs, but are not often addressed in lower year courses, which concentrate on fundamentals. By introducing these neuroscience topics in the first year, it is anticipated that students will at least be made aware of the possible neuroscience streams of courses that they can select as their chosen or alternative streams while at the same time introducing students to neuroscience researchers that could end up supervising them for their Capstone course experience. This course is the beginning of the neuroscience program being able to contribute to research intensification within the programs.

2. ***What is the relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content? If overlap exists, please indicate the nature and extent of consultation which has taken place. If the course is to be cross-listed, integrated or listed as a course credit exclusion with another course, approval is required from all the relevant Faculties/units.***

There is no overlap with other courses.

3. ***If applicable, please indicate the relationship of the proposed course to interdisciplinary programs; i.e. for which interdisciplinary program(s) will the course count for major/minor credit. As well, please indicate the nature and extent of consultation that has taken place with the relevant interdisciplinary program coordinator(s).***

n/a

4. ***What is the expected enrolment in the course?***

Expected enrolment is roughly 60-70.

Bibliography:

Please list the <u>required readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.).

Each invited speaker will be asked if they wish to provide a selected reading for those students who want to learn more about their area. Any readings will be made available on the Moodle course site

Please list any <u>suggested readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.)

This will depend on the speaker invited.

Please list any <u>online resources</u> for the course (please include complete bibliographical information as above).

n/a

If the course is to be integrated (graduate/undergraduate), a list of the additional readings required of graduate students must be included. If no additional readings are required, a rationale should be provided.

n/a

Library Support Statement:

Proposals for new courses must include a **library support statement** from the Bibliographer responsible for the relevant discipline to indicate whether resources are adequate to support the course. To request a support statement, see the list of subject and liaison librarians at http://www.library.yorku.ca/web/about-us/contact-us/liaison-librarians/.

Consultation/Approval:

- The Faculty of Health Curriculum Committee will only consider new course proposals that have been approved by the unit responsible for offering the course.
- If the proposed course is to be cross-listed, integrated, listed as a course credit exclusion with another course, or listed as a major/minor course option in an interdisciplinary program, the proposal must be accompanied by a statement from the collaborating unit signaling agreement to the proposal.

Course Number Information:

Faculty:	Rubric: (i.e. HLST)	Course #:	Weight: (i.e. 3.00, 6.00 or 0.00)
HH	NRSC	2000	3.0

Effective Session for Change: Term: (i.e. Fall, Fall/Winter, Winter)	Year: (i.e. 2017-18, 2018)
Fall	2021

Course Title: The official name of the course as it will appear in the Undergraduate Calendar.

Fundamental Molecular and Cellular Neuroscience

Short Title: <u>Maximum 40 characters</u>, including punctuation and spaces. The short title appears on any documents where space is limited (transcripts and lecture schedules).

Molecular and Cellular Neuroscience

Brief Course Description: For editorial consistency, verbs should be in the present tense and begin the description; e.g., "Analyzes the nature and extent of...," rather than "This course will analyze..." or “This course analyzes…”.

This is the official description of the course as it will appear in the Undergraduate Calendar. The course description should be carefully written to convey what the course is about. If applicable, include information regarding the language of instruction if other than English.

Survey of the key areas of neuroscience including a historic perspective, gross anatomy and histology of the nervous system, development of the nervous system, molecular and cellular neuroscience, and neurological disorders. Introduces methodologies of research and experimentation in neuroscience.

- **List course(s) where applicable:**

Integration†:		Course Credit Exclusions*:	
Prerequisites:	SC/BIOL 1000 3.00; SC/BIOL 1001 3.00; HH/PSYC 1010 6.00	Cross-listed to:	
Corequisites:			

†Integrated courses are graduate courses integrated (taught with) 4000-level undergraduate courses

*<u>Course credit exclusion</u> is a formal status accorded to pairs of courses that are recognized as having sufficient overlap in content to warrant specifically excluding students from obtaining credit for both.

- Include the following information only if the course is: limited to a specific group of students; closed to a specific group of students; if there is any additional information necessary for students to know before enrolling (notes); if the course includes experiential education, and whether the students will work with a community partner and/or if it will involve going off-campus.

Open to:	Honours and Specialized Honours BSc students
Not open to	
Notes:	

- **Science Course:**

	YES	NO
Denotes courses in KINE or PSYC to count as science credit for BSc degree programs	X	

Expanded Course Description

- Please provide a detailed course description that effectively conveys what this course is about. Please ensure that this description includes, but is not limited to: 1) course topics/theories; 2) course learning objectives; 3) course learning outcomes; and 4) a description of any experiential education (EE) and/or technology-enhanced learning (also referred to as eLearning) activities.

Term	Definition
Course Learning Objectives	Statements of the overall learning and teaching goals for the course and represent what the instructor would expect students to learn and retain in the course. They articulate what the teacher plans to achieve in the course.
Learning Outcomes	Statements of what the student will achieve by the end of the course. They provide a framework for assessment by stating what you expect the learners to be able to demonstrate after completing the course. A succinct learning outcome specifies the tasks students are expected to be able to perform and the level of competence expected for the tasks.
Experiential Education (EE)	The blending of theory/course work with concrete experience. Effective EE activities require students to reflect on and demonstrate their understanding of the relationship(s) between theory/course work and concrete experience.
Structured Reflection	Structured reflection is any planned activity or exercise that requires students to refer back and critically examine the concrete experience in light of existing theory and/or what is being covered in the course.
Technology-Enhanced Learning (eLearning)	The use of technology to support students' interaction: with and access to the content; to course learning activities; and with other students and faculty members in order to develop knowledge and skills

Refer to the last page of the course proposal for resources on course learning objectives and outcomes, experiential education and technology-enhanced learning.

The course is a core course of the neuroscience program. It provides an introductory survey of the key areas of neuroscience, providing the foundation for subsequent more advanced courses.

1) Course topics:
Section 1: Introduction - Neuroscience in a historic perspective; Gross Anatomy and Histology of the Nervous System (NS); Introduction to Neuroscience Methods

Section 2: Development of the Nervous System - Specification of cell identity in the nervous system; Axon navigation and target finding; Synapse formation and refinement; Pre/Postembryonic development of the brain; Development of the Sensory Nervous System; Development of the Motor Nervous System; Development and Regeneration of the peripheral nervous system; Aging and senescence in the brain

Section 3: Molecular and Cellular Neuroscience - Neuronal communication: Electrical and Chemical Synapses; Building an excitable membrane: Ion Channels and Transporters; Extracellular Communication in the NS (I): Neurotransmitter and Receptors; Extracellular Communication in the NS (II): Signaling Molecules and Extracellular Matrix; Intracellular Communication in the NS (I): Molecular basis of synaptic plasticity; Intracellular Communication in the NS (II): Translating electrical and chemical signals into memories; Molecular and cellular basis of addiction.

Section 4: Introduction to the Molecular and Cellular Basis of Neurological Disorders - Inherited Neurological Disorders such as developmental disorders of the CNS and PNS, and channelophathies; acquired neurological disorders such as ischemia and neuronal cell death, and neuroinflammation; genetic basis of complex neurological disorders such as autism, schizophrenia, epilepsy

2) Course Learning Objectives:

- Provide a broad, introductory overview to the key areas of neuroscience
- Explore a number of key processes and structures studied in neuroscience
- Demonstrate how to critically review and analyze a journal article presenting research in the field
- Inspire reflection on a media article discussing current research and/or topics in neuroscience
- Guide students toward an individual approach to and process for critically analyzing neuroscience information presented in journal articles and in the media

3) Expected Learning Outcomes: Students who have passed this course will be expected to be able to

- Distinguish the different cell types present in the peripheral and central nervous system and outline the mechanisms by which the central and peripheral nervous systems form.
- Describe the many properties of ion channels and how they contribute to the resting membrane potential and the propagation of the action potential.

- Distinguish the different types of cell surface receptor for neurotransmitters and hormones and distinguish between voltage- and ligand-gated ion channels.
- Explain the mechanisms by which nervous impulses are conducted along the axons of myelinated and unmyelinated axons.
- Explain the basic molecular mechanisms underlying chemical transmission in the nervous system.
- Describe how action potentials and voltage-sensitive calcium channels regulate neurotransmission.
- Describe the basic mechanism by which neurons communicate, e.g. synaptic transmission and electrical coupling.
- Describe how synaptic information is integrated and the synaptic basis of LTP and LTD.
- Describe how ion channels and cell surface receptors contribute to cell function in physiological systems, e.g. the retina and auditory systems.
- Describe how drug development can be used to elucidate the nature of the molecular targets used in the treatment of specific CNS disorders.
- Relate basic neuroscience concepts to animal and human psychology and behaviour.
- Explain the mechanisms of action of drugs of abuse and the use of drugs to treat neurological and psychiatric disorders.
- Determine and analyze the accuracy and relevance of information presented in online and/or in print media presenting on new drug development to address a brain disorder (e.g., dementia, addiction).
- Describe the purpose and process of at least two research methodologies used in neuroscience (e.g., electrophysiological, brain imaging)
- Discuss their approach to and process for analyzing research articles based on information presented in class.

4) Experiential Education is expanded on in the next section.

Experiential Education/Technology-Enhanced Learning

EE remains a top priority for York University and the Faculty of Health as it offers a range of benefits for students related to academic performance, civic engagement and employability (for more information on the benefits of EE for students and course directors, please go to: **http://health.yorku.ca/experiential-education/faculty/**. Course directors are invited to integrate EE into their course where possible, but it is understood that some EE strategies may not be feasible in every course.

Course proposals with EE must be reviewed by Andra Petro, EE Coordinator (apetro@yorku.ca) prior to the submission of the proposal to the Faculty of Health Curriculum Committee.

• ***Please indicate (X) if the course uses any EE and/or technology-enhanced learning?***	***YES***	***X***	***NO***	
• ***If NOT, please outline some of the reasons EE or technology-enhanced learning could not be incorporated the course.***				
• ***If YES, please indicate (X) whether your course will include one or more of the following types of EE and technology-enhanced learning. Refer to York's Common Language for Experiential Education for complete definitions and further details.***				
X	***Classroom based (e.g. guest speakers, role playing, visual media, case studies, simulations, workshops and laboratory, course-based research etc.)***			
	Community based (e.g. community-based learning; community-based research; community service learning)			
	Work focused (e.g. placement/practicum)			
Please outline how you plan to engage students in reflection (critically examining a concrete experience) around the EE activities described above.				
Experiential Education: Students will have the opportunity to analyze research and media articles that draw on the knowledge and concepts being taught in class. Depending on enrollment, students could work in groups to critically reflect and write about one media article elaborating on reflection questions such as "What" (e.g., what neuroscience issue is being addressed?), "So What" (e.g., how does this information relate to your neuroscience content?), and "Now what" (e.g., What would they like to learn more about pertaining to this topic?). The analysis of the research article will also offer students the opportunity to critically reflect on the				

research processes followed and/or discussed in the article, supporting students' emerging understanding of the purpose and process of at least two of these methodologies**.**

Not only is it important for students to have a foundational understanding of the range of topics/subjects covered, but students will also need to develop fundamental skills in working with/understanding/exploring these topics so that they are ready for subsequent courses that will demand a more sophisticated set of transferable skills (e.g. problem solving, communication, information handling). Therefore, we propose that the students will benefit from an EE approach that emphasizes reflection on the learning process (not only the content itself) to assist students in identifying and developing skills that will be important to their success in future courses. That said, students will analyze their approach to reading a research article pertinent to the topics covered in the course as part of a debriefing conversation following their group work activity described in the first paragraph. This latter activity will help students build an awareness of their own analytical thought processes. Both EE activities will begin to build skills in academic writing that will be needed for the upper level Capstone course.

Technology Enhanced Learning: Students will be able to work together online through the Moodle discussion forums or Wiki features, in order to engage in their written work. Personal response systems (e.g., iClickers/REEF) can be used to provide low-stakes, timely feedback to both students and instructor regarding student comprehension of course material. This course will leverage learning technologies, video software, and simulations to describe the neuroscience content and showcase the processes. Students will also have access to a Moodle site where these videos/simulations will be available for later review.

Instruction/Course Format

- ***Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.)***

At least one section every year. This course will have to be offered in the Fall term as it is a prerequisite for NRSC 2100.

- ***Number of School/Department members currently competent to teach the course.***

About 10 from the Departments of Biology, Psychology, and Kinesiology & Health Science.

- ***Instructor(s) likely to teach the course in the coming year.***

The first year possibly Georg Zoidl, Dorota Crawford. In subsequent years a new faculty hire would support the offering of this course.

- ***An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved. This information is required to indicate whether an effective length of term is being maintained.***

In the first year this course may be offered in the usual 3 lecture hours per week for 12 weeks. Given the depth of factual based information, it can also be designed and delivered using the flipped classroom format whereby online lectures/videos/simulations are available for students to review before class but at their own pace, and before exams as a study aid. In-class time can then be used for maximizing learning using personal response system technology to formatively assess student knowledge and other student engagement activities to delve deeper into their learning.

- ***In absence of scheduled contact hours, please provide an indication of the estimated time students are likely to spend engaged in learning activities required by the course.***

The course will typically meet once weekly for 3 hours.

- ***In the absence of scheduled contact hours, please indicate how the course design encourages student engagement and supports students in achieving the learning objectives.***

Student engagement with the course material will be encouraged and enhanced using simulations that demonstrate the structures and functions of, for example, ion channels and neural pathways. These simulations and similar demonstrations offer students the opportunity to engage with the material by 'seeing' these processes occur rather than simply reading about these processes in the text book. Having the content available online through videos and simulations also allows students to review the content at their own pace and prior to exams.

Engagement will also be encouraged in class using activities such as Think, Pair, Share, and the personal response system technology. The assignments are designed to inspire students to think critically about how "what they are learning" can be applied to real world scenarios. This will include, for example, an opportunity to analyze media and journal articles that discuss the various functions and topics being taught. These activities will also serve as a means to support students in achieving the learning outcomes of the course, as students will be required to demonstrate an application and synthesis of knowledge by explaining, describing, and discussing the content in producing the final product for this assignment. Group work will contribute to students building essential skills in interpersonal communication and collaboration. Opportunities for critical reflection will also help students to explore their individual learning process and to build skills in critical thinking and communication that will be essential to their success in future courses and in their chosen careers.

Evaluation:

4. ***Please provide a detailed description of the basis of evaluation for the proposed course, including the type and percentage value of each assignment.***

Students will be evaluated using assessments that consider both their understanding of key course concepts as well as their development of key thinking and writing skills.

Two non-cumulative exams, a mid-term and a final, plus participation in class through personal response system polls will assess students' content knowledge. The mid-term will be weighted 30% and the final exam will be worth 30% of the total mark. Responses to the personal response system polls will be worth 10% of the grade.

The final 30% of the mark will be divided between the reflection activity on the media article and the journal article critique assignment. These two assessments are weighted toward skill development alongside an emerging self-awareness – students will be expected to work toward successfully completing the assignment itself but also will be assessed on how well they critically reflect on their learning in and from this experience.

5. If the course is to be integrated (i.e., graduate/undergraduate), please list the additional evaluation requirements for graduate students.

n/a

6. If the proposed course employs technology-enhanced forms of delivery (i.e., non "face-to-face", please identify how the integrity of learning evaluation will be maintained (will "on-site" examinations be required, etc.)

All exams will take place in class or during the scheduled exam time-period.

Other Resources:

3. Please provide a statement regarding the adequacy of physical resources (equipment, space, etc.). As well, please indicate if any other resources are required. Approval of a new course will be considered only if adequate resources are available to support the course.

Existing space and library resources are adequate.

4. If there is a technology-enhanced component to the course, a statement is required from the Learning Technology Services indicating whether resources are adequate to support the course. Requests for statements can directed to Rob Finlayson (rfinlays@yorku.ca). Please note, it will take two weeks to get a statement of support.

Course Rationale:

5. ***How will the course contribute to the educational objectives of the School/Department and of the Faculty?***

This course contributes to the educational objectives of the Neuroscience major as it is the first of 5 new neuroscience courses in the newly proposed neuroscience program. It provides a foundational survey of key topics and is therefore prerequisite to subsequent courses, allowing those courses to treat specific neuroscience topics in much greater depth.

As an introductory survey level course aimed at providing an overview of key concepts and ideas in the field, it will be open to majors and non-neuroscience majors. This will allow various other upper level existing courses which currently cater to students with little background in the neuroscience field (such as some of the courses contributing to each neuroscience stream such as BIOL 4370 3.0, KINE 3670 3.0, KINE 4500 3.0, KINE 4505 3.0, PSYC 4380 3.00 to name a few) to refrain from having to review these beginning level concepts and thus spend more time engaging in specialized in-depth treatments of specific areas. In the future and if applicable such upper level courses will need to specify NRSC 2000 3.0 as a prerequisite.

This course contributes to the educational objectives of the two Faculties and 3 academic units as it contributes to the depth and breadth of knowledge as well as the application of knowledge for a BSc degree.

6. ***What is the relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content? If overlap exists, please indicate the nature and extent of consultation which has taken place. If the course is to be cross-listed, integrated or listed as a course credit exclusion with another course, approval is required from all the relevant Faculties/units.***

In PSYC 2240 3.00 Biological Basis of Behaviour, a few weeks are spent learning about general anatomy and physiology, nerve cells, neural impulses, synapses, memory, and some psychological disorders. However, PSYC 2240 does not go into the depth of detail about molecular and cellular physiology that this new course does. In addition, PSYC 2240 spends about two-thirds of the course on topics not covered in this new course (e.g., emotional behaviours, reproductive behaviours, genetics, evolution, wakefulness, sleep). Therefore, it is felt that there are enough differences in depth and breadth of topics that these two courses do not need to be cross-listed with each other.

7. ***If applicable, please indicate the relationship of the proposed course to interdisciplinary programs; i.e. for which interdisciplinary program(s) will the course count for major/minor credit. As well, please indicate the nature and extent of consultation that has taken place with the relevant interdisciplinary program coordinator(s).***

n/a

8. ***What is the expected enrolment in the course?***

Expected enrolment: 100-150

Bibliography:

Please list the <u>required readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.).

There are a number of core textbooks that will serve as reference books throughout the neuroscience program and will be used again in other core neuroscience courses. Three are:

- Neuroscience 6th Ed., Purves, D. et. al. (Eds.), Oxford University Press. (2017)
- Principles of Neurobiology, L. Luo, Taylor & Francis Ltd (2015)
- Fundamental Neuroscience, Squire et. al. (Eds.), Academic Press (2012)

This course will also use journal articles and examples from current literature in Medline/Pubmed such as Nature Neuroscience Reviews, Trends in Neuroscience, etc.

Please list any <u>suggested readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.)

Examples from current literature will change each year but in general will be found in Medline/Pubmed (Nature Neuroscience Reviews, Trends in Neuroscience, etc.)

Please list any <u>online resources</u> for the course (please include complete bibliographical information as above).

For students, the experiential education guide is a useful resource: http://ee_guide.info.yorku.ca/.

If the course is to be integrated (graduate/undergraduate), a list of the additional readings required of graduate students must be included. If no additional readings are required, a rationale should be provided.

n/a

<u>Library Support Statement</u>:

Proposals for new courses must include a **<u>library support statement</u>** from the Bibliographer responsible for the relevant discipline to indicate whether resources are adequate to support the course. To request a support statement, see the list of subject and liaison librarians at http://www.library.yorku.ca/web/about-us/contact-us/liaison-librarians/.

Consultation/Approval:

- The Faculty of Health Curriculum Committee will only consider new course proposals that have been approved by the unit responsible for offering the course.
- If the proposed course is to be cross-listed, integrated, listed as a course credit exclusion with another course, or listed as a major/minor course option in an interdisciplinary program, the proposal must be accompanied by a statement from the collaborating unit signaling agreement to the proposal.

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New Course Proposal Form
Faculty of Health Curriculum Committee

School/Department: Biology, Psychology, Kinesiology and Health Science

Course Number Information:

Faculty: HH **Rubric:** NRSC (i.e. HLST) **Course #:** 2100 **Weight:** 3.0 (i.e. 3.00, 6.00 or 0.00)

Effective Session for Change: **Term:** Winter (i.e. Fall, Fall/Winter, Winter) **Year:** 2021 (i.e. 2017-18, 2018)

Course Title: The official name of the course as it will appear in the Undergraduate Calendar.

Systems, Behavioural & Cognitive Neuroscience

Short Title: <u>Maximum 40 characters</u>, including punctuation and spaces. The short title appears on any documents where space is limited (transcripts and lecture schedules).

Systems, Behavioural & Cognitive Neuroscience

Brief Course Description: For editorial consistency, verbs should be in the present tense and begin the description; e.g., "Analyzes the nature and extent of...," rather than "This course will analyze..." or "This course analyzes…".

This is the official description of the course as it will appear in the Undergraduate Calendar. The course description should be carefully written to convey what the course is about. If applicable, include information regarding the language of instruction if other than English.

Explores the structure and function of the human brain. Topics include the organization of the central nervous system, the function and neural basis of sensory and movement systems, consciousness, language, thought and memory.

- **List course(s) where applicable:**

Integration†:		Course Credit Exclusions*:	
Prerequisites:	NRSC 2000 3.0.	Cross-listed to:	
Corequisites:			

†Integrated courses are graduate courses integrated (taught with) 4000-level undergraduate courses

*<u>Course credit exclusion</u> is a formal status accorded to pairs of courses that are recognized as having sufficient overlap in content to warrant specifically excluding students from obtaining credit for both.

- Include the following information only if the course is: limited to a specific group of students; closed to a specific group of students; if there is any additional information necessary for students to know before enrolling (notes); if the course includes experiential education, and whether the students will work with a community partner and/or if it will involve going off-campus.

Open to:	Honours BSc and Specialized Honours students
Not open to	
Notes:	

- **Science Course:**

	YES	**NO**
Denotes courses in KINE or PSYC to count as science credit for BSc degree programs	X	

Expanded Course Description

- Please provide a detailed course description that effectively conveys what this course is about. Please ensure that this description includes, but is not limited to: 1) course topics/theories; 2) course learning objectives; 3) course learning outcomes; and 4) a description of any experiential education (EE) and/or technology-enhanced learning (also referred to as eLearning) activities.

Term	Definition
Course Learning Objectives	Statements of the overall learning and teaching goals for the course and represent what the instructor would expect students to learn and retain in the course. They articulate what the teacher plans to achieve in the course.
Learning Outcomes	Statements of what the student will achieve by the end of the course. They provide a framework for assessment by stating what you expect the learners to be able to demonstrate after completing the course. A succinct learning outcome specifies the tasks students are expected to be able to perform and the level of competence expected for the tasks.
Experiential Education (EE)	The blending of theory/course work with concrete experience. Effective EE activities require students to reflect on and demonstrate their understanding of the relationship(s) between theory/course work and concrete experience.
Structured Reflection	Structured reflection is any planned activity or exercise that requires students to refer back and critically examine the concrete experience in light of existing theory and/or what is being covered in the course.
Technology-Enhanced Learning (eLearning)	The use of technology to support students' interaction: with and access to the content; to course learning activities; and with other students and faculty members in order to develop knowledge and skills

Refer to the last page of the course proposal for resources on course learning objectives and outcomes, experiential education and technology-enhanced learning.

1) As a core component of the neuroscience degree, this course provides students an opportunity to explore the structure and function of the human brain. Potential topics to be covered:

The Neural Basis of Cognition

- The Organization of the Central Nervous System
- The Functional Organization of Perception and Movement
- The Organization of Cognition
- Functional Imaging of Cognition

Perception

- Sensory Coding
- The Somatosensory System: Receptors and Central Pathways
- The Constructive Nature of Visual Processing
- Low-Level Visual Processing: The Retina
- Visual Processing and Action
- The Inner Ear
- The Auditory Central Nervous System
- Smell and Taste: The Chemical Senses

Movement

- The Organization and Planning of Movement
- The Motor Unit and Muscle Action
- Voluntary Movement: The Primary Motor Cortex
- The Control of Gaze
- The Vestibular System
- The Cerebellum

The Unconscious and Conscious Processing of Neural Information

- The Sensory, Motor, and Reflex Functions of the Brain Stem
- Emotions and Feelings
- Sleep and Dreaming

Language, Thought, Affect, and Learning

- Language
- Learning and Memory
- Cellular Mechanisms of Implicit Memory Storage and the Biological Basis of Individuality
- Prefrontal Cortex, Hippocampus, and the Biology of Explicit Memory Storage

2) Course Learning Objectives:

- Provide an introductory overview of the structure and function of the human brain
- Discuss case studies or famous cases of brain abnormalities to explore the function of various structures in the brain
- Facilitate simulation activities using videos that demonstrate and explain brain function to provide multimodal opportunities for learning about brain structures and their associated functions

3) Expected Learning Outcomes:

Students who have passed this course are expected to be able to:

- Describe the structural organization of the human central nervous system
- Describe the brain's major components, lobes of the cerebral cortex, and the gross functional organization, including the areas responsible for sensory systems and motor output
- Identify the various techniques by which we can measure brain function
- Describe how the techniques used to measure brain function capture information about how the brain works
- Describe the sensory systems, including the coding of information at the sensory receptors, through the processing of this information in the cortex

- Describe the motor system, from the areas in the brain responsible for planning movements, the contributions of the cerebellum, through the actions of motor units
- Explain the functions/structure of the brain that control eye and head movements and their relationship to the vestibular system
- Explain what is meant by consciousness
- Describe which functions of the brain are conscious or unconscious
- Describe language and how it differs from other animal communication systems
- Identify the parts of the brain responsible for producing and comprehending language
- Describe memory systems in the brain
- Differentiate between declarative and procedural memories.

4) Experiential education is explored in more detail in the next section.

Experiential Education/Technology-Enhanced Learning

EE remains a top priority for York University and the Faculty of Health as it offers a range of benefits for students related to academic performance, civic engagement and employability (for more information on the benefits of EE for students and course directors, please go to: **http://health.yorku.ca/experiential-education/faculty/**. Course directors are invited to integrate EE into their course where possible, but it is understood that some EE strategies may not be feasible in every course.

Course proposals with EE must be reviewed by Andra Petro, EE Coordinator (apetro@yorku.ca) prior to the submission of the proposal to the Faculty of Health Curriculum Committee.

• ***Please indicate (X) if the course uses any EE and/or technology-enhanced learning?***	***YES***	***x***	***NO***	
• ***If NOT, please outline some of the reasons EE or technology-enhanced learning could not be incorporated the course.***				
• ***If YES, please indicate (X) whether your course will include one or more of the following types of EE and technology-enhanced learning. Refer to York's Common Language for Experiential Education for complete definitions and further details.***				
x	***Classroom based (e.g. guest speakers, role playing, visual media, case studies, simulations, workshops and laboratory, course-based research etc.)***			
	Community based (e.g. community-based learning; community-based research; community service learning)			
	Work focused (e.g. placement/practicum)			
Please outline how you plan to engage students in reflection (critically examining a concrete experience) around the EE activities described above.				

Experiential Education: Students will have the opportunity to develop transferable skills such as problem solving by exploring case studies where famous cases of brain abnormalities are used to discuss what structures or functions of the brain are damaged and therefore interfering with the functioning of the normal human brain. Students will be asked to write a critical reflection based on a provided case study e.g., addressing the questions "what?" (e.g., what did they learn about the structure/function covered, what neuroimaging techniques were used to measure the structure/function), "so what" (how does this information contribute to our knowledge in the field of neuroscience), and "what now" (what more would they like to know about this topic or what further research needs to be engaged in to expand on this topic). This activity should encourage reflection on the integration of key course concepts and how the student worked to determine which structures and/or functions of the brain were being impacted.

Technology Enhanced Learning: In class polls providing low stakes, timely feedback (e.g., by using personal response system technology) can be used to help students to evaluate their understanding of the course content and for the course director to receive real time formative feedback of the students understanding of the course material. As much of this course focuses on the systems and functions in the normal human brain, technology will be used to provide students with a diversity of means to review and learn course content. For example, video simulations of brain function (e.g. data collected from fMRI, etc.,) and video recordings that explain brain function (e.g. from YouTube, MERLOT.org) will offer a multimodal means of reviewing core concepts. Students will also have access to a Learning Management System (Moodle) site where these videos/simulations will be available for later review.

Instruction/Course Format

- ***Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.)***

One section will be offered every year, in the winter term.

- ***Number of School/Department members currently competent to teach the course.***

There are a number of faculty who can teach this course, drawn from the departments of Psychology and Kinesiology. They include Doug Crawford, Joseph DeSouza, Laurence Harris, Richard Murray, Jennifer Steeves, Laurie Wilcox, Mazyar Fallah, Dorota Crawford, Denise Henriques, and Lauren Sergio.

- ***Instructor(s) likely to teach the course in the coming year.***

In the first year, possibly Joseph DeSouza. In subsequent years, a new neuroscience hire would support the offering of this course.

- ***An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved. This information is required to indicate whether an effective length of term is being maintained.***

In the first year this course may be offered in the usual 3 lecture hours per week for 12 weeks. Given the depth and breadth of factual based information, it can also be designed and delivered using the flipped classroom whereby online lectures/videos/simulations are available for students to review before class but at their own pace, and before exams. Or it can be adapted to a blended format whereby in class time is replaced with online learning activities (e.g., discussion forums promoting debates in pairs/groups that help students to problem solve about case-studies; learning objects could be created that allow students to practice matching of structures to functions.)

Any in-class time can then be used for maximizing learning using personal response system technology to evaluate student knowledge and student engagement activities to delve deeper into their learning. For example, an in-class activity could be used such as "Think, Pair, Share" where students are posed a question about the content, pair up with a partner to discuss it, and then share what they know with each other and eventually with the rest of the class. In class time could also be used to engage in problem solving about the case study.

- ***In absence of scheduled contact hours, please provide an indication of the estimated time students are likely to spend engaged in learning activities required by the course.***

Currently the course is being proposed to hold scheduled contact hours once weekly for 3 hours.

- ***In the absence of scheduled contact hours, please indicate how the course design encourages student engagement and supports students in achieving the learning objectives.***

If the course is to be offered in a flipped or blended format, student engagement with the course material will be enhanced with the use of video and similar technologies designed to offer multiple means of interacting with key course concepts. Students will also have the opportunity to work with peers to review and respond to case studies and/or simulations that will offer 'real life' examples of the complex structure and function of the human brain, particularly when there are abnormalities or accidents that impede its normal function. In class activities will also offer students the opportunity to engage with their peers in small and large group discussions, e.g. inspired by Think, Pair, Share activities. Engagement with the course material and their peers supports the achievement of the courses' learning objectives by offering multiple means to discuss and review key course concepts. The use of video as a strategy for delivering course content reflects an opportunity for multiple means of engaging with and learning about key concepts, ensuring (where possible) that students with a variety of learning preferences can work toward understanding the material. Case studies also offer a means to integrate and make connections among the material, as this course emphasizes an understanding of normal brain functioning, such that each concept cannot be understood in isolation. Taking a 'systems approach' to the course material (e.g. using reflective activities to help students consider brain function and neurological processes) will help to meet the descriptive level outcomes for the course. Students will be guided to move beyond only identifying core structures or key functions of the brain to begin understanding how these structures and functions work together.

Evaluation:

7. ***Please provide a detailed description of the basis of evaluation for the proposed course, including the type and percentage value of each assignment.***

Students will be evaluated with three non-cumulative equally weighted onsite written exams (25% each), one in the final exam time-period. Exams will include both multiple choice questions to assess if students can correctly identify key course concepts, alongside matching and/or short answer questions designed to assess students' ability to describe and explain the structure and function of the normal human brain. Responses to the in-class polls will be worth 10% of the grade. 15% of the students' final grade will be calculated from their work on responding to the in-class case study/simulation exercises. Students will be assessed on the engagement with/participation in the exercises (e.g. they must be present in class and complete the exercise) as well as their reflective responses. Responses will be assessed both on accuracy (against the course material) as well as their ability to make critical connections between core course concepts.

8. If the course is to be integrated (i.e., graduate/undergraduate), please list the additional evaluation requirements for graduate students.

n/a

9. If the proposed course is employs technology-enhanced forms of delivery (i.e., non "face-to-face", please identify how the integrity of learning evaluation will be maintained (will "on-site" examinations be required, etc.)

All exams will be taken in class or during the scheduled exam time-period.

Other Resources:

5. Please provide a statement regarding the adequacy of physical resources (equipment, space, etc.). As well, please indicate if any other resources are required. Approval of a new course will be considered only if adequate resources are available to support the course.

Lecture hall, with space for approximately 100-150 students, internet connection, and audiovisual equipment.

6. If there is a technology-enhanced component to the course, a statement is required from the Learning Technology Services indicating whether resources are adequate to support the course. Requests for statements can directed to Rob Finlayson (rfinlays@yorku.ca). Please note, it will take two weeks to get a statement of support.

Course Rationale:

9. ***How will the course contribute to the educational objectives of the School/Department and of the Faculty.***

As a core course of the Neuroscience degree program this course contributes to the educational objectives of the Neuroscience major. Students will be introduced to the fundamentals of neuroscience in this course, as well as with NRSC 2000 3.0 and NRSC 2200 4.0, all taken in the second year. These courses will serve as the background for more specialized courses that the students will take at the 3000- and 4000- level.

As this course is designed to provide an overview of the structure and function of the normal human brain, concepts relevant to a variety of science-based and similar courses, it will be open to non-neuroscience majors. This will allow various other upper level existing courses which currently cater to students with little background in the neuroscience field (such as some of the courses contributing to each neuroscience stream such as BIOL 4370 3.0, KINE 3670 3.0, KINE 4500 3.0, KINE 4505 3.0, PSYC 4380 3.00 to name a few) to spend less time reviewing these beginning level concepts and spend more time engaging in specialized in-depth treatments of specific areas. In the future and if applicable such upper level courses will need to specify NRSC 2100 3.0 as a prerequisite.

This course contributes to the educational objectives of the two Faculties and 3 academic units as it contributes to the depth and breadth of knowledge as well as the application of knowledge for a BSc degree.

10. ***What is the relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content. If overlap exists, please indicate the nature and extent of consultation which has taken place. If the course is to be cross-listed, integrated or listed as a course credit exclusion with another course, approval is required from all the relevant Faculties/units.***

Existing courses PSYC 2220 3.00 Sensation and Perception I, PSYC 2240 3.00 Biological Basis of Behaviour, PSYC 3260 3.00 Cognition, PSYC 3265 3.00 Memory, and PSYC 3270 3.00 Sensation and Perception II cover similar material but from a distinctly different psychological perspective. These courses are sufficiently different to be included as chosen or alternative courses in the proposed neuroscience program streams.

11. ***If applicable, please indicate the relationship of the proposed course to interdisciplinary programs; i.e. for which interdisciplinary program(s) will the course count for major/minor credit. As well, please indicate the nature and extent of consultation that has taken place with the relevant interdisciplinary program coordinator(s).***

n/a

12. ***What is the expected enrolment in the course?***

Expected enrolment: 100-150

Bibliography:

Please list the <u>required readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.).

The textbook proposed below will serve as reference books throughout the neuroscience program and will be used again in other core neuroscience courses:

Principles of Neural Science, 5th Edition. Kandel, E.R. et al., McGraw-Hill, New York. 2012. ISBN 0-07-139011-1

Please list any suggested readings for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.)

This will depend on the instructor.

Please list any online resources for the course (please include complete bibliographical information as above).

For students, the experiential education guide is a useful resource: http://ee_guide.info.yorku.ca/

If the course is to be integrated (graduate/undergraduate), a list of the additional readings required of graduate students must be included. If no additional readings are required, a rationale should be provided.

n/a

Library Support Statement:

Proposals for new courses must include a **library support statement** from the Bibliographer responsible for the relevant discipline to indicate whether resources are adequate to support the course. To request a support statement, see the list of subject and liaison librarians at http://www.library.yorku.ca/web/about-us/contact-us/liaison-librarians/.

Consultation/Approval:

- The Faculty of Health Curriculum Committee will only consider new course proposals that have been approved by the unit responsible for offering the course.
- If the proposed course is to be cross-listed, integrated, listed as a course credit exclusion with another course, or listed as a major/minor course option in an interdisciplinary program, the proposal must be accompanied by a statement from the collaborating unit signaling agreement to the proposal.

health | YORK UNIVERSITÉ UNIVERSITY

New Course Proposal Form
Faculty of Health Curriculum Committee

School/Department: Biology, Psychology, Kinesiology and Health Science

Course Number Information:

Faculty:	**Rubric:**	**Course #:**	**Weight:**
HH	NRSC (i.e. HLST)	2200	3.0 (i.e. 3.00, 6.00 or 0.00)

Effective Session for Change: **Term:** Winter (i.e. Fall, Fall/Winter, Winter) **Year:** 2022 (i.e. 2017-18, 2018)

Course Title: The official name of the course as it will appear in the Undergraduate Calendar.

Neuroscience Techniques

Short Title: **Maximum 40 characters**, including punctuation and spaces. The short title appears on any documents where space is limited (transcripts and lecture schedules).

Neuroscience Techniques

Brief Course Description: For editorial consistency, verbs should be in the present tense and begin the description; e.g., "Analyzes the nature and extent of...," rather than "This course will analyze..." or "This course analyzes…".

This is the official description of the course as it will appear in the Undergraduate Calendar. The course description should be carefully written to convey what the course is about. If applicable, include information regarding the language of instruction if other than English.

Provides students with an overview of and exposure to experimentation techniques and methodologies in the fields of systems and cognitive, cellular and molecular, and computational and theoretical neuroscience. These could include any of the following: EEG, fMRI, behavioural methods such as psychophysics and eye/body tracking, electrophysiology, patch and dynamic clamp, transgenic mouse technology, molecular imaging, neuronal coding and communication, neuronal networks, and brain-machine interfaces.

- **List course(s) where applicable:**

Integration†:		Course Credit Exclusions*:	
Prerequisites:	NRSC 2000 3.0	Cross-listed to:	
Corequisites:	NRSC 2100 3.0.		

†Integrated courses are graduate courses integrated (taught with) 4000-level undergraduate courses

*Course credit exclusion is a formal status accorded to pairs of courses that are recognized as having sufficient overlap in content to warrant specifically excluding students from obtaining credit for both.

- Include the following information only if the course is: limited to a specific group of students; closed to a specific group of students; if there is any additional information necessary for students to know before enrolling (notes); if the course includes experiential education, and whether the students will work with a community partner and/or if it will involve going off-campus.
-

Open to:	Students registered in the Neuroscience program
Not open to	
Notes:	

- **Science Course:**

	YES	NO
Denotes courses in KINE or PSYC to count as science credit for BSc degree programs	X	

Expanded Course Description

- Please provide a detailed course description that effectively conveys what this course is about. Please ensure that this description includes, but is not limited to: 1) course topics/theories; 2) course learning objectives; 3) course learning outcomes; and 4) a description of any experiential education (EE) and/or technology-enhanced learning (also referred to as eLearning) activities.

Term	Definition
Course Learning Objectives	Statements of the overall learning and teaching goals for the course and represent what the instructor would expect students to learn and retain in the course. They articulate what the teacher plans to achieve in the course.
Learning Outcomes	Statements of what the student will achieve by the end of the course. They provide a framework for assessment by stating what you expect the learners to be able to demonstrate after completing the course. A succinct learning outcome specifies the tasks students are expected to be able to perform and the level of competence expected for the tasks.
Experiential Education (EE)	The blending of theory/course work with concrete experience. Effective EE activities require students to reflect on and demonstrate their understanding of the relationship(s) between theory/course work and concrete experience.
Structured Reflection	Structured reflection is any planned activity or exercise that requires students to refer back and critically examine the concrete experience in light of existing theory and/or what is being covered in the course.
Technology-Enhanced Learning (eLearning)	The use of technology to support students' interaction: with and access to the content; to course learning activities; and with other students and faculty members in order to develop knowledge and skills

Refer to the last page of the course proposal for resources on course learning objectives and outcomes, experiential education and technology-enhanced learning.

This could be a blended format course that consist of in class lectures, demonstrations, computer lab work, and online activities.

1) In class time will be spent discussing and/or debating techniques and methodological developments in neuroscience, describing how similar theoretical questions were / are investigated using different approaches, the advantages and disadvantages of each method, and the role of ethics in neuroscience.

Online or in computer lab activities will explore a minimum of 4 different neuroscience techniques and methods through video demonstrations and online experiments using software/hardware such as "Backyard Brains" (https://backyardbrains.com/experiments/).

Demonstrations of neuroscience techniques will be video recorded within different research labs and posted in the course learning management system for students to review. Students will review research articles that use the technique and engage in online discussion/journal club focusing on a key question critiquing the technique.

Students will be provided tutorials that show them how to build and analyze graphs using different techniques/methods. Students will be provided with a sample of data generated from the technique used and asked to produce a graph of the data, as well as a short explanation of their final product.

A guest speaker from the office of research ethics can be invited to discuss research ethics. Students will be invited to review the TCPS tutorial modules on research ethics (http://www.pre.ethics.gc.ca/eng/index/), as well as the senate policy on ethics (http://secretariat-policies.info.yorku.ca/policies/ethics-review-process-for-research-involving-human-participants-policy/) and provide in advance questions to be posed to the guest speaker.

At the end of the course students will present either orally in class or by developing a video module or podcast posted in the course learning management system a critical reflection about the laboratory/experimental technique. They will describe: What (what did they learn about the lab and the technique(s) they use), so what (what key course concepts does this technique help them to understand, what usefulness and limitations are associated with the technique), and what now (what more would they like to know about this technique or are there other techniques that could better investigate the nervous system in this context). If this final component is team based, students will complete a peer-to-peer and self-evaluation on their contribution to and participation in the team-based presentation.

2) Course Learning Objectives:

- Provide an overview of neuroscience experimental techniques used to investigate a variety of research questions

- Facilitate reviews of research articles and video recordings describing neuroscience techniques to critique the advantages and constraints associated with its use
- Guide students in building and analyzing graphical representations of quantitative data obtained using different techniques
- Consider the ethical implications of selecting and engaging in different neuroscience techniques

3) Expected Learning Outcomes:

Students who successfully complete the course will be able to

- Critique the purpose and process of four neuroscience experimental techniques for the investigation of a variety of research questions
- Describe the usefulness and limitations of four different available neuroscience techniques, including their spatial and temporal resolutions and degrees of invasiveness.
- Analyze quantitative information by graphically represent experimental data
- Describe an appropriate neuroscience technique to answer specific questions about structure and function of the brain and behavior.
- Communicate and critique the features of at least one experimental neuroscience technique
- Discuss ethics involved in engaging in different neuroscience techniques.

4) experiential education is described in more detail in the next section

Experiential Education/Technology-Enhanced Learning

EE remains a top priority for York University and the Faculty of Health as it offers a range of benefits for students related to academic performance, civic engagement and employability (for more information on the benefits of EE for students and course directors, please go to: http://health.yorku.ca/experiential-education/faculty/. Course directors are invited to integrate EE into their course where possible, but it is understood that some EE strategies may not be feasible in every course.

Course proposals with EE must be reviewed by Andra Petro, EE Coordinator (apetro@yorku.ca) prior to the submission of the proposal to the Faculty of Health Curriculum Committee.

• ***Please indicate (X) if the course uses any EE and/or technology-enhanced learning?***	***YES***	***x***	***NO***	
• ***If NOT, please outline some of the reasons EE or technology-enhanced learning could not be incorporated the course.***				
• ***If YES, please indicate (X) whether your course will include one or more of the following types of EE and technology-enhanced learning. Refer to York's Common Language for Experiential Education for complete definitions and further details.***				
x	***Classroom based (e.g. guest speakers, role playing, visual media, case studies, simulations, workshops and laboratory, course-based research etc.)***			
	Community based (e.g. community-based learning; community-based research; community service learning)			
	Work focused (e.g. placement/practicum)			
Please outline how you plan to engage students in reflection (critically examining a concrete experience) around the EE activities described above.				

Experiential Education: students will be given the opportunity to analyze and interpret data using a specific type of technique and discuss a variety of neuroscience techniques used for experimentation. A final presentation will be a reflective exercise prompting students to consider how a technique demonstrates key course concepts. They also will be asked to review tutorial modules on research ethics (http://www.pre.ethics.gc.ca/eng/index/), as well as the senate policy on ethics (http://secretariat-policies.info.yorku.ca/policies/ethics-review-process-for-research-involving-human-participants-policy/) and provide in advance questions to be posed to the guest speaker.

Technology-Enhanced Learning: This course is being proposed as a blended format course whereby a minimum of one-third of in class time will be replaced with online learning activities reviewing lab techniques, engaging in simulations, and participating in the journal club/discussion forums. Students will have the opportunity to explore a variety of techniques used in experimentation. The use of various software and hardware tools will be guided by the instructor to practice the skills students will be expected to develop in the neuroscience major. Learning technologies (e.g. engaging in discussion forums/journal club online in the course learning management system, etc.) will also be used to demonstrate and disseminate information related to core course concepts.

Instruction/Course Format

- ***Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.)***

One section of the course will be offered each year.

- ***Number of School/Department members currently competent to teach the course.***

Any of the core neuroscience faculty are capable of being the course director.

- ***Instructor(s) likely to teach the course in the coming year.***

Erez Freud, Denise Henriques, Susan Murtha

- ***An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved. This information is required to indicate whether an effective length of term is being maintained.***

This course is being proposed as a blended format course whereby a minimum of one-third of in class time will be replaced with online learning activities reviewing lab techniques, engaging in simulations, and participating in the journal club/discussion forums.

- ***In absence of scheduled contact hours, please provide an indication of the estimated time students are likely to spend engaged in learning activities required by the course.***

Approximately 2 hours each week online

- ***In the absence of scheduled contact hours, please indicate how the course design encourages student engagement and supports students in achieving the learning objectives.***

Principles of universal design for learning (flexible, accessible, enabling students to make choices and be more involved in the learning process) will be applied to course design to ensure students engage in the online forums.

Access to resources to show students how to critique and review journal articles, how to create online video modules and/or podcasts, how to build a graph in Excel from data provided, etc., will be found or created and added to the Moodle course for students use as needed. Where applicable students will be provided with a grading rubric for how they will be evaluated in online discussion forums and with their presentations.

Evaluation:

10. ***Please provide a detailed description of the basis of evaluation for the proposed course, including the type and percentage value of each assignment.***

In order to follow the principles of universal course design for learning the expectation is that students will be evaluated on the following:

- Three of four best submissions of graphs based on data provided using different techniques (45%, i.e., 15% each)
- Three of four best submissions to the online Journal /Discussion forums guided by prompt questions (30%, i.e., 10% each)
- Oral reflection presentation (in person or online) about one of the techniques (25%)
    - If the oral presentation is done as a team, then the final presentation is worth 22% and students engage in a peer to peer and self-evaluation for collaborating together on the team presentation (3%) (guidelines and rubrics for team work will be provided)

Note: no formal final exams are suggested for this course. However, if the CD deems that having a formal final exam is an appropriate option for students who miss a high percentage of the online or in computer lab and in class activities that could not be made up in another way, then that option could be exercised.

11. ***If the course is to be integrated (i.e., graduate/undergraduate), please list the additional evaluation requirements for graduate students.***

n/a

12. ***If the proposed course is employs technology-enhanced forms of delivery (i.e., non "face-to-face", please identify how the integrity of learning evaluation will be maintained (will "on-site" examinations be required, etc.)***

Blended format.

Other Resources:

7. ***Please provide a statement regarding the adequacy of physical resources (equipment, space, etc.). As well, please indicate if any other resources are required. Approval of a new course will be considered only if adequate resources are available to support the course.***

Software that emulates/simulates different techniques will need to be purchased for this course.

8. If there is a technology-enhanced component to the course, a statement is required from the Learning Technology Services indicating whether resources are adequate to support the course. Requests for statements can directed to Rob Finlayson (rfinlays@yorku.ca). Please note, it will take two weeks to get a statement of support.

Course Rationale:

13. ***How will the course contribute to the educational objectives of the School/Department and of the Faculty?***

This course contributes to the educational objectives of the newly proposed Neuroscience degree. This course has the unique opportunity to help students develop essential knowledge about the breadth of neuroscience techniques. An emphasis on skills alongside the already described knowledge acquisition will complement the intended learning outcomes of the other core neuroscience courses being proposed. Currently, although expertise in the neurosciences is well represented among the faculty, there is no specific course that covers either the breadth of experimental techniques currently used in neuroscience research, or the ethical implications of conducting research using those techniques. This new course proposal fills that gap. Successfully completing this course will contribute to the students' ability to achieve the following neuroscience program expectations:

- Describe the diverse experimental research methods used in the broad areas of neuroscience and defend the use of these methods.
- Relate neuroscience to other disciplines and apply learning from those disciplines within neuroscience
- Analyze and interpret pre-existing or novel data, including research findings, and communicate the findings in both oral and written formats
- Integrate and apply theoretical perspectives and major findings across broad areas of neuroscience
- Represent information in a quantitative format, to analyze and interpret quantitative information, including graphs and statistics.

14. ***What is the relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content. If overlap exists, please indicate the nature and extent of consultation which has taken place. If the course is to be cross-listed, integrated or listed as a course credit exclusion with another course, approval is required from all the relevant Faculties/units.***

Currently, although there are other research methods courses and other neuroscience courses offered there is little if any overlap between this course and any other course due to the breadth of exposure to different neuroscience techniques. The course complements other proposed new courses in the neuroscience program. The course promotes development of knowledge about neuroscience techniques and skill development in critical analysis and reflection.

15. ***If applicable, please indicate the relationship of the proposed course to interdisciplinary programs; i.e. for which interdisciplinary program(s) will the course count for major/minor credit. As well, please indicate the nature and extent of consultation that has taken place with the relevant interdisciplinary program coordinator(s).***

n/a

16. ***What is the expected enrolment in the course?***

Enrolment is capped at about 60-70 students.

Bibliography:

Please list the <u>required readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.).

Each technique will be covered by a review article plus potentially 1-3 example results articles. The papers will be shared online with hyperlinks in the course learning management system (e.g., Moodle) course.

Please list any <u>suggested readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.)

This will be dependent on the technique covered.

Please list any <u>online resources</u> for the course (please include complete bibliographical information as above).

For faculty members, there are some useful resources on reflection available on the Faculty of Health website: http://health.yorku.ca/experiential-education/ and on the Teaching Commons website: http://teachingcommons.yorku.ca/resources-2/experiential-education/.

For students the experiential education guide is a useful resource: http://ee_guide.info.yorku.ca/. Other excellent resources exist for guiding students on writing journals such as: https://emedia.rmit.edu.au/learninglab/content/writing-reflective-journal

An excellent resource of rubrics to guide and evaluate a number written/oral/team work skills can be found on the AACU website (see *value@aacu.org*)

If the course is to be integrated (graduate/undergraduate), a list of the additional readings required of graduate students must be included. If no additional readings are required, a rationale should be provided.

n/a

Library Support Statement:

Proposals for new courses must include a **library support statement** from the Bibliographer responsible for the relevant discipline to indicate whether resources are adequate to support the course. To request a support statement, see the list of subject and liaison librarians at http://www.library.yorku.ca/web/about-us/contact-us/liaison-librarians/.

Consultation/Approval:

- The Faculty of Health Curriculum Committee will only consider new course proposals that have been approved by the unit responsible for offering the course.
- If the proposed course is to be cross-listed, integrated, listed as a course credit exclusion with another course, or listed as a major/minor course option in an interdisciplinary program, the proposal must be accompanied by a statement from the collaborating unit signaling agreement to the proposal.

New Course Proposal Resources

Learning Objectives/Outcomes - http://teachingcommons.yorku.ca/resources-2/elearning/elearning/identifying-learning-outcomes-and-selecting-assessment-tasks/

Key questions for writing learning objectives/outcomes and assessment tasks:

- What essential knowledge, skills, and attitudes etc. would you expect the students to acquire?
- How sophisticated or complex (memorization, analysis, creation, etc.) would you expect students learning to be?
- What will students be able to do to demonstrate/articulate their level of learning?
- How do we know that they have learned it? What information is needed to be collected to verify/demonstrate students' learning of learning outcomes?
- How informative are each of these assessment task to understanding the student learning process?
- Are these clearly stated and communicated to students?

For information about learning objectives, please contact Health's Educational Developer, **Barbara Kerr**, by email at kerrb@yorku.ca or by phone at ext. 20691.

Experiential Education (EE) - http://health.yorku.ca/experiential-education/faculty

The Faculty of Health EE website includes:

- The common language for Experiential Education
- Examples of experiential education in the Faculty of Health
- Tools for and examples of reflection activities
- Available resources and support

For information about the different types of and activities to engage in EE, please contact the EE coordinator, **Anda Petro** by email at apetro@yorku.ca or by phone at ext. 40655.

Technology-Enhanced Learning - http://lts.info.yorku.ca/health/

The Faculty of Health enjoys priority service from the Learning Technology Services (LTS) unit. Their services can be accessed at http://lts.info.yorku.ca/health/. Additionally, you can contact **Sairam Chinnam** directly by email at schinnam@yorku.ca or by phone at ext. 40205.

Additional resources on technology-enhanced can be located at the Teaching Commons. For example, you can view sample blended eLearning courses at York University at http://teachingcommons.yorku.ca/resources-2/elearning/elearning/sample-blended-elearning-courses-at-york-university/. You can also contact **Yelin Su**, Educational Developer by email at ysu@yorku.ca or by phone at ext. 22117 for additional assistance.

health | YORK UNIVERSITÉ UNIVERSITY

New Course Proposal Form
Faculty of Health Curriculum Committee

School/Department: Biology, Psychology, Kinesiology and Health Science

Course Number Information:

Faculty:	HH	**Rubric:** (i.e. HLST)	NRSC	**Course #:**	3000	**Weight:** (i.e. 3.00, 6.00 or 0.00)	3.0

Effective Session for Change: **Term:** Fall (i.e. Fall, Fall/Winter, Winter) **Year:** 2022 (i.e. 2017-18, 2018)

Course Title: The official name of the course as it will appear in the Undergraduate Calendar.

Molecular and Cellular Basis of Perception and Cognition

Short Title: **Maximum 40 characters,** including punctuation and spaces. The short title appears on any documents where space is limited (transcripts and lecture schedules).

Molecular and Cellular Basis of Perception and Cognition

Brief Course Description: For editorial consistency, verbs should be in the present tense and begin the description; e.g., "Analyzes the nature and extent of...," rather than "This course will analyze..." or “This course analyzes…”.

This is the official description of the course as it will appear in the Undergraduate Calendar. The course description should be carefully written to convey what the course is about. If applicable, include information regarding the language of instruction if other than English.

Explores the molecular, structural and cellular basis of complex brain functions focussing on perception, learning and memory. Discuss technological advances in areas of genome engineering, optogenetics, imaging and animal models used in the field. Examples of human neurological disease conditions are used whenever appropriate to exemplify the consequences of sensory deficiencies in the nervous system.

- **List course(s) where applicable:**

Integration†:		Course Credit Exclusions*:	
Prerequisites:	NRSC 2000 3.0 and NRSC 2100 3.0	Cross-listed to:	
Corequisites:	NRSC 2200 3.0		

†Integrated courses are graduate courses integrated (taught with) 4000-level undergraduate courses

*Course credit exclusion is a formal status accorded to pairs of courses that are recognized as having sufficient overlap in content to warrant specifically excluding students from obtaining credit for both.

- Include the following information only if the course is: limited to a specific group of students; closed to a specific group of students; if there is any additional information necessary for students to know before enrolling (notes); if the course includes experiential education, and whether the students will work with a community partner and/or if it will involve going off-campus.

Open to:	Honours and Specialized Honours BSc students
Not open to	
Notes:	

- **Science Course:**

	YES	**NO**
Denotes courses in KINE or PSYC to count as science credit for BSc degree programs	X	

Expanded Course Description

- Please provide a detailed course description that effectively conveys what this course is about. Please ensure that this description includes, but is not limited to: 1) course topics/theories; 2) course learning objectives; 3) course learning outcomes; and 4) a description of any experiential education (EE) and/or technology-enhanced learning (also referred to as eLearning) activities.

Term	Definition
Course Learning Objectives	Statements of the overall learning and teaching goals for the course and represent what the instructor would expect students to learn and retain in the course. They articulate what the teacher plans to achieve in the course.
Learning Outcomes	Statements of what the student will achieve by the end of the course. They provide a framework for assessment by stating what you expect the learners to be able to demonstrate after completing the course. A succinct learning outcome specifies the tasks students are expected to be able to perform and the level of competence expected for the tasks.
Experiential Education (EE)	The blending of theory/course work with concrete experience. Effective EE activities require students to reflect on and demonstrate their understanding of the relationship(s) between theory/course work and concrete experience.
Structured Reflection	Structured reflection is any planned activity or exercise that requires students to refer back and critically examine the concrete experience in light of existing theory and/or what is being covered in the course.
Technology-Enhanced Learning (eLearning)	The use of technology to support students' interaction: with and access to the content; to course learning activities; and with other students and faculty members in order to develop knowledge and skills

Refer to the last page of the course proposal for resources on course learning objectives and outcomes, experiential education and technology-enhanced learning.

Since the beginning of life on Earth perception of the world outside of organisms has been critical for the survival of any species. When sensory systems got more complex converting sensory information to long lasting memories became highly advantageous. Today, they enable us to respond to a constantly changing environment evoking physiological responses and behaviours. This is facilitated through highly complex processes originating in specialized nerve cells communicating with our brains. Understanding the molecular, structural and cellular basis of perception and how perception is converted into long lasting memories, maintained and protected over a lifetime is one of the most important questions in Neurobiology.

1) As a core component of the Neuroscience program, this course explores the molecular, structural and cellular basis of complex brain functions focussing on perception, learning and memory. Potential topics include:

1: The Biological Foundations of Sensory Perception, Learning and Memory

- General Introduction
- Introduction to Methods in Sensory Perception, Learning and Memory Research

2: The Somatosensory System - Touch, Feeling, and Pain

- Anatomy, histology and development of the Somatosensory System
- Structure and function of mechanoreceptors detecting changes and fluctuations in pressure, position, and movement.
- Structure and function of thermoreceptors detecting hot and cold temperatures both of the outside world and inside the body.
- Structure and function of pain receptors detecting pressure, chemicals, and severe heat.
- Integrating somatosensory functions at molecular and cellular level.
- Dysfunctions of somatosensory systems.

3: The Chemosensory Systems - Taste and Smell

- Anatomy, histology and development of the Olfactory and Gustatory System
- Olfactory receptors: molecular basis for recognition and discrimination of odors.
- Olfaction and stem cells.
- Taste Perception and Coding in vertebrates and insects.
- Chemosensory perception in the gut.

- The role of ion channels and receptors in chemosensation.
- Signaling pathways in chemosensation.
- Animal models and methods to study chemosensation.
- Disorders of smell and taste senses and the link to diseases or conditions, such as Obesity, Diabetes, Hypertension, Malnutrition and Degenerative diseases of the nervous system.

4: Molecular and Cellular Basis of Hearing in Animals

- Anatomy, histology and development of the EAR

- COCHLEA:

- The hair cell cytoskeleton: an intricate scaffold that underlies hearing.
- Gap junction communication, homeostasis and genetic causes of deafness.
- The uniquely shaped hair bundle: morphogenetic events that control bundle development and polarity
- Motoring to the tip: myosin motor proteins regulating stereociliary length
- Constricting the base: myosins shape the taper of stereocilia
- At the heart of hearing: the mechanotransduction machinery of hair cells.
- Function and development of auditory hair cells.
- Animal models revealing the molecular and cellular basis for specific sensory connections.

- VESTIBULAR SYSTEM.

- Structures helping control one's sense of steadiness or balance.
- Molecules building specialized structures.

5: Molecular and Cellular Basis of Vision

- Anatomy, histology and development of the eye

- CORNEA:

- Epithelium: development, stem cells, barrier function, immunology, molecular biology of homeobox genes
- Stroma: wound healing, neovacularization, matrix structure and remodeling, - ion channels, cell junctions and transporters

- ANTERIOR CHAMBER AND LENS:

- Molecular mechanisms of ocular morphogenesis
- Molecular, cellular, and developmental biology of the lens, with emphasis on the regulation and evolution of gene expression
- Molecular and cellular basis of transparency and cataract formation
- Ion channels, cell junctions, and transporters in the function of the lens, and ciliary epithelium
- Mechanisms of fluid balance and control of intra-ocular pressure
- Molecular and cellular control of the extracellular matrix

- RETINA:

- Photoreceptors: biochemistry, molecular biology, cell biology and physiology of differentiation, signal transduction, and signal transmission; molecular and cellular biology of inherited and age-related retinal degenerations
- Pigment epithelium: molecular and cellular studies of polarity of membrane proteins; synthesis of interphotoreceptor matrix, growth factors and retinoid carrier proteins; transplantation
- Central connections: neurophysiology of transmission; contrast and colour perception and the physiology of amblyopia
- Developmental biology and retinal organization; retinal stem cells.

- ANIMAL MODELS AND GENETICS IN VISION RESEARCH

- Mouse and other mammalian models for studying vision disorders and probing fundamental mechanisms
- Non-mammalian models, including zebrafish, Xenopus, Drosophila
- Application of human genetics to understanding disease genes and risk factors and develop new approaches to cell and gene therapy for ocular disease.

6: Integrating Sensory Perception, Learning and Memory

- Calcium, calcium binding proteins and the role of kinases.
- Ion channels and receptors and their role in structural and functional dynamics at synapses
- ATP, adenosine and purinergic signaling in synaptic plasticity
- Cytoskeletal dynamics and synaptic plasticity

- Epigenetic regulation of memory formation and maintenance
- Channelopathies and dysfunctions of Sensory Perception, Learning and Memory
- Tauopathies and dysfunctions of Sensory Perception, Learning and Memory.
- Application of genome engineering and optogenetics to understand disease genes and risk factors for learning and memory disorders.
- Mammalian and non-mammalian animal models for studying learning and memory

2) Course Learning Objectives:

- Provide an overview of the structures, components, and processes involved in how the brain perceives and processes sensory and cognitive information across the life-span
- Facilitate case study exercises and/or simulations to evaluate technologies currently in use to investigate the sensory systems and processes of the brain
- Facilitate reviews of journal articles and/or articles in the media to explore the various sensory processes and critique how they are discussed in these mediums

3) Expected Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe the structural, molecular and cellular components of the nervous system relevant to perceive and process sensory information.
- Describe the structural, molecular and cellular components of the nervous system relevant for learning and memory.
- Describe fundamental processes that generate, shape and maintain sensory organs in the developing and aging brain.
- Explain the molecular and cellular basis of fundamental processes in signal transduction (e.g. Membranes and Membrane Potentials, The Action Potential, Voltage-dependent Membrane Permeability) with a focus on sensory organs, learning and memory.
- Explain the functions of Ion Channels, Electrical and Chemical Synapses
- Explain the functions of Signal Transduction Pathways.
- Describe pathological mechanisms of inherited sensory deficiencies like deafness or forms of blindness from a molecular and cellular perspective.
- Describe pathological mechanisms of learning and memory deficiencies
- Critique published decisions about- or arguments related to- real-world topics related to the nervous system with a focus on sensory processing, learning and memory.
- Compare the use of several state-of-the-art technologies to investigate the Sensory Systems in Health and Disease.
- Compare in vitro and in vivo strategies to investigate sensory systems from molecules to structures and cells.

4) experiential

Experiential Education/Technology-Enhanced Learning

EE remains a top priority for York University and the Faculty of Health as it offers a range of benefits for students related to academic performance, civic engagement and employability (for more information on the benefits of EE for students and course directors, please go to: **http://health.yorku.ca/experiential-education/faculty/**. Course directors are invited to integrate EE into their course where possible, but it is understood that some EE strategies may not be feasible in every course.

Course proposals with EE must be reviewed by Andra Petro, EE Coordinator (apetro@yorku.ca) prior to the submission of the proposal to the Faculty of Health Curriculum Committee.

• ***Please indicate (X) if the course uses any EE and/or technology-enhanced learning?***	***YES***	***x***	***NO***	
• ***If NOT, please outline some of the reasons EE or technology-enhanced learning could not be incorporated the course.***				

- ***If YES, please indicate (X) whether your course will include one or more of the following types of EE and technology-enhanced learning. Refer to York's Common Language for Experiential Education for complete definitions and further details.***

x	***Classroom based (e.g. guest speakers, role playing, visual media, case studies, simulations, workshops and laboratory, course-based research etc.)***
	Community based (e.g. community-based learning; community-based research; community service learning)
	Work focused (e.g. placement/practicum)

Please outline how you plan to engage students in reflection (critically examining a concrete experience) around the EE activities described above.

Experiential Education:
Students will have the opportunity to develop transferable skills such as problem solving and team work by exploring a real-world topic related to the nervous system with a focus on sensory processing, learning and memory. Students will be asked to work in teams (in class or online) to write a critical reflection on a journal article and/or media posting. They will be asked to address the questions: "what?" (e.g., what did they learn about the sensory process covered, what technologies were used to investigate the sensory system), "so what" (e.g., how does this information contribute to our knowledge in the field of neuroscience, does and/or how does the technologies used to investigate the sensory system further our understanding of this system), and "what now" (e.g., what more would they like to know about this topic or what further research needs to be engaged in to expand on this topic, are there other technologies that could better investigate the sensory system in this context). This activity should encourage reflection on the integration of key course concepts and give the student an opportunity to critique published decisions about or arguments related to real-world topics.

An additional in-class activity to encourage deeper understanding of the content could be used such as "Think, Pair, Share" where students are posed a question about the content, pair up with a partner to discuss it, and then share what they know with each other and eventually with the rest of the class.

Technology-Enhanced Learning:
Using simulations and/or a case study approach, students will evaluate technological tools currently in use to investigate sensory systems in health and disease and examine exemplars of sensory conditions of the central nervous system.

Personal response systems (e.g., iClickers/REEF) and online mini quizzes can be used to provide low-stakes, timely feedback to both students and instructor regarding student comprehension of course material.
Students will also have access to a Moodle site where recordings of lectures, and videos/simulations will be available for later review.

Instruction/Course Format

- ***Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.)***

This course will be offered every year, in the winter term.

- ***Number of School/Department members currently competent to teach the course.***

3

- ***Instructor(s) likely to teach the course in the coming year.***

When first offered, possible instructors could be Dorota Crawford, Georg Zoidl. In future years a new hire in the neuroscience area would support the offering of this course.

- ***An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved. This information is required to indicate whether an effective length of term is being maintained.***

In the first-year this course is offered, it may be offered in-class twice weekly (1.5 hours each session) for 12 weeks. However, given the depth and breadth of factual based information, it can also be re-designed and delivered using a blended format whereby half of the in-class time could be replaced with online learning activities involving online lecture recordings/videos/simulations. Students can review the content in preparation for class but at their own pace, and before exams as a study aid. Learning activities online could

also include discussion forums promoting debates in pairs/groups that help students to problem solve about exemplars of the consequences of sensory deficiencies in the nervous system.

Any in-class time can then be used for maximizing learning using personal response system technology to evaluate student knowledge and student engagement activities to delve deeper into their learning. For example, an in-class activity could be used such as “Think, Pair, Share” where students are posed a question about the content, pair up with a partner to discuss it, and then share what they know with each other and eventually with the rest of the class.

- ***In absence of scheduled contact hours, please provide an indication of the estimated time students are likely to spend engaged in learning activities required by the course.***

Currently the course is being proposed to hold scheduled contact hours twice weekly, 1.5 hours each session**.**

- ***In the absence of scheduled contact hours, please indicate how the course design encourages student engagement and supports students in achieving the learning objectives.***

- Course content will be posted in Moodle every week prior to class activities, including approximately three hours of required readings.
- Each week multiple choice questions (mini-quiz in Moodle) based on the course content will be available for students so that they can evaluate their understanding of the course content. The results from these quizzes can also provide formative information to the CD about the course content that students are having the most difficulty with in order for the CD to engage in just in time teaching in the classroom.
- Students will also have the opportunity to inform their understanding of the core course concepts and to apply this knowledge through the critical reflection exercise in exploring state of the art techniques and exemplars of sensory deficiencies.

Evaluation:

13. ***Please provide a detailed description of the basis of evaluation for the proposed course, including the type and percentage value of each assignment.***

Students will be evaluated with three non-cumulative equally weighted onsite written exams (25% each), one in the final exam time-period. Exams will comprise of both multiple-choice questions and matching/short answer questions to assess if students can correctly identify and describe and explain the core course concepts.

Responses to the polls and/or online mini-quizzes will be worth 10% of the grade.

12% of the students’ final grade will be calculated from their team work on the critical reflection activity. Responses will be assessed both on accuracy (against the course material) as well as their ability to make critical connections between core course concepts.

Because of the team work component, a Peer to peer and self-evaluation based on their collaboration experience will also be used (3%).

14. If the course is to be integrated (i.e., graduate/undergraduate), please list the additional evaluation requirements for graduate students.

n/a

15. If the proposed course employs technology-enhanced forms of delivery (i.e., non “face-to-face”, please identify how the integrity of learning evaluation will be maintained (will “on-site” examinations be required, etc.)

All exams will take place on site.

Other Resources:

9. Please provide a statement regarding the adequacy of physical resources (equipment, space, etc.). As well, please indicate if any other resources are required. Approval of a new course will be considered only if adequate resources are available to support the course.

Lecture hall with space for approximately 100 students. Internet access and audiovisual equipment.

10. If there is a technology-enhanced component to the course, a statement is required from the Learning Technology Services indicating whether resources are adequate to support the course. Requests for statements can directed to Rob Finlayson (rfinlays@yorku.ca). Please note, it will take two weeks to get a statement of support.

Course Rationale:

17. ***How will the course contribute to the educational objectives of the School/Department and of the Faculty?***

This course contributes to the educational objectives of the Neuroscience major because it explores in depth the molecular, structural and cellular basis of complex brain functions. It builds on the 2000-level NRSC courses and is key to student achievement of learning objectives described previously.

18. ***What is the relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content? If overlap exists, please indicate the nature and extent of consultation which has taken place. If the course is to be cross-listed, integrated or listed as a course credit exclusion with another course, approval is required from all the relevant Faculties/units.***

There is no significant overlap with other courses due to the molecular, cellular basis adopted in this course.

19. ***If applicable, please indicate the relationship of the proposed course to interdisciplinary programs; i.e. for which interdisciplinary program(s) will the course count for major/minor credit. As well, please indicate the nature and extent of consultation that has taken place with the relevant interdisciplinary program coordinator(s).***

n/a

20. ***What is the expected enrolment in the course?***

Expected enrolment is up to a 100.

Bibliography:

Please list the <u>required readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.).

There are a number of core textbooks that will serve as reference books throughout the neuroscience program and will be used again in other core neuroscience courses. They are

1. Principles of Neural Science, 5th Edition. Kandel, E.R. et al., McGraw-Hill, New York. 2012. ISBN 0-07-139011-1
2. Neuroscience 6th Ed., Purves, D. et. al. (Eds.),Oxford University Press. (2017)
3. Principles of Neurobiology, L. Luo, Taylor & Francis Ltd (2015)
4. Fundamental Neuroscience, Squire et. al. (Eds.), Academic Press (2012)

This course will also use

5. Examples from current literature in Medline/Pubmed such as Nature Neuroscience Reviews, Trends in Neuroscience, etc.

Please list any <u>suggested readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.)

Examples from current literature will change each year but in general will be found in Medline/Pubmed (Nature Neuroscience Reviews, Trends in Neuroscience, etc.)

Please list any <u>online resources</u> for the course (please include complete bibliographical information as above).

Online eJournals as appropriate.

For students the experiential education guide is a useful resource for explaining about reflection: http://ee_guide.info.yorku.ca/.

If the course is to be integrated (graduate/undergraduate), a list of the additional readings required of graduate students must be included. If no additional readings are required, a rationale should be provided.

n/a

<u>Library Support Statement</u>:

Proposals for new courses must include a **<u>library support statement</u>** from the Bibliographer responsible for the relevant discipline to indicate whether resources are adequate to support the course. To request a support statement, see the list of subject and liaison librarians at http://www.library.yorku.ca/web/about-us/contact-us/liaison-librarians/.

Consultation/Approval:

- The Faculty of Health Curriculum Committee will only consider new course proposals that have been approved by the unit responsible for offering the course.
- If the proposed course is to be cross-listed, integrated, listed as a course credit exclusion with another course, or listed as a major/minor course option in an interdisciplinary program, the proposal must be accompanied by a statement from the collaborating unit signaling agreement to the proposal.

School/Department: Biology, Psychology, Kinesiology and Health Science

Course Number Information:

Faculty:	HH	**Rubric:**	NRSC	**Course #:**	4000	**Weight:**	6.00
			(i.e. HLST)				(i.e. 3.00, 6.00 or 0.00)

Effective Session for Change:	**Term:**	Fall	**Year:**	2023
		(i.e. Fall, Fall/Winter, Winter)		(i.e. 2017-18, 2018)

Course Title: The official name of the course as it will appear in the Undergraduate Calendar.

Neuroscience Individual Research Project

Short Title: **Maximum 40 characters**, including punctuation and spaces. The short title appears on any documents where space is limited (transcripts and lecture schedules).

Individual Research Project

Brief Course Description: For editorial consistency, verbs should be in the present tense and begin the description; e.g., "Analyzes the nature and extent of...," rather than "This course will analyze..." or “This course analyzes…”.

This is the official description of the course as it will appear in the Undergraduate Calendar. The course description should be carefully written to convey what the course is about. If applicable, include information regarding the language of instruction if other than English.

A Capstone neuroscience research project under the supervision of a neuroscience core/affiliated faculty member. An individual intensive research project engaged in a laboratory, or in the community (industry, hospital), leading to the creation of an original piece of research, final written paper, as well as an oral presentation to the neuroscience community at York.

- **List course(s) where applicable:**

Integration†:		Course Credit Exclusions*:	
Prerequisites:	NRSC 3000 3.0; NRSC 2200	Cross-listed to:	
Corequisites:			

†Integrated courses are graduate courses integrated (taught with) 4000-level undergraduate courses

*Course credit exclusion is a formal status accorded to pairs of courses that are recognized as having sufficient overlap in content to warrant specifically excluding students from obtaining credit for both.

- Include the following information only if the course is: limited to a specific group of students; closed to a specific group of students; if there is any additional information necessary for students to know before enrolling (notes); if the course includes experiential education, and whether the students will work with a community partner and/or if it will involve going off-campus.

Open to:	Only to students majoring in Neuroscience. Students must have honours standing, completed at least 84 credits in total, with an additional (on top of NRSC 3000) 18 credits from the 3000/4000-level Neuroscience alternative streams.
Not open to	
Notes:	The student will need to contact individual faculty members and find one that is taking on students (this may be facilitated by the Neuroscience Program Coordinator). The student and faculty member must sign a form in which they agree on the type and amount of work to be done.

• **Science Course:**	**YES**	**NO**
Denotes courses in KINE or PSYC to count as science credit for BSc degree programs	X	

Expanded Course Description

- Please provide a detailed course description that effectively conveys what this course is about. Please ensure that this description includes but is not limited to: 1) course topics/theories; 2) course learning objectives; 3) course learning outcomes; and 4) a description of any experiential education (EE) and/or technology-enhanced learning (also referred to as eLearning) activities.

Term	Definition
Course Learning Objectives	Statements of the overall learning and teaching goals for the course and represent what the instructor would expect students to learn and retain in the course. They articulate what the teacher plans to achieve in the course.
Learning Outcomes	Statements of what the student will achieve by the end of the course. They provide a framework for assessment by stating what you expect the learners to be able to demonstrate after completing the course. A succinct learning outcome specifies the tasks students are expected to be able to perform and the level of competence expected for the tasks.
Experiential Education (EE)	The blending of theory/course work with concrete experience. Effective EE activities require students to reflect on and demonstrate their understanding of the relationship(s) between theory/course work and concrete experience.
Structured Reflection	Structured reflection is any planned activity or exercise that requires students to refer back and critically examine the concrete experience in light of existing theory and/or what is being covered in the course.
Technology-Enhanced Learning (eLearning)	The use of technology to support students' interaction: with and access to the content; to course learning activities; and with other students and faculty members in order to develop knowledge and skills

Refer to the last page of the course proposal for resources on course learning objectives and outcomes, experiential education and technology-enhanced learning.

1. Course Topics or Theories:

This 6-credit Capstone project is similar to a research intensive honours thesis project however the expectation for this Capstone project involves contributing as an individual to the existing body of knowledge in the field of neuroscience by engaging in original empirical experimental/clinical research. Time commitment is at a minimum 10 hours a week. This Capstone project involves considerable self-directed work and must reflect critical thinking and analytical skills and an understanding of the scientific method. A strong project is built on carefully reviewing and analyzing the literature, communicating clearly, and acting ethically and professionally. Topics could range from molecular/cellular neuroscience, to behavioural/cognitive neuroscience, to systems neuroscience.

2. **Course Learning Objectives:**

- Students will work independently, and be a good research citizen

A written student-supervisor agreement outlining the tasks and learning expectations for the project and detailing the hours involved, will be filled in with the supervisor in early September. Students will also submit for approval a project proposal to the supervisor.

The student will work with his/her supervisor directly during which they will discuss each phase of the research (selecting a topic, designing the study, collecting the data, analyzing data, and communicating the results in writing and orally). In mid-January the supervisor will provide feedback on the performance of the student in terms of meeting the learning outcomes specified in the student-supervisor agreement. The format of this evaluation will vary from project to project, but the requirements of this evaluation will be specified in the original documents.

Research citizenship and professionalism skills will be developed through their work in labs and lab meetings, modelling the behaviors that are valuable to future careers in the field. While lab meetings and experiences may look different from project to project, all students will be evaluated (5% of their final grade) on how they contribute to the creation and ongoing support of a positive, collegial research environment.

Students will also submit to their supervisor a short, written, critical self-reflection (evaluated at 5%) designed to provide students with an opportunity to critically reflect on their experience conducting an individual research project in the neuroscience program. They can be asked to critique their own thoughts, attitudes, and actions related to neuroscience research, and describe how/why they have changed or stayed the same as a result of their research experience. They can be asked to identify at least one attitude/action that they think they could apply, do better, or do differently (it can apply to any aspect of their professional or academic life) as a result of what they have learned about research in neuroscience.

- Students will develop a project plan, implement their research, analyze and synthesis results, and communicate their results in writing and orally.

In late September/early October, students will hand in a short précis (abstract) of their intended research project along with a reference or reading list outlining what literature and why it will serve as foundational for their research project. This précis will be formatively reviewed by the supervisor and worth 5% of the student's final grade. Approximately mid-January the student will hand in to the supervisor a draft of the Introduction and Methods of the project. The aim of submitting this early draft is to provide an opportunity for feedback on the student's writing (evaluated and worth 25%) and their proposed methodology, its feasibility, and directly related to current literature and best experimental practices in the field.

At a public presentation of all Neuroscience Capstone projects the student will provide an oral presentation of the research to the faculty and students associated with the Neuroscience program. Students will be also given an option of using a poster, video, or other information sharing technologies to present their final project. This final presentation will be evaluated (20%).

At the end of the term, the supervisor(s) will provide the student with a grade of the final project (5% for précis & reading list, 25% for draft, 20% for oral presentation, 40% for final paper, 5% for research citizenship, and 5% for critical self-reflection) and an overall evaluation of the degree to which the student has met the agreed-upon expectations and the learning objectives.

3.**Expected Learning Outcomes:** while individual student work will vary based on their chosen projects, by the end of the course all students will be able to:

- Defend a chosen argument or stance based on collected evidence (e.g. data, literature, etc.)
- Describe, in depth, a key concept or core principle in the neuroscience field
- Determine and implement appropriate research skills to complete a laboratory or clinical or research project based on a mutually-determined topic or problem
- Display autonomy and professional capacity by learning to work effectively with others (supervisor, lab mates, team mates)
- Implement ethical practices in completing their chosen research project
- Analyze and defend their research both orally and in writing
- Display rigour and meticulousness in completing their chosen research project
- Display professionalism skills in all interactions with faculty supervisor, peers, and other members of the Neuroscience community

4. Experiential education/technology enhanced learning are described in more detail in the next section.

Experiential Education/Technology-Enhanced Learning

EE remains a top priority for York University and the Faculty of Health as it offers a range of benefits for students related to academic performance, civic engagement and employability (for more information on the benefits of EE for students and course directors, please go to: **http://health.yorku.ca/experiential-education/faculty/**. Course directors are invited to integrate EE into their course where possible, but it is understood that some EE strategies may not be feasible in every course.

Course proposals with EE must be reviewed by Andra Petro, EE Coordinator (apetro@yorku.ca) prior to the submission of the proposal to the Faculty of Health Curriculum Committee.

• ***Please indicate (X) if the course uses any EE and/or technology-enhanced learning?***	***YES***	***x***	***NO***	
• ***If NOT, please outline some of the reasons EE or technology-enhanced learning could not be incorporated the course.***				
• ***If YES, please indicate (X) whether your course will include one or more of the following types of EE and technology-enhanced learning. Refer to York's Common Language for Experiential Education for complete definitions and further details.***				
x	***Classroom based (e.g. guest speakers, role playing, visual media, case studies, simulations, workshops and laboratory, course-based research etc.)***			
x	***Community based (e.g. community-based learning; community-based research; community service learning)***			
	Work focused (e.g. placement/practicum)			

Please outline how you plan to engage students in reflection (critically examining a concrete experience) around the EE activities described above.

Experiential Education
This course is highly experiential, as students will have the opportunity to propose, design and pursue a research project that is centered on the real-world application of a key concept in the neuroscience degree. This laboratory/clinical research may also involve work in the field as part of the data collection and/or data analysis process. These projects will be developed in response to a topic mutually-identified by the student and their faculty supervisor. The final paper and accompanying presentation will give students the opportunity to share what they have learned, relate it back to concepts/theories, identify any gaps in their findings/knowledge (what they know what they don't know), and suggest ways to address these gaps in knowledge. The student will make meaning of their time conducting research and exploring relevant issues in neuroscience by presenting their findings to the neuroscience community at York.

Technology-Enhanced Learning
Students will have access to a variety of technological tools designed to support their research, including tools for data collection, data analysis, and/or information dissemination. Students will also have the option of using video or other information sharing technologies to present their work to the York neuroscience community.

Instruction/Course Format

- ***Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.)***

This course will be offered every year usually during the Fall and Winter terms.

- ***Number of School/Department members currently competent to teach the course.***

All faculty members associated with the Neuroscience program could supervise this Capstone project.

- ***Instructor(s) likely to teach the course in the coming year.***

This course requires a supervisor for the student.

- ***An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved. This information is required to indicate whether an effective length of term is being maintained.***

Approximately 10 hours per week (library research, lab-based/clinical research, data analysis, writing, etc.) over 8 months.

- ***In absence of scheduled contact hours, please provide an indication of the estimated time students are likely to spend engaged in learning activities required by the course.***

Beyond organizational meetings in early September and the public presentations at the end of the course, there are no formally scheduled meetings during the course. Students are expected to engage in about 10 hours a week on their projects. Students may be required to attend regular and/or scheduled lab meetings with their supervisor as part of their project requirements, which will be negotiated between the student and their supervisor.

- ***In the absence of scheduled contact hours, please indicate how the course design encourages student engagement and supports students in achieving the learning objectives.***

Students will be undertaking a self-directed deep exploration of a neuroscience research topic, including the critical analysis and synthesis of knowledge to identify and explain complex issues in the neuroscience field. Engagement in the research and achievement of learning objectives is facilitated by a neuroscience faculty member who will be offering formative feedback and advice throughout the year, and as well through valuable mentorship by graduate students associated with the research project.

Evaluation:

16. ***Please provide a detailed description of the basis of evaluation for the proposed course, including the type and percentage value of each assignment.***

The course requires an initial project proposal that will be submitted by the student to and approved by the supervisor. Each project is intended to propose a research-oriented solution to a particular real-world problem or identified challenge in the Neuroscience field. Projects will be expected to be, among other criteria, feasible, scalable, and directly related to current literature and best practices in the field.

Students will engage in considerable self-directed work and will meet with his/her supervisor during which they will discuss each phase of the research (selecting a topic, designing the study, collecting the data, analyzing data, and getting feedback on their written work and presentation). A short précis (abstract) and reading/reference list will be handed in no later than one month into the course and will be evaluated (5% of the final grade) to provide formative feedback to the student on their proposed research project. No later than 4 months after beginning the project (approximately January 15th) the student will hand in to the supervisor a draft of the Introduction and Methods sections of the project. The aim of submitting this draft is to provide an opportunity for feedback on the students' writing (evaluated and worth 25%) describing their Introduction and proposed Methods to be used for their research. At the same time the supervisor will provide feedback on the performance of the student in terms of their progress toward meeting the learning outcomes specified in the project proposal as well as the core outcomes specified for the course. The format of this evaluation will vary from project to project, but the requirements of this evaluation will be specified in the original project proposal.

Students will be assessed on their work in labs and lab meetings, modelling the importance of developing professionalism skills that are valuable to future careers in the field. While lab meetings and experiences may look different from project to project, all students will be assessed on research citizenship (5% of their final grade) on how they contribute to the creation and ongoing support of a positive, collegial, lab (research) environment.

At the beginning of September, the neuroscience program coordinator will establish a date and format for the oral presentation of all Neuroscience Capstone projects. This presentation will normally consist of either a short public oral presentation of the project. Students will be also given an option of using a poster or video or other information sharing technologies to present their final projects. All of the faculty, staff, and students associated with the Neuroscience program will be invited to attend this presentation. This final presentation will be evaluated (20%) using a rubric adapted from the Oral communication value rubric proposed by AACU (American Academy of Colleges and Universities see *value@aacu.org*) evaluating skills such as reflection (e.g., uses concepts learned about neuroscience to draw further conclusions and links it to research, shows that they recognize and can critique the beliefs and assumptions they hold etc.); language (e.g., language supports the effectiveness of communication, is appropriate to the topic and audience, grammatical, clear, etc.); delivery (e.g., posture, gesture, eye contact, and vocal expressiveness shows confidence and authority. looks more often at the audience than at his/her speaking materials/notes, etc.); supporting material (e.g., explanations, examples, illustrations, statistics, analogies, and quotations from relevant authorities are appropriate); central message (e.g., compelling, precisely stated, appropriately repeated, memorable, and strongly supported, etc.).

At the end of the term, the supervisor will provide the student with a grade of the final paper (40%) and an overall evaluation of the degree to which the student has met the agreed-upon expectations and the learning objectives.

Students will also submit to their supervisor a short, written, self-reflection (evaluated at 5%) designed to provide students with an opportunity to critically reflect on their experience in the neuroscience program and to outline how and what they have learned about neuroscience research, the field in general, and themselves. They will be asked to critique their own thoughts, attitudes, and actions related to neuroscience research, and describe how/why they have changed or stayed the same as a result of their research experience. They can be asked to identify at least one attitude/action that they think they could apply, do better, or do differently (it can apply to any aspect of their professional or academic life) as a result of what they have learned about neuroscience.

Marking Scheme:

Precis and reading list: 5%
Mid-way draft evaluation: 25%
Oral presentation evaluation: 20%
Final report: 40%
Research citizenship: 5%
Written self-reflection: 5%

17. If the course is to be integrated (i.e., graduate/undergraduate), please list the additional evaluation requirements for graduate students.

n/a

18. If the proposed course is employs technology-enhanced forms of delivery (i.e., non "face-to-face", please identify how the integrity of learning evaluation will be maintained (will "on-site" examinations be required, etc.)

n/a

Other Resources:

11. Please provide a statement regarding the adequacy of physical resources (equipment, space, etc.). As well, please indicate if any other resources are required. Approval of a new course will be considered only if adequate resources are available to support the course.

No new resources are required in order to mount this course. Where necessary, faculty supervising a research project will accommodate the student(s) in their laboratories.

12. If there is a technology-enhanced component to the course, a statement is required from the Learning Technology Services indicating whether resources are adequate to support the course. Requests for statements can directed to Rob Finlayson (rfinlays@yorku.ca). Please note, it will take two weeks to get a statement of support.

Course Rationale:

21. ***How will the course contribute to the educational objectives of the School/Department and of the Faculty?***

This course is the Capstone course for the Neuroscience program. It will contribute to the educational objectives of the Neuroscience program by giving the students an opportunity to engage in a valuable experience conducting research either in a lab or applied setting. Successfully completing this course will contribute to the students' ability to achieve the following neuroscience program expectations:

- Integrate and apply theoretical perspectives and major findings across broad areas of neuroscience
- Demonstrate a detailed knowledge in one of the Specialized Neuroscience streams
- Relate neuroscience to other disciplines, and apply learning from those disciplines within neuroscience e.g., mathematics, computer science, physics, health sciences, sport and society
- Locate and retrieve scientific information, and to read and critique scientific articles, demonstrate scientific writing skills, and deliver oral presentations.
- Describe the diverse experimental research methods used in the broad areas of neuroscience and defend the use of these methods.
- Develop testable research questions based upon their in-depth knowledge in one or more of the broad areas of neuroscience and apply research methods, experimental designs, and analysis techniques used to investigate such scientific questions.
- Analyze and interpret pre-existing or novel data, including research findings, and communicate the findings in both oral and written formats to diverse audiences.
- Represent information in a quantitative format, to analyze and interpret quantitative information, including graphs and statistics.
- Demonstrate initiative, personal responsibility, and accountability in the laboratory and other settings.

22. ***What is the relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content? If overlap exists, please indicate the nature and extent of consultation which has taken place. If the course is to be cross-listed, integrated or listed as a course credit exclusion with another course, approval is required from all the relevant Faculties/units.***

There already exists 4000 level thesis courses in Biology, Psychology and Kinesiology & Health Science, all of which operate in a similar manner. But not of all of which are in-depth in lab or clinically based research projects requiring a final written project, an oral presentation, and a written self-reflection. The expectation is that students will engage more fulsomely in the lab, with a research question, engage in analysis, problem solving, writing, and oral communication that will culminate in contributing to the existing body of knowledge.

The Specialized Honours Neuroscience program aims to distinguish itself by a robust research-level Capstone experience, which this course fulfils.

23. ***If applicable, please indicate the relationship of the proposed course to interdisciplinary programs; i.e. for which interdisciplinary program(s) will the course count for major/minor credit. As well, please indicate the nature and extent of consultation that has taken place with the relevant interdisciplinary program coordinator(s).***

n/a

24. ***What is the expected enrolment in the course?***

Expected enrolment will be approximately 35 students/year.

Bibliography:

Please list the <u>required readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.).

Required reading from library holdings will vary based on the specific project(s) and specific focus of the neuroscience faculty member in a given year. In general, the existing electronic journal subscriptions should be sufficient for this course.

Please list any <u>suggested readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.)

This will vary depending on the project.

Please list any <u>online resources</u> for the course (please include complete bibliographical information as above).

For faculty members, there are some useful resources on the Teaching Commons website: http://teachingcommons.yorku.ca/resources-2/experiential-education/. As well as a faculty resource page at https://spark.library.yorku.ca/faculty-teaching-with-spark-guidelines-for-using-spark/ comprised of modules that support topics such as academic integrity, effective literature search strategies research, writing, etc.

AACU (American Academy of Colleges and see *value@aacu.org*) has developed and provided different rubrics for evaluating writing, critical thinking, team work, oral presentation skills, etc. that could easily be adapted for the evaluation needs of this course.

An excellent resource that exists for guiding students on writing are the SPARK (Student Paper and Academic Research Kit) modules found online at https://spark.library.yorku.ca/

Universities

If the course is to be integrated (graduate/undergraduate), a list of the additional readings required of graduate students must be included. If no additional readings are required, a rationale should be provided.

n/a

Library Support Statement:

Proposals for new courses must include a **library support statement** from the Bibliographer responsible for the relevant discipline to indicate whether resources are adequate to support the course. To request a support statement, see the list of subject and liaison librarians at http://www.library.yorku.ca/web/about-us/contact-us/liaison-librarians/.

Consultation/Approval:

- The Faculty of Health Curriculum Committee will only consider new course proposals that have been approved by the unit responsible for offering the course.
- If the proposed course is to be cross-listed, integrated, listed as a course credit exclusion with another course, or listed as a major/minor course option in an interdisciplinary program, the proposal must be accompanied by a statement from the collaborating unit signaling agreement to the proposal.

health | YORK UNIVERSITÉ UNIVERSITY

New Course Proposal Form

Faculty of Health Curriculum Committee

School/Department: Biology, Psychology, Kinesiology and Health Science

Course Number Information:

Faculty: HH **Rubric:** NRSC (i.e. HLST) **Course #:** 4002 **Weight:** 6.00 (i.e. 3.00, 6.00 or 0.00)

Effective Session for Change: **Term:** Fall (i.e. Fall, Fall/Winter, Winter) **Year:** 2023 (i.e. 2017-18, 2018)

Course Title: The official name of the course as it will appear in the Undergraduate Calendar.

Neuroscience Team Research Project

Short Title: <u>Maximum 40 characters</u>, including punctuation and spaces. The short title appears on any documents where space is limited (transcripts and lecture schedules).

Team Research Project

Brief Course Description: For editorial consistency, verbs should be in the present tense and begin the description; e.g., "Analyzes the nature and extent of...," rather than "This course will analyze..." or “This course analyzes…”.

This is the official description of the course as it will appear in the Undergraduate Calendar. The course description should be carefully written to convey what the course is about. If applicable, include information regarding the language of instruction if other than English.

A Capstone neuroscience team-based research project under the supervision of a neuroscience core/affiliated faculty member and usually an advisor from the community (industry or hospital). An intensive team-based research project leading to the creation of an original piece of research, final written paper, as well as an oral presentation to the neuroscience community at York.

- **List course(s) where applicable:**

Integration†:		Course Credit Exclusions*:	
Prerequisites:	NRSC 3000 3.0; NRSC 2200	Cross-listed to:	
Corequisites:			

†Integrated courses are graduate courses integrated (taught with) 4000-level undergraduate courses

*<u>Course credit exclusion</u> is a formal status accorded to pairs of courses that are recognized as having sufficient overlap in content to warrant specifically excluding students from obtaining credit for both.

- Include the following information only if the course is: limited to a specific group of students; closed to a specific group of students; if there is any additional information necessary for students to know before enrolling (notes); if the course includes experiential education, and whether the students will work with a community partner and/or if it will involve going off-campus.

Open to:	Only to students majoring in Neuroscience. Students must have honours standing, completed at least 84 credits in total, with an additional (on top of NRSC 3000) 18 credits from the 3000/4000-level Neuroscience alternative streams.
Not open to	
Notes:	The student will need to contact individual faculty members and find one that is taking on students (this may be facilitated by the Neuroscience Program Coordinator). The student and faculty member must sign a form in which they agree on the type and amount of work to be done.

• **Science Course:**	**YES**	**NO**
Denotes courses in KINE or PSYC to count as science credit for BSc degree programs	X	

Expanded Course Description

- Please provide a detailed course description that effectively conveys what this course is about. Please ensure that this description includes but is not limited to: 1) course topics/theories; 2) course learning objectives; 3) course learning outcomes; and 4) a description of any experiential education (EE) and/or technology-enhanced learning (also referred to as eLearning) activities.

Term	Definition
Course Learning Objectives	Statements of the overall learning and teaching goals for the course and represent what the instructor would expect students to learn and retain in the course. They articulate what the teacher plans to achieve in the course.
Learning Outcomes	Statements of what the student will achieve by the end of the course. They provide a framework for assessment by stating what you expect the learners to be able to demonstrate after completing the course. A succinct learning outcome specifies the

	tasks students are expected to be able to perform and the level of competence expected for the tasks.
Experiential Education (EE)	The blending of theory/course work with concrete experience. Effective EE activities require students to reflect on and demonstrate their understanding of the relationship(s) between theory/course work and concrete experience.
Structured Reflection	Structured reflection is any planned activity or exercise that requires students to refer back and critically examine the concrete experience in light of existing theory and/or what is being covered in the course.
Technology-Enhanced Learning (eLearning)	The use of technology to support students' interaction: with and access to the content; to course learning activities; and with other students and faculty members in order to develop knowledge and skills

Refer to the last page of the course proposal for resources on course learning objectives and outcomes, experiential education and technology-enhanced learning.

1. **Course Topics or Theories:**
This 6-credit Capstone project is similar to a research intensive honours thesis project however the expectation for this Capstone project involves working as a team to contribute to the existing body of knowledge in the field of neuroscience by engaging in original empirical experimental/clinical research or solving an applied problem. Time commitment is at a minimum 10 hours a week. This Capstone project involves considerable self-directed and group work and must reflect critical thinking and analytical skills and an understanding of the scientific method. A strong project is built on carefully reviewing and analyzing the literature, communicating clearly, and acting ethically and professionally. Topics could range from molecular/cellular neuroscience, to behavioural/cognitive neuroscience, to systems neuroscience.

2. **Course Learning Objectives:**

- Students will work collaboratively in teams and be a good research citizen

The students will work in small research teams (approximately 4-5 students) through each phase of the research (selecting a topic, designing the study, collecting the data, analyzing data, and communicating the results in writing and orally). A written agreement outlining the proposed research project, scope of the research project, anticipated tasks and how work will be divided amongst group members, hours involved (time required), and resources required will be filled in with the course director in early September. Each student team will work directly with the course director to review and discuss their proposed project plan; this agreement must be signed by the students and the course director before work can begin on the project. In mid-January the course director will provide feedback on the performance of the student teams in terms of meeting the learning outcomes specified in the original agreement. The format of this evaluation will vary from project to project, but the requirements of this evaluation will be specified in the original documents.

Students will also submit to their supervisor at the end of the course an evaluation of their collaboration (peer-to-peer and self, evaluated at 5%) designed to provide students with an opportunity to critically reflect on their experience conducting a team-based project in the neuroscience program. A collaboration rubric can be created where students assess and critique their contributions and their peers contributions to the development of the project (e.g., role in researching and gathering information, ability to share and relay information, punctuality); responsibility in ensuring the project outcomes are fulfilled (e.g., fulfills team role & duties, contributes to the development of the final paper); ability to be a valuable team player (e.g., listens to others, expresses self to others, makes fair decisions).

Individually, students will also be assessed on their research citizenship: professionalism skills through their work in labs, lab meetings, in the community, modelling the behaviors that are valuable to future careers in the field. While lab meetings and experiences may look different from project to project, all students will be evaluated (5% of their final grade) on how they contribute to the creation and ongoing support of a positive, collegial research, team environment.

- Students will develop a project plan, implement their research, analyze and synthesis results, and communicate their results in writing and orally.

In late September/early October, each student team will hand in to the course director a short précis (abstract) of their intended research project along with a reference or reading list outlining what literature and why it will serve as foundational for their research project. This précis will be formatively reviewed by the course director and worth 5% of the students' final grade. Approximately mid-January the teams will hand in to the course director a draft of the Introduction and Methods of the project. The aim of submitting this early draft is to provide an opportunity for feedback on the group's collaborative writing (evaluated and worth 25%), proposed methodology for their project, and ensure it is grounded in a real-world problem or identified challenge in the

Neuroscience field. Projects will be expected to be, among other criteria, feasible, scalable, and directly related to current literature and best practices in the field.

At a public presentation of all Neuroscience Capstone projects the team will provide an oral presentation of the projects to the faculty and students associated with the Neuroscience program. Students will be also given an option of using a poster, video, or other information sharing technologies to present their final projects. This final presentation will be evaluated (20%).

At the end of the term, the course director will provide the students with a grade of the final project (5% for précis & reading list, 5% for a peer-to-peer and self- evaluation of their work with their project team, 25% for draft Intro and Methods, 20% for oral presentation, 40% for final project/paper, and 5% for research citizenship) and an overall evaluation of the degree to which each student has met the agreed-upon expectations and the learning objectives.

3. **Expected Learning Outcomes**: while student work will vary based on their chosen projects, by the end of the course all students will be able to

- Defend a chosen argument or stance based on collected evidence (e.g. data, literature, etc.)
- Describe, in depth, a key concept or core principle in the neuroscience field
- Determine and implement appropriate research skills to complete the project based on a mutually-determined topic or problem
- Display autonomy and professional capacity by learning to work effectively with others (course director, community advisor, team mates)
- Implement ethical practices in completing their chosen research project
- Analyze and defend their research both orally and in writing
- Display rigour and meticulousness in completing their chosen research project
- Display professionalism skills in all interactions with faculty and community advisor, peers, and other members of the Neuroscience community

4. Experiential education/technology enhanced learning are described in more detail in the next section.

Experiential Education/Technology-Enhanced Learning

EE remains a top priority for York University and the Faculty of Health as it offers a range of benefits for students related to academic performance, civic engagement and employability (for more information on the benefits of EE for students and course directors, please go to: **http://health.yorku.ca/experiential-education/faculty/**. Course directors are invited to integrate EE into their course where possible, but it is understood that some EE strategies may not be feasible in every course.

Course proposals with EE must be reviewed by Andra Petro, EE Coordinator (apetro@yorku.ca) prior to the submission of the proposal to the Faculty of Health Curriculum Committee.

• ***Please indicate (X) if the course uses any EE and/or technology-enhanced learning?***	***YES***	***x***	***NO***	
• ***If NOT, please outline some of the reasons EE or technology-enhanced learning could not be incorporated the course.***				
• ***If YES, please indicate (X) whether your course will include one or more of the following types of EE and technology-enhanced learning. Refer to York's Common Language for Experiential Education for complete definitions and further details.***				
X	***Classroom based (e.g. guest speakers, role playing, visual media, case studies, simulations, workshops and laboratory, course-based research etc.)***			
X	***Community based (e.g. community-based learning; community-based research; community service learning)***			
	Work focused (e.g. placement/practicum)			
Please outline how you plan to engage students in reflection (critically examining a concrete experience) around the EE activities described above.				

Experiential Education
This course is highly experiential, as students will have the opportunity to work as a team and propose, design, and pursue a research project that is centered on the real-world application of a key concept in the neuroscience degree. This laboratory/clinical research may also involve work in the field as part of the data collection and/or data analysis process. These projects will be developed in response to a topic mutually-identified by the student teams, the course director, and a community partner (industry, hospital). Working in small groups, students will also have the opportunity to experience and develop skills in teamwork, collaborative research & writing, and group presentations. These experiences and skills mirror those important for success in the diversity of careers available to students after graduation.

The final paper and accompanying presentation will give students the opportunity to share what they have learned, relate it back to concepts/theories, identify any gaps in their findings/knowledge (what they know what they don't know), and suggest ways to address these gaps in knowledge. The student will make meaning of their time conducting research and exploring relevant issues in neuroscience by presenting their findings to the neuroscience community at York.

Technology-Enhanced Learning
Students will have access to a variety of technological tools designed to support their research, including tools for collaborative research & writing (e.g. Google Docs), data collection, data analysis, and/or information dissemination. Students will also have the option of using video or other information sharing technologies to present their work to the York neuroscience community.

Instruction/Course Format

- ***Planned frequency of offering and number of sections anticipated (every year, alternate years, etc.)***

This course will be offered every year usually during the Fall and Winter terms.

- ***Number of School/Department members currently competent to teach the course.***

All faculty members associated with the Neuroscience program could teach this course.

- ***Instructor(s) likely to teach the course in the coming year.***

This course requires a course director to guide the student teams, establish relationships and liaise with the community partner(s). A new hire in Neuroscience could teach this course. Gary Turner has indicated interest in offering it in the interim.

- ***An indication of the number of contact hours (defined in terms of hours, weeks, etc.) involved. This information is required to indicate whether an effective length of term is being maintained.***

Approximately 10 hours per week (library research, lab-based/clinical research, data analysis, writing, etc.) over 8 months.

- ***In absence of scheduled contact hours, please provide an indication of the estimated time students are likely to spend engaged in learning activities required by the course.***

Beyond organizational meetings in early September and the public presentations at the end of the course, there are no formally scheduled meetings during the course. Students are expected to engage in about 10 hours a week with their groups on their projects. Students may be required to attend regular and/or scheduled lab meetings with a/their lab supervisor as part of their course or project requirements, which will be negotiated between the student teams and the course director and/or advisor from the community (industry or hospital).

- ***In the absence of scheduled contact hours, please indicate how the course design encourages student engagement and supports students in achieving the learning objectives.***

Students will be undertaking a self-directed team based deep exploration of a neuroscience research topic, including the critical analysis and synthesis of knowledge to identify and explain complex issues in the neuroscience field. Engagement in the research and achievement of learning objectives is facilitated by a course director and advisor from the community who will be offering formative feedback and advice throughout the year, and as well potentially through valuable mentorship by graduate students associated with the research project.

Evaluation:

19. ***Please provide a detailed description of the basis of evaluation for the proposed course, including the type and percentage value of each assignment.***

The course requires an initial project proposal that will be submitted by each research team to the course director and approved by the course director. Each project is intended to propose and/or conduct one or multiple research-oriented solution(s) to a particular real-world problem or identified challenge in the Neuroscience field. Projects will be expected to be, among other criteria, feasible, scalable, and directly related to current literature and best practices in the field.

Students will engage in considerable self-directed work and the team will meet with the course director during which they will discuss each phase of the research (selecting a topic, designing the study, collecting the data, analyzing data, and getting feedback on their written work and presentation). A shortprécis(abstract) and reading/reference list will be handed in no later than one month into the course and will be evaluated (5% of the final grade) to provide formative feedback to the student teams on their proposed research project. No later than 4 months after beginning the project (approximately January 15th) the team will hand in to the supervisor a draft of the Introduction and Methods sections of the project. The aim of submitting this draft is to provide an opportunity for feedback on their collaborative writing (evaluated and worth 25%) describing their Introduction and proposed Methods to be used for their project (evaluated and worth 25%). At the same time the course director will provide feedback on the performance of each team in terms of their progress toward meeting the learning outcomes specified in the project proposal as well as the core outcomes specified for the course. The format of this evaluation will vary from project to project, but the requirements of this evaluation will be specified in the original project proposal.

Students will also be assessed on their work in labs, lab meetings at York or in the community, modelling the importance of developing professionalism skills that are valuable to future careers in the field. While lab meetings and experiences may look different from project to project, all students will be assessed on citizenship (5% of their final grade) on how they contribute to the creation and ongoing support of a positive, collegial, research environment.

At the beginning of September, the neuroscience program coordinator will establish a date and format for the oral presentation of all Neuroscience Capstone projects. This presentation will normally consist of either a short public oral presentation of the project. Students will be also given an option of using a poster or video or other information sharing technologies to present their final projects. All of the faculty, staff, and students associated with the Neuroscience program will be invited to attend this presentation. This final presentation will be evaluated (20%) using a rubric adapted from the Oral communication value rubric proposed by AACU (American Academy of Colleges and Universities see *value@aacu.org*) evaluating skills such as reflection (e.g., uses concepts learned about neuroscience to draw further conclusions and links it to research, shows that they recognize and can critique the beliefs and assumptions they hold etc.); language (e.g., language supports the effectiveness of communication, is appropriate to the topic and audience, grammatical, clear, etc.); delivery (e.g., posture, gesture, eye contact, and vocal expressiveness shows confidence and authority. looks more often at the audience than at his/her speaking materials/notes, etc.); supporting material (e.g., explanations, examples, illustrations, statistics, analogies, and quotations from relevant authorities are appropriate); central message (e.g., compelling, precisely stated, appropriately repeated, memorable, and strongly supported, etc.).

At the end of the term, the supervisor will provide the student with a grade of the final paper (40%) and an overall evaluation of the degree to which the teams have met the agreed-upon expectations and the learning objectives.

Students will also submit to their supervisor an evaluation of their collaboration (peer-to-peer and self, evaluated at 5%) designed to provide students with an opportunity to critically reflect on their experience conducting a team-based project in the neuroscience program. A collaboration rubric will be created or adapted from the team based value rubric proposed by AACU (American Academy of Colleges and Universities see *value@aacu.org*) whereby students assess and critique their contributions and their peers contributions to the development of the project (e.g., role in researching and gathering information, ability to share and relay information, punctuality); responsibility in ensuring the project outcomes are fulfilled (e.g., fulfills team role &

duties, contributes to the development of the final paper); and ability to be a valuable team player (e.g., listens to others, expresses self to others, makes fair decisions).

Marking Scheme:

Precis and reading list: 5%
Mid-way draft evaluation: 25%
Oral presentation evaluation: 20%
Final report: 40%
Research Citizenship: 5%
Peer-to-peer and self-reflection: 5%

20. If the course is to be integrated (i.e., graduate/undergraduate), please list the additional evaluation requirements for graduate students.

n/a

21. If the proposed course is employs technology-enhanced forms of delivery (i.e., non "face-to-face", please identify how the integrity of learning evaluation will be maintained (will "on-site" examinations be required, etc.)

n/a

Other Resources:

13. Please provide a statement regarding the adequacy of physical resources (equipment, space, etc.). As well, please indicate if any other resources are required. Approval of a new course will be considered only if adequate resources are available to support the course.

No new physical resources are required in order to mount this course. A new hire in Neuroscience will be required to mount different sections of this course. In the interim Gary Turner has indicated interest in being a course director.

14. If there is a technology-enhanced component to the course, a statement is required from the Learning Technology Services indicating whether resources are adequate to support the course. Requests for statements can directed to Rob Finlayson (rfinlays@yorku.ca). Please note, it will take two weeks to get a statement of support.

Course Rationale:

- ***How will the course contribute to the educational objectives of the School/Department and of the Faculty?***

This course is the Capstone course for the Neuroscience program. It will contribute to the educational objectives of the Neuroscience program by giving the students an opportunity to engage in a valuable experience conducting research as a team either in a lab or in the community with industry or hospital partners. Successfully completing this course will contribute to the students' ability to achieve the following neuroscience program expectations:

- Integrate and apply theoretical perspectives and major findings across broad areas of neuroscience
- Demonstrate a detailed knowledge in one of the Specialized Neuroscience streams
- Relate neuroscience to other disciplines, and apply learning from those disciplines within neuroscience e.g., mathematics, computer science, physics, health sciences, sport and society
- Locate and retrieve scientific information, and to read and critique scientific articles, demonstrate scientific writing skills, and deliver oral presentations.
- Describe the diverse experimental research methods used in the broad areas of neuroscience and defend the use of these methods.
- Develop testable research questions based upon their in-depth knowledge in one or more of the broad areas of neuroscience and apply research methods, experimental designs, and analysis techniques used to investigate such scientific questions.
- Analyze and interpret pre-existing or novel data, including research findings, and communicate the findings in both oral and written formats to diverse audiences.
- Represent information in a quantitative format, to analyze and interpret quantitative information, including graphs and statistics.
- Demonstrate initiative, personal responsibility, and accountability in the laboratory and other settings.

- ***What is the relationship of the proposed course to other existing offerings, particularly in terms of overlap in objectives and/or content? If overlap exists, please indicate the nature and extent of consultation which has taken place. If the course is to be cross-listed, integrated or listed as a course credit exclusion with another course, approval is required from all the relevant Faculties/units.***

There already exists 4000 level thesis courses in Biology, Psychology and Kinesiology & Health Science, all of which operate in a similar manner. But not of all of which are in-depth, team based, in community research projects requiring a final written project, an oral presentation, and a peer-to-peer and self-evaluation. The expectation is that students will engage more fulsomely with a research question, engage in analysis, problem solving, writing, and oral communication that will culminate in contributing to the existing body of knowledge.

The Specialized Honours Neuroscience program aims to distinguish itself by a robust research-level Capstone experience, which this course fulfils.

- ***If applicable, please indicate the relationship of the proposed course to interdisciplinary programs; i.e. for which interdisciplinary program(s) will the course count for major/minor credit. As well, please indicate the nature and extent of consultation that has taken place with the relevant interdisciplinary program coordinator(s).***

n/a

- ***What is the expected enrolment in the course?***

Expected enrolment will be approximately 35 students/year.

Bibliography:

Please list the <u>required readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.).

Required reading from library holdings will vary based on the specific project(s) and specific focus of the neuroscience faculty member in a given year. In general, the existing electronic journal subscriptions should be sufficient for this course.

Please list any <u>suggested readings</u> for the course.

The reading list must contain complete bibliographical information (full name of author, title, year of publication, etc.)

This will vary depending on the project.

Please list any <u>online resources</u> for the course (please include complete bibliographical information as above).

For faculty members, there are some useful resources on the Teaching Commons website: http://teachingcommons.yorku.ca/resources-2/experiential-education/. As well as a faculty resource page at https://spark.library.yorku.ca/faculty-teaching-with-spark-guidelines-for-using-spark/ comprised of modules that support topics such as academic integrity, effective literature search strategies research, writing, etc.

AACU (American Academy of Colleges and see *value@aacu.org*) has developed and provided different rubrics for evaluating writing, critical thinking, team work, oral presentation skills, etc. that could easily be adapted for the evaluation needs of this course.

An excellent resource that exists for guiding students on writing are the SPARK (Student Paper and Academic Research Kit) modules found online at https://spark.library.yorku.ca/

Universities

If the course is to be integrated (graduate/undergraduate), a list of the additional readings required of graduate students must be included. If no additional readings are required, a rationale should be provided.

n/a

Library Support Statement:

Proposals for new courses must include a **library support statement** from the Bibliographer responsible for the relevant discipline to indicate whether resources are adequate to support the course. To request a support statement, see the list of subject and liaison librarians at http://www.library.yorku.ca/web/about-us/contact-us/liaison-librarians/.

Consultation/Approval:

- The Faculty of Health Curriculum Committee will only consider new course proposals that have been approved by the unit responsible for offering the course.
- If the proposed course is to be cross-listed, integrated, listed as a course credit exclusion with another course, or listed as a major/minor course option in an interdisciplinary program, the proposal must be accompanied by a statement from the collaborating unit signaling agreement to the proposal.

Appendix E: Description of Courses*

*Not all of these are taken by all students as sometimes there is a choice e.g., 3 credits of EECS are required but there are many different EECS courses from which to choose. For information purposes, they are all listed here.

1000-level (listed are the 1000 level courses required for admission to the neuroscience program and contributing to the major)		
BIOL 1000 3.00	**Biology I - Cells, Molecular Biology and Genetics:** An introduction to major unifying concepts and fundamental principles of biology, including evolution and cell theory. Topics include cells, biological energetics, metabolism, cell division and genetics. Three lecture hours per week; three laboratory hours in alternate weeks.	Existing; offered in F, W and S1
BIOL 1001 3.00	**Biology II - Evolution, Ecology, Biodiversity and Conservation Biology:** A continuation of Biology I, exploring major unifying concepts and fundamental principles of biology, building on earlier concepts. Topics include mechanisms of evolution, ecology, a survey of biodiversity and conservation biology. Three lecture hours per week; three laboratory hours in alternate weeks.	Existing; offered in W and S2
CHEM 1000 3.00	**Chemical Structure:** Introduction to chemistry with emphasis on physical and electronic structure of matter, including gases, liquids and solids. Topics include behaviour of gases; thermochemistry; atomic structure and periodic table; chemical bonding and architecture; structure of liquids and solids; frontiers of chemistry. Two and one-half lecture hours per week, one tutorial hour per week, six three-hour laboratory sessions.	Existing; offered in F, W and SU
CHEM 1001 3.00	**Chemical Dynamics:** This course complements SC/CHEM 1000 3.00 - with emphasis on chemical change and equilibrium. Topics include chemical kinetics; chemical equilibrium; entropy and free energy as driving forces for chemical change; electrochemistry; frontiers in chemistry. Two and one-half lecture hours per week, one tutorial hour per week, six three-hour laboratory sessions.	Existing; offered in W and SU
EECS 1520 3.00	**Computer Use: Fundamentals**: An introduction to the use of computers focusing on concepts of computer technology and organization (hardware and software) and the use of applications such as spreadsheets and information retrieval tools for problem solving. Three lecture hours per week.	Existing; offered in F, W and SU
EECS 1530 3.00	**Computer Use: Programming**: Concepts of computer systems and technology - e.g. software engineering, algorithms, programming languages, theory of computation. Practical work focuses on problem solving using a high-level programming language. The course requires extensive laboratory work. Three lecture hours per week.	Existing, offered in W
EECS 1540 3.00	**Computer Use for the Natural Sciences**: Introduction to problem solving using computers - top down and modular design; implementation in a procedural programming language - control structures, data structures, subprograms; application to simple numerical methods, modelling and simulation in the sciences; use of library subprograms. Three lecture hours per week.	Existing, offered in W
EECS 1570 3.00	**Introduction to Computing for Psychology:** An introduction to computing concepts with applications to problems drawn from psychology, including concepts of computer programming in an integrated computing and visualization environment. Three lecture hours per week. Prerequisite: SC/MATH 1505 6.00	Existing; offered in W
MATH 1013 3.00	**Applied Calculus I:** Introduction to the theory and applications of both differential and integral calculus. Limits. Derivatives of algebraic and trigonometric functions. Riemann sums, definite integrals and the Fundamental Theorem of Calculus.	Existing; offered in F, W and S1

	Logarithms and exponentials, Extreme value problems, Related rates, Areas and Volumes. Three lecture hours per week.	
MATH 1014 3.00	**Applied Calculus II:** Calculus in Polar Coordinates. Techniques of Integration. Indeterminate Forms. Improper Integrals. Sequences, infinite series and power series. Approximations. Introduction to ordinary differential equations. Three lecture hours per week. Prerequisite: SC/MATH 1013 3.00	Existing, offered in F, W and S2
MATH 1505 6.00	**Mathematics for the Life and Social Sciences**: A presentation of the elements of single-variable differential and integral calculus, elementary linear algebra and introductory probability and statistics. This course is designed to provide a comprehensive mathematical background for students of the biological and social sciences. Emphasis is placed on basic mathematical skills and their applications. Prerequisite: 12U Advanced Functions (MHF4U) or equivalent, or SC/MATH 1510 6.00.	Existing, Y
PSYC 1010 6.00	**Introduction to Psychology:** A survey of psychology introducing basic terms, concepts and methods. Included are topics such as biological bases of behaviour, learning, perception, motivation, cognition, child development, personality, and abnormal and social psychology. Three lecture hours per week.	Existing; offered in Y, W and S
NRSC 1001 1.0	**Frontiers of Neuroscience:** An introduction to research directions within the field of neuroscience, and in particular of faculty members at York, including exposure to professionalism and ethics, and to facilities and organizations in the wider community	New
2000-level		
NRSC 2000 3.00	**Fundamental Molecular and Cellular Neuroscience:** An introductory survey of the key areas of neuroscience including a historic perspective, gross anatomy and histology of the nervous system, development of the nervous system, molecular and cellular neuroscience, and neurological disorders. Methodologies of research and experimentation in neuroscience will also be introduced. Three lecture hours per week. Prerequisites: SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00; HH/PSYC 1010 6.00	New
NRSC 2100 3.00	**Systems, Behavioural and Cognitive Neuroscience:** This course is a core component of the Neuroscience degree program. In this course, students will explore the structure and function of the normal human brain. Topics include the organization of the central nervous system, the function and neural basis of sensory and movement systems, consciousness, language, thought and memory. Three lecture hours per week. Prerequisites: HH/SC/NRSC 2000 3.00	New
NRSC 2200 3.00	**Neuroscience Techniques:** Provides students with exposure to experimentation techniques and methodologies in the fields of systems and cognitive, cellular and molecular, and computational and theoretical neuroscience. These include EEG, fMRI, behavioural methods such as psychophysics and eye/body tracking, electrophysiology, patch and dynamic clamp, transgenic mouse technology, molecular imaging, neuronal coding and communication, neuronal networks, and brain-machine interfaces. Prerequisite: HH/SC/NRSC 2000 3.003.00. Corequisite: HH/SC/NRSC 2100 3.00	New
PSYC 2021 3.00 or KINE 2050 3.00 or BIOL 2060 3.00	**Three statistics options:** PSYC 2021: The fundamental concepts and application of descriptive statistics. An introduction to probability and inferential statistics, including hypothesis testing with the normal- and t-distributions.	Existing: PSYC 2021 F,W,SU;

	KINE 2050: An introduction to scientific method and the statistical analysis of experimental data. The conduct of simple experiments, techniques of naturalistic observation and the analysis of resulting data using fundamental concepts of descriptive and inferential statistics. BIOL 2060: Statistical problem solving for biologists. Basic theory for the analysis of parametric and non-parametric data. A project period is devoted to discussion and solving of statistical problems. Three hours per week.	KINE 2050 W; BIOL 2060 F,W
3000-level		
NRSC 3000 3.00	**Molecular and Cellular Neurobiology:** This course is a core component of the Neuroscience program. In this course students will explore the molecular, structural and cellular basis of complex brain functions focusing on perception, learning and memory. Students will learn about technological advances in areas of genome engineering, optogenetics, imaging and animal models used in the field. Examples of human neurological disease conditions will be discussed whenever appropriate to exemplify the consequences of sensory deficiencies in the nervous system. Three lecture hours per week. Prerequisites: HH/SC/NRSC 2000 3.00; HH/SC/NRSC 2100 3.00; HH/SC/NRSC 2200 3.00	New
PSYC 3250 3.00	**Neural Basis of Behaviour:** This course surveys issues concerning the development and localization of cerebral functions and examines experimental and clinical studies illustrating behavioural effects of brain damage. Three lecture hours per week. Prerequisite: AK/AS/HH/SC/PSYC 1010 6.00 or AK/HH/PSYC 2410 6.00, with a minimum grade of C; AK/AS/HH/SC/PSYC 2240 3.00 or AK/HH/PSYC 3145 3.00.	Existing; offered in F and W
KINE 3650 3.00	**Functional Neuroanatomy:** This course investigates the anatomy of the central nervous system, additionally discussing the clinical functional relevance of each area. Three lecture hours per week. Prerequisite: HH/KINE 2031 3.00 or SC/BIOL 4370 3.00 or HH/PSYC 3250 3.00.	Existing; offered in F
4000-level		
NRSC 4000 6.00	**Neuroscience Individual Research Project:** A Capstone neuroscience research project under the supervision of a neuroscience core/affiliated faculty member. An intensive research project engaged in a laboratory, or in the community, leading to the creation of an original piece of research, final written paper, as well as an oral presentation to the neuroscience community at York. Prerequisites: HH/SC/NRSC 2000 3.00; HH/SC/NRSC 2100 3.00; HH/SC/NRSC 2200 3.00; HH/SC/NRSC 3000 3.00; HH/SC/NRSC 3100 3.00; HH/PSYC 3250 3.00; HH/KINE 3650 300	New
NRSC 4002 6.00	**Neuroscience Team Research Project:** A team-based Capstone neuroscience research project under the supervision of a neuroscience core/affiliated faculty member engaged in a laboratory, or in the community, leading to the creation of an original piece of research, final written paper, as well as an oral presentation to the neuroscience community at York. Prerequisites: HH/SC/NRSC 2000 3.00; HH/SC/NRSC 2100 3.00; HH/SC/NRSC 2200 3.00; HH/SC/NRSC 3000 3.00; HH/SC/NRSC 3100 3.00; HH/PSYC 3250 3.00; HH/KINE 3650 300	New
Specialized Neuroscience: Molecular and Cellular Neuroscience		
KINE 3670 3.00	**Molecular and Cellular Neuroscience with Applications to Health:** The course covers the basic principles of molecular and cellular neuroscience. The course introduces students to the most basic fundamentals of neuroscience, which is the study of the functional properties of the nervous system and relationship between brain and disease. Topics covered range from neuronal	Existing; offered in F

	structure and function, communication at the synapse and neuromuscular junction, membrane receptors, synaptic transmission, neurotransmitters to the intra- and intercellular signaling systems within the sensory, motor and memory systems. This course provides the background for higher-level courses that deal with more specialized topics in neuroscience and the neurobiology of disease. Three lecture hours per week. Prerequisite: HH/KINE 3012 3.00.	
BIOL 4310 3.00	**Physiology of Circadian Timing**: This course examines the mechanism by which cells generate 24h (circadian) rhythms, how the numerous sites of these cells are coordinated by nerves and hormones and the critical roles of human circadian clocks in health and diseases. Three lecture hours per week. Prerequisites: SC/BIOL 2020 4.00 or SC/BIOL 2020 3.00; SC/BIOL 2021 4.00 or SC/BIOL 2021 3.00; SC/BIOL 3060 4.00.	Existing; offered in F
BIOL 4370 3.00	**Neurobiology:** An analysis of recent advances in neurobiology, particularly information processing and storage in nervous systems and the biochemical basis of learning, memory and behaviour. The neurobiology of addiction, diseases of the nervous system and regeneration are also discussed. Three lecture hours per week. Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 3060 4.00.	Existing; offered in F
KINE 4230 3.00	**Neuronal development for activity and health:** Analyzes the cellular, molecular and physiological processes underlying neuronal and neuromuscular development in health and disease. Three lecture hours per week. Prerequisite: HH/KINE 3012 3.00.	Existing; offered in W
KINE 4505 3.00	**Neurophysiology of Movement in Health and Disease:** This course provides an overview of current neurophysiological concepts in motor control, with an emphasis on the neurophysiological principles underlying human movement disorders. Three lecture hours per week. Prerequisite: AS/HH/SC/KINE 3011 3.00 or AS/HH/SC/KINE 3020 3.00.	Existing; offered in F
Specialized Neuroscience: Behavioural and Cognitive Neuroscience		
PSYC 2220 3.00	**Sensation and Perception I**: A course in problems, experimental methods and research findings in sensation and perception. Vision and hearing are covered in some detail, including discussion of the structure and function of the eye and ear, and cortical areas responsible for processing visual and auditory information. Three lecture hours per week. Prerequisites: AK/AS/HH/SC/PSYC 1010 6.00 with a minimum grade of C.	Existing; offered in F and W
PSYC 2260 3.00	**Cognition**: A survey of higher-order cognitive processes in humans. Topics include attention, memory, problem solving, thinking and language. Prerequisite: AK/AS/HH/SC/PSYC 1010 6.00 or AK/HH/PSYC 2410 6.00, with a minimum grade of C. Course credit exclusions: AK/PSYC 3135 3.00 (prior to Summer 2002), GL/PSYC 3370 3.00.	Existing; offered in S1
PSYC 3140 3.00	**Abnormal Psychology**: A course on the nature, causes and treatment of a number of behaviour disorders. Topics include developmental disorders, anxiety problems, personality disorders, substance abuse, affective disorders, organic brain disorders and schizophrenia. Three lecture hours per week. Prerequisite: AK/AS/HH/SC/PSYC 1010 6.00 or AK/HH/PSYC 2410 6.00, with a minimum grade of C. Course	Existing; offered in F and W

	credit exclusions: AK/PSYC 3215 3.00 (prior to Summer 2002), GL/PSYC 3230 3.00.	
PSYC 3265 3.00	**Memory**: An examination of how humans encode, store and retrieve information from memory. Although the course focuses on data from laboratory studies and their theoretical interpretation, some consideration is given to applied aspects of human memory. Prerequisite: AK/AS/HH/SC/PSYC 1010 6.00 or AK/HH/PSYC 2410 6.00, with a minimum grade of C. Course credit exclusions: AK/PSYC 3130 3.00 (prior to Summer 2002), GL/PSYC 3390 3.00.	Existing; offered in F and W
PSYC 3270 3.00	**Sensation and Perception II:** A continuation of Sensation and Perception I. Senses such as balance, taste, smell and touch are considered, and there is more thorough discussion of the methods used to study sensory processing and perception. Prerequisites: AK/AS/HH/SC/PSYC 1010 6.00 with a minimum grade of C; AK/AS/HH/SC/PSYC 2220 3.00 or AK/HH/PSYC 3120 3.00.	Existing; offered in W
PSYC 3495 3.00	**Neuroscience of Aging & Cognitive Health:** This course investigates the neural basis of cognitive changes across the adult lifespan. Students will learn how the brain is altered in structure and function as people age and how these changes impact cognition. The course will examine the border between normal and abnormal aging and how neuroscience research is informing strategies to sustain cognitive health into older adulthood Prerequisite: HH/PSYC 1010 6.00 with a minimum grade of C; HH/PSYC 2240 3.00.	Existing; offered in W
PSYC 4080 6.00	**Neuropsychology of Abnormal Behaviour**: An examination of the genetic, physiological and anatomical bases of several types of abnormal behaviour. The social, public policy and ethical implications of a neuropsychological view of abnormal behaviour are discussed. Three lecture hours per week. Prerequisites: AK/AS/HH/SC/PSYC 1010 6.00 with a minimum grade of C; AK/AS/HH/SC/PSYC 2030 3.00 or AK/HH/PSYC 2530 3.00; one of AK/AS/HH/SC/PSYC 2021 3.00, AK/AS/HH/SC/PSYC 2020 6.00, AK/HH/PSYC 2510 3.00; AK/AS/HH/SC/PSYC 2240 3.00 or AK/HH/PSYC 3145 3.00; AK/HH/PSYC 3140 3.00 (after Winter 2002) or AS/SC/PSYC 3140 3.00 or AK/HH/PSYC 3215 3.00.	Existing; offered in Y
KINE 4210 3.00	**Disorders of Visual Cognition:** We rely heavily on vision to interact with the world. This course investigates the clinical disorders that are manifested with impairments in different stages of visual processing. Prerequisite: HH/KINE 3020 3.00 or SC/BIOL 4370 3.00 or HH/PSYC 3250 3.00.	Existing; offered in alternate years
PSYC 4260 3.00	**Seminar in Sensation and Perception:** This seminar course gives advanced, detailed coverage of topics in sensation and perception. Specific topics vary according to the instructor, and could include vision (e.g., shape perception, colour perception), hearing (e.g., auditory localization, speech perception), or vestibular perception (e.g., balance, the sense of movement). The course emphasizes reading and evaluating original scientific work, and readings include journal articles or research monographs. Special attention is paid to understanding the value and limitations of common experimental methods in perception research. Prerequisites: AK/AS/HH/SC/PSYC 1010 6.00 with a minimum grade of C; AK/AS/HH/SC/PSYC 2030 3.00 or AK/HH/PSYC 2530 3.00; one of AK/AS/HH/SC/PSYC 2021 3.00, AK/AS/HH/SC/PSYC 2020 6.00, AK/HH/PSYC 2510 3.00; AK/AS/HH/SC/PSYC 2220 3.00 or AK/HH/PSYC 3120 3.00.	Existing; offered in W

PSYC 4270 3.00	**Seminar in Memory and Cognition:** An examination of a number of issues in memory and cognition. The course focuses on areas of current interest and may include topics such as pattern recognition, perception of art, memory retrieval, connectionist models, problem solving, thinking, concept formation, categorization and artificial intelligence. Prerequisites: AK/AS/HH/SC/PSYC 1010 6.00 with a minimum grade of C; AK/AS/HH/SC/PSYC 2030 3.00 or AK/HH/PSYC 2530 3.00; one of AK/AS/HH/SC/PSYC 2021 3.00, AK/AS/HH/SC/PSYC 2020 6.00, AK/HH/PSYC 2510 3.00; one of AK/HH/PSYC 3130 3.00, AK/HH/PSYC 3135 3.00, AK/HH/PSYC 3260 3.00 (after Winter 2002), AS/SC/PSYC 3260 3.00, AK/AS/HH/SC/PSYC 3265 3.00.	Existing; offered in F & W
PSYC 4360 3.00	**Visuospatial Memory and Goal-Directed Action:** The course examines how the brain represents, updates, and transforms spatial information from the senses, primarily vision, into goal-directed movements of the eyes, head, and hand. Classes consist of a combination of lectures followed by journal article discussions and / or formal seminar presentations by students. Prerequisites: Students must have at least one introductory neuroscience or animal physiology course HH/PSYC 2240 3.00, SC/BIOL 3060 3.00, HH/KINE 3650 3.00.	Existing; offered in W
Specialized Neuroscience: Systems Neuroscience		
KINE 3020 3.00	**Skilled Performance and Motor Learning:** An introduction to the analysis and development of skilled performance. Two lecture hours and two laboratory hours per week. Prerequisites: AS/HH/SC/KINE 2050 3.00; AS/SC/PSYC 1010 6.00.	Existing; offered in F
BIOL 4380 3.00	**Systems Neuroscience:** This course investigates the neural basis of visual and auditory perception, echolocation, smell, short- and long-term memory, and motor control. Emphasis is on understanding how neural interactions analyze sensory information and control complex behaviour. Three lecture hours per week. Prerequisite: SC/BIOL 3060 4.00.	Existing; offered in W
PSYC 4215 3.00	**Neuroimaging of Cognition - fMRI Methods**: This course offers fundamental knowledge on neuroimaging of cognition using fMRI, including practical aspects of experimental design and analytical approaches. The course provides the necessary theoretical perspectives of fMRI experiments and provides extensive “hands-on” experience in fMRI analysis. The course is integrated with a graduate level course.	New
KINE 4225 3.00	**Principles of Neuro-motor Learning:** This course covers concepts of how the brain learns and controls voluntary movement, particular those of the upper limbs. Prerequisite: HH/KINE 2050 3.00, HH/KINE 3020 3.00	Existing; offered in W
KINE 4240 3.00	**Applied Human Factors:** This course discusses human factors, e.g. sensory, perceptual, motor and cognitive systems, and how they feature in machines, systems design, procedures and skills, with an emphasis on physical activities and sport. Prerequisite: HH/KINE 3020 3.00 or SC/BIOL 4370 3.00 or HH/PSYC 3250 3.00.	Existing; offered in alternate years
KINE 4500 3.00	**Neural Control of Movement:** This neuroscience course reviews fundamental concepts of movement control, with an emphasis on the brain mechanisms underlying motor behaviour. Topics include walking, looking, reaching, posture and complex skill coordination. Movement control concepts will be used to understand the neural basis of symptoms associated with motor disorders such as Parkinson's disease, ataxia, Lou Gehrig's disease, muscular dystrophy, and stroke. Prerequisite: AS/HH/SC/KINE 3020 3.00 or permission of the course director.	Existing; offered in alternate years.
PSYC 4380 3.00	**Seminar in Neuroscience: Rhythms of the Brain:** Explores the temporal dynamics of brain activity, from ultradian and circadian cycles to the high-frequency neural oscillations associated with attention and memory. Topics addressed	Existing; offered in W

	include: sleep rhythms, hippocampal rhythms, central pattern generators, neocortical oscillations and memory consolidation. Prerequisite: AK/AS/HH/SC/PSYC 1010 6.00, AK/AS/HH/SC/PSYC 2021 3.00, AK/AS/HH/SC/PSYC 2030 3.00, AK/AS/HH/SC/PSYC 2240 3.00, AK/AS/HH/SC/PSYC 3250 3.00.	

Appendix F: Calendar Copy

Specialized Honours BSc Program in Neuroscience (120 Credits)

Faculty of Health and Faculty of Science are described separately next

Faculty of Health:

Residency requirement: a minimum of 30 course credits and at least half (50 per cent) of the course credits required in each undergraduate degree program major/minor must be taken at York University.

Continuation requirement: students must attain a cumulative grade point average of 6.00 (B) on 30 credits to continue in the program.

Graduation requirement: all graduates must complete a total of at least 120 credits with a minimum overall cumulative grade point average of 6.00 (B).

General education requirement: a minimum of 12 credits as follows:

- six credits at the 1000 level in approved Faculty of Health general education or humanities categories approved by the Faculty of Liberal Arts & Professional Studies
- six credits at the 1000 level in approved Faculty of Health general education or social science categories approved by the Faculty of Liberal Arts & Professional Studies

Note 1: it is required that students complete the general education requirements above within their first 60 credits.

Note 2: students may complete a maximum of 30 credits in general education, any additional credits not being used to fulfill general education may count toward electives.

Note 3: general education requirements are satisfied by taking approved humanities or social science categories courses and Faculty of Health general education courses. For further information please visit http://health.info.yorku.ca/current-student-information/general-education-requirements/.

Basic science requirement: a minimum of 15 credits as follows:

- six credits in mathematics selected from:
  - SC/MATH 1505 6.00 or
  - SC/MATH 1013 3.00 and
  - SC/MATH 1014 3.00
- three credits selected from:
  - LE/EECS 1520 3.00
  - LE/EECS 1540 3.00
  - LE/EECS 1570 3.00
- 6 credits
  - SC/CHEM 1000 3.00
  - SC/CHEM 1001 3.00

Major credits: students must complete a minimum of 64 credits in neuroscience major.

- SC/BIOL 1000 3.00
- SC/BIOL 1001 3.00
- HH/PSYC 1010 6.00
- NRSC 1001 1.00
- NRSC 2000 3.00
- NRSC 2100 3.00
- NRSC 2200 3.00
- HH/PSYC 2021 3.00 or HH/KINE 2050 3.00
- NRSC 3000 3.00
- HH/PSYC 3250 3.00
- HH/KINE 3650 3.00
- NRSC 4000 6.00 or NRSC 4002 6.00

- 12 credits selected from the list of courses in the chosen specialized stream
- 12 credits selected from the list of courses below to satisfy breadth requirement in the alternative specialized stream.

    - Molecular and Cellular Neuroscience Stream
        - HH/KINE 3670 3.00
        - SC/BIOL 4310 3.00
        - SC/BIOL 4370 3.00
        - HH/KINE 4230 3.00
        - HH/KINE 4505 3.00
    - Behavioural and Cognitive Neuroscience Stream
        - HH/PSYC 2220 3.00
        - HH/PSYC 2260 3.0
        - HH/PSYC 3140 3.00
        - HH/PSYC 3265 3.00
        - HH/PSYC 3270 3.00
        - HH/PSYC 3495 3.00
        - HH/PSYC 4080 6.00
        - HH/KINE 4210 3.00
        - HH/PSYC 4260 3.00
        - HH/PSYC 4270 3.00
        - HH/PSYC 4360 3.00
    - Systems Neuroscience Stream
        - HH/KINE 3020 3.00
        - SC/BIOL 4380 3.00
        - HH/PSYC 4215 3.00
        - HH/KINE 4225 3.00
        - HH/KINE 4240 3.00
        - HH/KINE 4500 3.00
        - HH/PSYC 4380 3.00

Upper-level credits: a minimum of 42 credits at the 3000 level or 4000 level, including 18 credits at the 3000 or 4000 level in the major with 12 credits at the 4000 level.

Required science credits outside the major: A minimum of nine credits in science disciplines outside the major, of which three credits must be at the 2000-level or above. Students in the major will be deemed to have fulfilled required science credits outside the major by completing at least 12 credits in the alternative streams.

Electives: additional elective credits as required for an overall total of at least 120 credits. Elective credits may be used to fulfill science and upper-level credits.

Faculty of Science:

Residency requirement: a minimum of 30 course credits and at least half (50 per cent) of the course credits required in each undergraduate degree program major/minor must be taken at York University.

Continuation requirement: students must attain a cumulative grade point average of 6.00 (B) on 30 credits to continue in the program.

Graduation requirement: all graduates must complete the home Faculty requirements, a total of at least 120 credits with a minimum overall cumulative grade point average of 6.00 (B).

General education requirement: a minimum of 12 credits from two different areas of study, including at least three credits from each area, subject to restrictions from the Faculty of Science. For the purpose of this regulation “different area” means offered by a different academic unit such as divisions, departments or Faculties.

For further information please visit: http://science.yorku.ca/current-students/my-degree/program-requirements/general-education/

Basic science requirement: a minimum of 15 credits as follows:

- six credits in mathematics selected from:
  - SC/MATH 1505 6.00 or
  - SC/MATH 1013 3.00 and
  - SC/MATH 1014 3.00
- three credits selected from:
  - LE/EECS 1520 3.00
  - LE/EECS 1540 3.00
  - LE/EECS 1570 3.00
- 6 credits
  - SC/CHEM 1000 3.00
  - SC/CHEM 1001 3.00

Major credits: students must complete a minimum of 64 credits in neuroscience major.

- SC/BIOL 1000 3.00
- SC/BIOL 1001 3.00
- HH/PSYC 1010 6.00
- NRSC 1001 1.00
- NRSC 2000 3.00
- NRSC 2100 3.00
- NRSC 2200 3.00
- HH/BIOL 2060 3.00
- NRSC 3000 3.00
- HH/PSYC 3250 3.00
- HH/KINE 3650 3.00
- NRSC 4000/4002 6.00
- 12 credits selected from the list of courses in the chosen specialized stream
- 12 credits selected from the list of courses below to satisfy breadth requirement in the alternative specialized stream.

  - Molecular and Cellular Neuroscience Stream
    - HH/KINE 3670 3.00
    - SC/BIOL 4310 3.00
    - SC/BIOL 4370 3.00
    - HH/KINE 4230 3.00
    - HH/KINE 4505 3.00
  - Behavioural and Cognitive Neuroscience Stream
    - HH/PSYC 2220 3.00
    - HH/PSYC 2260 3.0
    - HH/PSYC 3140 3.00
    - HH/PSYC 3265 3.00
    - HH/PSYC 3270 3.00
    - HH/PSYC 3495 3.00
    - HH/PSYC 4080 6.00
    - HH/KINE 4210 3.00
    - HH/PSYC 4260 3.00
    - HH/PSYC 4270 3.00
    - HH/PSYC 4360 3.00
  - Systems Neuroscience Stream
    - HH/KINE 3020 3.00
    - SC/BIOL 4380 3.00
    - HH/PSYC 4215 3.00
    - HH/KINE 4225 3.00
    - HH/KINE 4240 3.00
    - HH/KINE 4500 3.00
    - HH/PSYC 4380 3.00

Science Breadth: a total of 24 credits in science disciplines outside the major, of which the three credits must be at the 2000 level or above. 15 of the 24 credits are satisfied by the General Education requirement.

Students in the major will be deemed to have fulfilled required science credits outside the major by completing at least 12 credits in the alternate streams.

Upper-level credits: a minimum of 42 credits at the 3000 level or 4000 level, including 18 credits at the 3000 or 4000 level in the major with 12 credits at the 4000 level.

Additional Elective Credits: additional elective credits as required for an overall total of at least 120 credits. Elective credits may be used to fulfill science and upper-level credits.

Appendix G: Assessment of Student Achievement in NRSC courses

Below is documentation of the methods and criteria for assessing student achievement. Using each program learning outcomes as a guide, key assessments from the core neuroscience courses are presented to showcase the way students' achievement will be measured.

Methods and Criteria for Assessing Student Achievement

Program Learning Outcome	***Assessment Methodologies***
1. Integrate and apply theoretical perspectives and major findings across broad areas of neuroscience, i.e., cellular and molecular, behavioural/cognitive, and systems.	• Engage in major findings in broad areas of neuroscience through attendance at up to 10 talks by researchers (or research groups), and/or representatives of other groups associated with Neuroscience such as research ethics in NRSC 1001 • Integrating content knowledge in Neuroscience on topics such as, histology of Neuroscience, aging and senescence in the brain in two written exams in NRSC 2000 • Responding to case studies/simulations, such as famous cases of brain abnormalities as part the in-class case studies/simulations exercises in NRSC 2100 • Students integrate and apply key concepts in systems, behaviours and cognitive Neuroscience through three written exams with multiple choice, matching and short answer questions where in NRSC 2100 • Demonstrate knowledge of detailed understanding of Neuroscience through team reflection presentation about one experimental technique in Neuroscience NRSC 2200 • Students identify, describe and explain their knowledge of molecular and cellular basis of perception and cognition in three non-cumulative equally weighted written exams and one final exam. Exams will be comprised of multiple-choice and matching/short answer questions where in NRSC 3000. • Defend a chosen argument or stance based on collected evidence (e.g., data, literature, etc.) in Neuroscience as part of Capstone project requirements including initial project proposal and final report in NRSC 4000/4002.
2. Demonstrate knowledge of, and recognize the relationships between, the structure and function of molecules and tissues involved in neurobiological systems at all levels: molecular, cellular, and organismal.	• Interview of two different Neuroscientists and write critical reflection in NRSC 1001 • Demonstrate content knowledge in molecular and cellular neuroscience and molecular and cellular basis of neurological disorders in two exams in NRSC 2000. • Responding to case studies/simulations, such as famous cases of brain abnormalities as part the in-class case studies/simulations exercises in NRSC 2100 • Demonstrate knowledge of key concepts in systems, behaviours and cognitive Neuroscience through three written exams with multiple choice, matching and short answer questions in NRSC 2100 • Critique the purpose and process of neuroscience experimental techniques through reviewing and critiquing five articles in the online Journal Club in NRSC 2200 • Students identify, describe and explain their knowledge of molecular and cellular basis of perception and cognition through three non-cumulative equally weighted written exams and one final exam. Exams will be comprised of multiple-choice and matching/short answer questions. • Demonstrate knowledge and recognize relationships in Neurobiological systems through Capstone project

	development including initial project proposal and final report in NRSC 4000/4002.
3. Demonstrate a detailed knowledge in one of the Specialized Neuroscience streams.	• Demonstrate detailed knowledge in a specific topic in Neuroscience as part of Capstone project development including initial project proposal and final report in NRSC 4000/4002. • Term paper in KINE 4505
4. Locate and retrieve scientific information, and to read, critique, and evaluate scientific articles, demonstrate scientific writing skills, and deliver oral presentations.	• Analysis of journal articles in Journal Critique assignment in NRSC 2000 • Oral presentation based on literature in Neuroscience in NRSC 2200 • Locate, retrieve and critique five articles in the online Journal Club in NRSC 2200 • Locate, retrieve and critique literature and data to defend a chosen argument based on the collected evidence for initial project proposal and final report in NRSC 4000/4002.
5. Perform basic laboratory techniques used in neuroscience research and understand and apply principles of laboratory safety.	• Implement and perform Neuroscience research to complete laboratory/clinical project or team-based project for initial project proposal and final report in NRSC 4000 or NRSC 4002
6. Describe the diverse experimental research methods used in the broad areas of neuroscience and defend the use of these methods.	• Critical reflection on the purpose of research in Neuroscience and the current context of how research is conducted in the field in NRSC 1001 • One-minute paper on experimental research methods presented in talk in NRSC 1001 • Describe the techniques by which we can measure brain functions as part the in-class case studies/simulations exercises in NRSC 2100 • Oral reflection presentation about one experimental technique in Neuroscience in NRSC 2200 • Completion of four of five graphs based on data provided using different techniques in NRSC 2200 • Critique the purpose and process of neuroscience experimental techniques through reviewing and critiquing five articles in the online Journal Club in NRSC 2200 • Critique published decisions in experimental research in Neuroscience in team work critical reflection activity in NRSC 3000. • Draft explaining research methods in Neuroscience in initial project draft in NRSC 4000/4002.
7. Develop testable research questions based upon their in-depth knowledge in one or more of the broad areas of neuroscience and apply research methods, experimental designs, and analysis techniques used to investigate such scientific questions.	• Investigate a variety of research questions through participating in four of five graphical analysis in NRSC 2200 • Developing testable research questions based on in-depth knowledge of neuroscience and apply the research methods through Capstone project including initial project proposal and final report in NRSC 4000/4002
8. Represent information in a quantitative format, to analyze and interpret quantitative information, including graphs and statistics.	• Completion of four of five graphs based on data provided using different techniques in NRSC 2200 • Represent, analyze and interpret research findings in Capstone project in final written report in NRSC 4000/4002.
9. Analyze and interpret pre-existing or novel data, including research findings, to develop lines of argument, propose solutions, and	• Consider information presented in talks and communicate this through a one-minute paper in NRSC 1001

communicate the findings in both oral and written formats to diverse audiences.	• Analysis of journal articles in Journal Critique assignment in NRSC 2000 • Analysis of data and research findings in-class case studies/simulations on systems, behavioural and cognitive Neuroscience exercises in NRSC 2100 • Apply appropriate data analysis techniques in analyzing experimental data in five journal critiques on research methods in Neuroscience in NRSC 2200 • Represent, analyze, interpret and explain research data orally through public presentation of Capstone project in NRSC 4000/4002 • Represent, analyze and interpret research data in Capstone project in final written report in NRSC 4000/4002.
10. Relate neuroscience to other disciplines, and apply learning from those disciplines within neuroscience e.g., mathematics, computer science, physics, health sciences, sport and society	• Critical reflection on the purpose of research in Neuroscience and the current context of how research is conducted in the field in NRSC 1001 • Analysis of media articles that draw on molecular and cellular Neuroscience and relate them the questions “What”, “So What” and “Now What” in Medical Article reflection activity-NRSC 2000 • Analysis of case studies/simulations that offer ‘real-life’ examples of the complex structure and function of the human brain through in-class case studies/simulations in NRSC 2100 • Relating Neuroscience through other disciplines through reviewing articles, some of which may be suggested by guest lectures as part of five journal critiques in NRSC 2200. • Analysis of real-world topic related to the nervous system with a focus on sensory processing in critical reflection activity in NRSC 3000.
11. Work effectively and collaboratively in teams.	• Working in groups to critically reflect and write about media articles in Neuroscience in Media Article reflection activity in NRSC 2000 • Choice of team reflection presentation on one Neuroscience technique in NRSC 2200 • Complete peer to peer and self-evaluation of collaborating of choose the team presentation in NRSC 2200 • Team critical reflection activity in NRSC 3000 • Complete peer to peer and self-evaluation of collaborating on the team presentation in NRSC 3000 • Work effectively with supervisor, lab mates, team mates during Capstone project and in developing initial proposal, final report and public presentation in NRSC 4000/4002.
12. Demonstrate initiative, personal responsibility, and accountability in the laboratory and class setting.	• Interview of two different Neuroscientists and write a critical reflection in NRSC 1001 • Demonstrate personal responsibility and accountability while working in groups to critically reflect and write about media articles in Neuroscience in Media Article reflection activity in NRSC 2000 • Participation in data workshops in NRSC 2200 • Self-evaluation in NRSC 2200 • Peer to peer evaluation of collaborating on team presentation in NRSC 2200 • Display professionalism in public presentation in NRSC 4000/4002
13. Demonstrate academic integrity, social responsibility, and respect	• Interview of two different Neuroscientists in NRSC 1001

for diversity and different points of view.	• Demonstrate respect for diversity and different points of view when working in groups to critically reflect and write about media articles in Neuroscience in Media Article reflection activity in NRSC 2000 • Demonstrate academic integrity, respect for diversity and different points of view while working effectively with others in NRSC 4000/4002

Detailed Assessment Criteria for Determining Student Achievement

Assessment	Course	Assessment Criteria
Critical Reflection	NRSC 1001	see for definitions of critical reflection http://health.yorku.ca/experiential-education/faculty/#squelch-taas-tab-content-1-6 • 0 assigned for below benchmark, 1 for reaching benchmark, 3 assigned for mastery
Critical Reflection	NRSC 4000	• reflect on their experience in the neuroscience program and to outline how and what they have learned about neuroscience research, the field in general, and themselves. • critique their own thoughts, attitudes, and actions related to neuroscience research, and describe how/why they have changed or stayed the same as a result of their research experience. • asked to identify at least one attitude/action that they think they could apply, do better, or do differently (it can apply to any aspect of their professional or academic life) as a result of what they have learned about neuroscience.
	NRSC 4002	• reflect on their experience conducting a team-based project in the neuroscience program. A collaboration rubric will be created or adapted from the team based value rubric proposed by AACU (American Academy of Colleges and Universities see *value@aacu.org*) whereby students assess and critique their contributions and their peers contributions to the development of the project (e.g., role in researching and gathering information, ability to share and relay information, punctuality); responsibility in ensuring the project outcomes are fulfilled (e.g., fulfills team role & duties, contributes to the development of the final paper); and ability to be a valuable team player (e.g., listens to others, expresses self to others, makes fair decisions).
One-minute paper	NRSC 1001	• Student are expected to answer the questions: “What was the most important concept they learned from the guest speaker?” and/or “What would they like to learn more about?”
Reflection Activity on Media Article	NRSC 2000	• Students are expected to write about one media article elaborating on reflection questions such as “What” (e.g., what neuroscience issue is being addressed?), “So What” (e.g., how does this information relate to your neuroscience content?),

		and “Now what” (e.g., What would they like to learn more about pertaining to this topic?).
Journal Article Critique Assignment	NRSC 2000	• Students are expected to analyze a research article, critically reflect on the research processes, and discuss their emerging understanding of the purpose and process of at least two of these methodologies
In-class case study/simulation exercises	NRSC 2100	• Students will be assessed on the engagement with/participation in the exercises (e.g. they must be present in class and complete the exercise) as well as their reflective responses. Responses will be assessed both on accuracy (against the course material) as well as their ability to make critical connections between core course concepts. • Students will be asked to write a critical reflection based on a provided case study e.g., addressing the questions “what?” (e.g., what did they learn about the structure/function covered, what neuroimaging techniques were used to measure the structure/function), “so what” (how does this information contribute to our knowledge in the field of neuroscience), and “what now” (what more would they like to know about this topic or what further research needs to be engaged in to expand on this topic).
Choice of Individual or Team reflection presentation about one of the laboratories	NRSC 2200	• In teams of 5, students will present a critical reflection about an experimental technique in a 15-minute presentation to the class. • They will describe: What (what did they learn about the lab), so what (what key course concepts does this technique help them to understand, what usefulness and limitations are associated with the technique), and what now (if you could engage in a research project using this technique would you do?) • Students will complete a peer-to-peer and self-evaluation on their contribution to and participation in the team-based presentation.
Critical reflection activity	NRSC 3000	• Students will be asked to work in teams (in class or online) to write a critical reflection on a journal article and/or media posting related to the nervous system with a focus on sensory processing, learning and memory • . They will be asked to address the questions: “what?” (e.g., what did they learn about the sensory process covered, what technologies were used to investigate the sensory system), “so what” (e.g., how does this information contribute to our knowledge in the field of neuroscience, does and/or how does the technologies used to investigate the sensory system further our understanding of this system), and “what now” (e.g., what more would they like to know about this topic or what further research needs to be engaged in to expand on this topic, are there other technologies that could better investigate the sensory system in this context).

Mid-way draft evaluation	NRSC 4000/4002	• Students will be asked to create an initial project proposal. No later than 4 months after beginning the project (approximately January 15th) the students will submit to their supervisor a draft of the Introduction and Methods of the project, • Students will receive feedback on their performance, and progress toward meeting the learning outcomes in their proposal and the course.
Oral presentation evaluation	NRSC 4000/4002	• Students will present their Capstone project. • This final presentation will be evaluated (approximately 20%) using a rubric adapted from the Oral communication value rubric proposed by AACU (American Academy of Colleges and Universities see *value@aacu.org*) evaluating skills such as reflection (e.g., uses concepts learned about neuroscience to draw further conclusions and links it to research, shows that they recognize and can critique the beliefs and assumptions they hold etc.); language (e.g., language supports the effectiveness of communication, is appropriate to the topic and audience, grammatical, clear, etc.); delivery (e.g., posture, gesture, eye contact, and vocal expressiveness shows confidence and authority. looks more often at the audience than at his/her speaking materials/notes, etc.); supporting material (e.g., explanations, examples, illustrations, statistics, analogies, and quotations from relevant authorities are appropriate); central message (e.g., compelling, precisely stated, appropriately repeated, memorable, and strongly supported, etc.).
Research citizenship		• Students will be assessed on their work in labs, lab meetings at York or in the community, modelling the importance of developing professionalism skills that are valuable to future careers in the field. While lab meetings and experiences may look different from project to project, all students will be assessed on how they contribute to the creation and ongoing support of a positive, collegial, research environment.

Statement of Library Support for the New Proposed Neuroscience Program

York University Libraries

October 2018

Submitted by: Ilo-Katryn Maimets, Rajiv Nariani,
Amy Poon

INTRODUCTION

This statement of library support for the proposed ***Bachelor of Science Specialized Honours Degree in Neuroscience*** has been prepared in accordance with the guidelines outlined in the Quality Assurance Framework as set out by the Ontario Universities Council on Quality Assurance. It describes the level of support currently provided by York University Libraries for the Neuroscience program proposed to be offered in the Faculty of Health (FoH) on the Keele campus. The Libraries support FoH programs including undergraduate through to the PhD level in related Health Sciences and Science programs through collections, instructional services, research assistance, access to knowledge resources, supporting research dissemination and providing adaptive services.

The proposed Neuroscience program will "provide students with an undergraduate path into graduate studies, leading to research-oriented careers in academia or industry. As such, and as outlined below, this program is aimed at high-achieving students. Students will graduate with a broad and advanced understanding of cellular and molecular, cognitive and behavioural, and systems neuroscience. Given their breadth and depth of knowledge and skills, graduates will also be prepared for other employment opportunities in life sciences professions and industry that are afforded by the rapid expansion of technological and entrepreneurial endeavors in neuroscience."

COLLECTIONS

General Description of the Collection

The current graduate diploma program in Neuroscience has been well supported since 2007 and draws strength from the collective knowledge of faculty members in the Department of Biology in the Faculty of Science and from the School of Kinesiology & Health Science and the Department of Psychology in the Faculty of Health at York University.

The Libraries' collections support the research and teaching needs of the faculty as well as the graduate students enrolled in these programs and courses offered in Psychology, Kinesiology & Health Sciences and Biology.

In the recent years there has been a growing focus on research in cognitive neuroscience, neuropsychology, and vision science. YUL continues to support these subject areas ranging from the introductory to the advanced, and the collection accommodates these diverse interests and supports the strong neuroscience component of these courses associated with the proposed *Bachelor of Science Specialized Honours Degree in Neuroscience*. The collection comprises a variety of formats: print, online and microform, consisting of monographs, journals, government publications, index databases and other reference sources.

Formats

The Libraries' collection comprises print, electronic, audio-visual, and microform resources in the form of monographs, journals, reference materials, films, videos, DVDs, government documents and statistics. Digital/electronic resources can be accessed from all libraries and off-campus through the York Libraries' web site.

Location of Resources

A large portion of the print collection in the areas of Biology and Kinesiology is concentrated in the Steacie Science and Engineering Library and includes resources in systems neuroscience, neuroanatomy, neurobiology, stress physiology, neurophysiology, and neuroendocrinology. In addition, the Science Library has strong holdings related to vision sciences, visual perception, vision-motor control, neural networks, and psychophysics. We also collect research level resources in cellular and molecular biology and immunobiology.

The Psychology and Behavioral Sciences print collection is housed in Scott Library, and includes resources covering learning, emotion and motivation, sleep disorders, cognitive sciences, psychophysics, perception, and some areas of health psychology. In addition, some supporting collections such as government documents and the microform collection are also housed at Scott Library.

Print Books

Monographs are purchased through the *Gobi Approval Plan* although other sources of new titles are also used. Searches are also conducted in ***WorldCat*** to locate titles of relevance and interest.

York University Libraries have been collecting reference material and handbooks in all areas of neurosciences including vision sciences and signal processing. Significant reference sources include the *Handbook of developmental cognitive neuroscience* (2014), *Encyclopedia of behavioral neuroscience* (2010), *Encyclopedia of neuroscience* (2008), *Handbook of neurochemistry and molecular neurobiology* (complete series), *Neurobiology of Disease* (2007), and *Signal processing for neuroscientists* (2007), *Oxford handbook of traumatic stress disorders* (2012), *Encyclopedia of Stress* (2007) and the *Encyclopedia of health and behavior* (2004). The Libraries have copies of the book *Principles of Neural Science* (5th Ed.). The Libraries remain been committed to meeting faculty and students needs and have print and/or online access to most of the journals mentioned in the assigned reading list.

Journals

Given the interdisciplinary nature of the program, the journal collections in neuroscience, cognitive science, neurobiology, psychology, biology, and health science are especially important since currency is emphasised. Subscriptions are maintained for all significant periodicals, and back runs are acquired if available. Whenever possible, electronic journal format is preferred over print. York University Libraries are moving towards providing a complete range of resources to students' desktops. As electronic subscriptions are added to the collection, print versions are cancelled once ongoing access to the electronic archives has been ensured.

The demand for periodicals, particularly online journals is increasingly fulfilled through our involvement and memberships in consortia such as the Canadian Research Knowledge Network (CRKN) and the Ontario Council of University Libraries (OCUL). Many journals are also available from publishers such as the *Elsevier, Karger, BioOne, and National Library of Medicine* and from aggregators such as *Synergy-Blackwell, PsycARTICLES* (APA), *CogNet* (MIT) and *Proquest*. Open access journals from *Directory of Open Access Journals (DOAJ),* and *Public Library of Science (PLoS)* are also listed in the library catalogue. Individual titles are added on request by faculty.

Electronic Resources

New E-journals and databases

York University Libraries subscribe to full text electronic journals viz. *Nature Reviews NeuroScience* and *Nature Reviews Genetics*. Additional journals the library subscribes to include *Nature Neuroscience*, *Journal of Cognitive Neuroscience*, and *The Journal of Neuroscience*.

All of the journals and books mentioned in required and recommended readings are available in print and/or electronic format at York University Libraries. In addition, the library subscribes to high impact journals in biology, kinesiology and health sciences, psychology & cognitive sciences, and all aspects of neuroscience.

The main journal indexes and databases of relevance to this area include *Biological Abstracts, Compendex and Inspec, Elsevier Biobase, Medline (Ovid/Pubmed), Mental Measurements Yearbook, Primal Pictures, PsycARTICLES, PsycINFO, Scholars Portal, Scopus, and Web of Science.*

Electronic Books

YUL subscribes to *MIT CogNet*, an online location for the brain and cognitive science community's scientific research and interchange, which provides access to a comprehensive platform of resources from several fields, such as artificial intelligence, linguistics, neuroscience, psychology, philosophy and education.

Another significant collection of electronic books is *PsycBOOKS* which contains full text versions of thousands of scholarly titles published by the *American Psychological Association*. These electronic books are in a broad range of areas in psychology. An electronic version of the 8 volume Kazdin *Encyclopedia of Psychology* is also included in this product and is available through the eresources Quick Search box via the Libraries' homepage at www.library.yorku.ca

The Libraries also subscribe to numerous electronic books in neurosciences, psychology and biology through other content providers on a variety of platforms.

The Biochemisty, Biology, Kinesiology, Neuroscience, Psychology and other Health and Science Research Guides list all the important online resources (subscribed and free) for neuroscience and are available from:

http://researchguides.library.yorku.ca/biochemistry
http://researchguides.library.yorku.ca/biology
http://researchguides.library.yorku.ca/kinesiology
http://researchguides.library.yorku.ca/neuroscience
http://researchguides.library.yorku.ca/psychology

Theses & Dissertations

Should faculty and students require access to theses and dissertations, this is made primarily available through *ProQuest Dissertations and Theses* database which provides full-text access to North American and European dissertations. International theses can be located through the *Networked Digital Library of Theses and Dissertations* (NDLTD) and other portals. Links to several additional sources of dissertations are available through the Neuroscience Research guide under the Advanced Research tab. Theses that are not available in full-text can be requested through the Interlibrary loan system called RACER (Rapid Access to Collections by Electronic Requesting).

Access to Collections

The library home page at http://www.library.yorku.ca is the central starting point for accessing the range of resources and services York University Libraries have to offer. Electronic resources are linked from the Libraries' home page and from the catalogue and can be accessed from workstations within the Libraries or from off-site computers. An excellent collection of online indexes and e-journals, as well as access to the Libraries' catalogue is available for users around the clock. Facilities for printing, scanning and photocopying are available in the Libraries as options for saving to disk or sending as e-mail.

Scholars Portal is a suite of services and products offered through a partnership of Ontario College and University Libraries (OCUL). Originally a database of e-journals, Scholars Portal has evolved beyond full text electronic journal content to include numerous indexes and abstracts (now called *Scholars Portal Search*) with seamless linking from initial search to final results via the ***Find It @York*** feature. This feature enhances the speed and effectiveness of research by linking individual records to electronic full text. Following a search in a database such as *Biological Abstracts*, the search results now provide a link from each citation to the York Library catalogue. Clicking on the ***Find it @ York*** brings up a menu of viewing and downloading options available for the citation. These can include links to one or more versions of the electronic text when it is available, or links to abstracts or the table of contents for journal issues when full text is not available. An additional link to the York library catalogue determines whether the article is available in print, and finally a link to *RACER* permits ordering of articles not held at York.

Purchase requests

Collection development is an ongoing process and the Libraries are committed to developing library resources that are in alignment with the University's curricular and research activities. Students and faculty members are encouraged to suggest additional books and resources for library purchases. Please forward any requests for purchase by using the form at: https://www.library.yorku.ca/web/suggestion-for-purchase-form/

Interlibrary Loans/Resource Sharing and Off- Campus Resources

Students and faculty are not restricted to using only resources that are available at York. All students, both graduate and undergraduate, and faculty have access to the collections of other university libraries through the interlibrary loan system called *RACER* (Rapid Access to Collections by Electronic Requesting). Students and faculty may borrow monographs and request articles not available at York through *RACER,* free of charge. Articles are delivered to the requestor's e-mail.

Intercampus Borrowing

Because some of the collections extend over two campuses and since all students need easy access to materials, the Libraries provide an intercampus borrowing system at no charge. Students can submit a request online to have library materials delivered from one campus to the other by the following business day. Students can also use a free shuttle service to travel between campuses.

SUPPORTING TEACHING, LEARNING & RESEARCH SERVICES

Research Dissemination through Open Access Initiatives

York University Libraries have been generous in supporting the Open Access (OA) movement and encourage submissions to OA journals. York University Libraries have directed a part of their collections funds to support faculty and graduate students' publishing endeavours by paying the Article Processing Charges for select OA publishers. Some of the supported publishers include *BioMed Central*, *Hindawi*, *Public Library of Science (PLoS), BioOne*, and *Open Medicine*.

Faculty are invited to deposit their papers for publication in YorkSpace, York's institutional digital repository. The non-exclusive archiving of research in York's digital repository lends an institutional presence and increases York University's scholarly profile while protecting faculty/author rights and preserving the work for future use. For more information about Scholarly and Open Access Publishing, please see https://www.library.yorku.ca/web/research/.

Undergraduate students have an opportunity each year to present a poster on their original research at the York Undergraduate Research Fair. Now in its 8th year, this Fair provides a real-life opportunity for promising undergraduate students to take their research conducted within the framework of a credit course and written up as a research paper and turn it into a poster that makes their research accessible to the public. Pre-fair workshops are held for students on designing posters in their disciplines, organizing poster content, and presenting to an audience.

Abstracts of all accepted submissions as well as the complete work of award winners will be published in a student-led journal.

Specialized Liaison Librarians

Library support is provided primarily at the Steacie Science & Engineering Library, Bronfman Business Library, and Scott Library. Liaison librarians assist students and faculty with literature research, provide in-class workshops, develop research guides and help to manage and organize the research literature using citation management programs. Science students and faculty can get reference help during reference hours in person, via e-mail, by telephone, and through the Ask Chat Reference Service accessed from the Ask & Services tab on the library home page. In addition, the libraries provide research help by email, phone and in person.

Managing Research Results

The Libraries support faculty and students using *Mendeley* or *Zotero*, both web-based citation management programs, to store and format citations to books, journal articles and other scholarly resources.

Scholarly Publishing Services

York University Libraries provide an electronic journal hosting service for York-affiliated journals. This service is called *York Digital Journals* (YDJ) and uses *Open Journal Systems* (OJS), an open source software platform. The Digital Scholarship Infrastructure Department is happy to work with York community members to create new journals or migrate existing journals to an online environment. The Libraries provide training and troubleshooting help with the OJS software, as well as advice to ensure maximum exposure.

YorkSpace is York University's digital library of research outputs. It is a platform that enables York community members to post, organize and preserve their research online in an institutional context. It showcases the scholarship of the York University community through the use of a special standards-based software platform that collects usage statistics and promotes visibility on the web. The Faculty of Health has a growing number of research papers stored in *YorkSpace* that subsequently can be discovered using Google.

STUDENT LEARNING and ACADEMIC SUCCESS

The Student Learning and Academic Success Department of the Libraries advances a cohesive and coordinated approach to develop students' information and other academic literacies throughout academic programs at York. Student-centred learning requires learners to find, evaluate, interpret and apply information to solve problems and construct new meanings and is an essential component of students' education. The Libraries' information literacy programming empowers learners to use information critically to learn and to create new knowledge, cultivating academic, professional and personal success.

York University Libraries has a very active information literacy program supporting undergraduate and graduate students and faculty. Informed by information literacy scholarship,

we strive to embed and integrate information literacy principles and learning outcomes into curricular and co-curricular programs. Information literacy programming is most successful when developed through a progressive incremental building of skills that are strategically embedded at critical junctures throughout the program. Learned in the context of the discipline with its own distinctive research practices and scholarly culture, this coherent and scaffolded learning experience ensures students graduate with the skills and knowledge to be successful in their academic pursuits and in their future careers.

Information Literacy Support for Students

Information Literacy is an essential component of students' education. Without the skills to find, retrieve, evaluate and use information, students cannot participate fully in a university environment or in their disciplinary culture. Critical engagement with information is an integral component of scholarly discourse and fundamental when involving students in teaching and learning.

Increasingly, programs at York University are developing curriculum-integrated approaches to information literacy (IL). This is a process whereby IL instruction and principles are embedded throughout an entire degree program by a progressive incremental building of IL skills. More students are reached as IL instruction is embedded strategically at critical junctures throughout the program, making it accessible to all students through a scaffolded approach.

The benefits of this are that library research skills (and information literacy) are learned in the context of the discipline with its own research practices and scholarly culture. This kind of coherent and graduated learning experience has been shown to improve retention and ensure that we graduate students who have the tools and knowledge to remain current and knowledgeable in their fields by easily following and incorporating developments and changes as they arise. This is more meaningful in that it prepares students for challenges they will actually face in their programs and their future careers.

If this were implemented in Neuroscience, the assigned librarian will be available to work with faculty members and curriculum committees to:

- articulate learning objectives related to information literacy,
- decipher how they might be mapped strategically into programs or courses, and
- co-design and implement assignments that hone and assess discipline-specific IL skills.

As an example, some of the core courses that might be considered for IL integration are those that are newly proposed for the program:

NRSC 1001 1.00 *Frontiers of Neuroscience*

IL instruction could include: (1) articulating research questions; (2) Using Web of Science and SCOPUS to identify key researchers in areas of neuroscience; (3) developing keyword search strategies and applying them to each database recognizing that each has its own syntax and features; (4) evaluating search results for use, recognizing that every genre has associated audiences and purposes; (5) managing and saving search results and references using

bibliographic management software such as Mendeley; (6) using information and citing one's sources using citation styles specific to the Health Literature.

NRSC 2000 3.00 *Fundamental Molecular and Cellular Neuroscience*

IL instruction could include: (1) introduction to the tools of neuroanatomy; (2) learning to use Medline and its advanced features such as the MeSH thesaurus, subheadings, and limits in the context of course assignments for searching the Biomedical literature; (3) how to search for neuroscience media articles; (4) evaluate sources for accuracy and relevance

NRSC 2100 3.00 *Systems, behavioral and cognitive neuroscience*

IL instruction could include: (1) introduction to the tools of neuroanatomy; (2) searching PsycINFO

Information literacy is particularly important for graduating students who are proficient in navigating the health information landscape. For this program which will be graduating students who are likely to continue in graduate and professional programs, equipping them with the skills required for academic success will give them an edge in these competitive markets.

CONCLUSION

Library support for the *Bachelor of Science Specialized Honours Degree in Neuroscience* is extensive and covers all aspects from collections, through access, to user assistance. This support stems from collaborations between the Libraries and faculty members and the student community. In reviewing the descriptions of the courses and programs that are offered in neuroscience, it is evident that the collections are well equipped to support the courses in this program. Collection development in the library is ongoing, and is based on a commitment to developing library resources that are in alignment with the University's curricular and research activities. Access to resources has been a focus of the libraries for a number of years, and has led to increases in collaborative initiatives such as RACER for interlibrary loans and document delivery, and Scholars Portal for a collaborative information gateway of software and resources, to name a few. Developments in these areas are also ongoing with a focus on improving desktop access for faculty and students. Finally, the library is committed to providing instructional and reference support to assist students and faculty with information needs that arise in the contexts of teaching, learning and research. York University Libraries look forward to maintaining these important working relationships so that the Libraries have the resources in place to support the Faculty of Health's plans for growth and diversification, as new courses and programs are introduced, and new faculty are appointed.

In summary, we contend that York University Libraries are well positioned to support the Bachelor of Science Specialized Honours Degree in Neuroscience, Faculty of Health at York University.

Sincerely,

Ilo-Katryn Maimets (Health and Science Librarian)
Rajiv Nariani (Health and Science Librarian)
Amy Poon (Health and Science Librarian)
Steacie Science and Engineering Library

Appendix 1: York University Libraries Annual Statistics 2016-17

CIRCULATION	2014/2015	2015/2016	2016/2017
Scott			
Circulation Services	60, 572	65,512	60,000
Reserves	29,823	27,532	16,931
Self Check	109,078	89,268	74,178
Total	**138,901**	**182,312**	**151,109**
Sound and Moving Image Library			
Circulation	22,468	17,523	14,691
Reserves	217	250	132
Total	**22,685**	**17,773**	**14,823**
Archives & Special Collections	3,337	2,828	2,815
Map Library			
Circulation	227	326	351
Reserves	223	116	147
GIS	325	1,451	591
Total	**775**	**1,893**	**1,089**
Bronfman			
Circulation	4,130	4,573	4,762
Reserves	5,681	5,128	4,067
Total	**9,811**	**9,701**	**8,829**
Frost			
Circulation	17,622	17,534	17,630
Reserves	1,990	1,906	1,709
Total	**19,448**	**19,440**	**19,339**
Steacie			
Circulation	9,662	6,991	7,335
Reserves	20,169	17,719	11,816
Self check	8,031	6,268	5,074
Total	**34,565**	**30,978**	**24,225**
Total Circulation	**268,029**	**212,274**	**187,427**
Total Reserves	**58,103**	**52,651**	**34,802**
Total Item Circulation	**326,132**	**264,925**	**222,229**
Renewals	299,835	236,535	206,389
Total Transactions	**625,967**	**501,460**	**428,618**
Nellie Rowell Langford Library	988	1058	919
Education Resource Centre	11,656	704	1013

USE OF ERESOURCES	2013/2014	2015/2016	2016/2017
Number of successful fulltext article re	3,469,115	3,258,533	3,658,345
Number of database searches	21,373,886	27,317,313	20,697,352

LAPTOP LENDING	2014/2015	2015/2016	2016/2017
Scott	1,251	3,866	4,971
Bronfman	182	286	676
Frost	478	494	895
Steacie	148	893	1,372
Total	**2,059**	**5,539**	**7,914**

Appendix 1: York University Libraries Annual Statistics 2016-17

ITEMS SHELVED	2014/2015	2015/2016	2016/2017
Scott			
Circulation	365,085	361,225	312,315
Government Documents	4,131	2,225	1,430
Microtext	13,839	11,669	12,610
Reference	530	595	150
Reserves	1,511	2,705	680
Map Library	2,320	2,354	2,354
Archives & Special Collections	6,026	2,828	2,815
Bronfman	14,441	13,974	14,480
Frost	32,337	28,285	24,709
Steacie	23,188	22,166	19,748
Total	**463,408**	**448,026**	**391,291**

COLLECTION GROWTH	As of 30-Apr-15	As of 30-Apr-16	As of 30-Apr-17
Print Volumes	2,714,182	2,398,271	2,417,989
Microform Units	4,271,143	4,359,357	4,232,805
Journal Titles/Other Subscriptions	3,765	3,860	3,579
Digital Journal Titles	43,514	43,514	44,830
Digital Monograph Titles	774,904	802,311	1,289,510
Media			
Maps	139,779	139,849	140,044
Aerial Photographs	5,051	5,051	5,051
GIS Data titles	701	703	707
Sound Recordings	50,130	51,768	52,287
Videocassettes	8,688	8057	8069
Films	2679	2,679	2,679
DVDs	24,524	25,328	23,374
Manuscripts and Archives			
Manuscripts (Linear metres)	4,683	4,795	4,858
University Records (Linear metres)	965	1,016	1,143
Photographs (Linear metres)	399	401	401
Moving Image Archives (Linear metres)	89,087	89,102	89,138
Born Digital Archives	214.6	4,386	4,578
Titles Catalogued	**84,577**	**114,869**	**53,405**

DIGITAL COLLECTIONS @ York	2014/2015	2015/2016	2016/2017
Digital Items Created	13,897	18,647	8,316*
Total Digital Items	105,591	124,238	132,554

*changes in metadata required before uploading of scanned items. Large upload expected in 2017-18.

Appendix 1: York University Libraries Annual Statistics 2016-17

RESOURCE SHARING		2014/2015	2015/2016	2016/2017
ILL, Interfilm	**Total Lending**	8,156	8,016	7,764
ILL, Interfilm	**Total Borrowing**	4,504	4,077	3,613

REFERENCE SERVICES	2014/2015	2015/2016	2016/2017
Scott			
Information Desk			
Reference	8,422	11,603	12,089
Other	10,240	3,877	9,792
Total Transactions	18,662	15,480	21,881
Scott Reference			
Reference	6,634	6,783	6,225
Other	1,526	946	2,774
Total Transactions	8,160	7,729	8,999
Sound and Moving Image			
Reference	83	N/A	555
Other	719	N/A	633
Total Transactions	802	N/A	1,188
Map Library			
Reference	379	553	587
Other	1,008	686	784
Total Transactions	1,387	1,239	1,371
Archives & Special Collections			
New Users	67	35	49
Returning users	253	127	213
Total Users	320	162	262
Bronfman			
Reference	4,855	7,316	5,894
Other	10,975	4,301	3,270
Total Transactions	15,830	11,617	9,164
Steacie			
Reference	2,947	5,083	4,161
Other	7,928	6,710	6,568
Total Transactions	10,875	11,793	10,729
Frost			
Reference	1,509	3,145	3,925
Other	2,485	1,110	3,314
Total Transactions	3,994	4,255	7,239
Total Reference	**25,149**	**34,645**	**33,698**
All Transactions	**60,030**	**52,275**	**60,833**
Virtual Reference	**2,742**	**2,602**	**1,950**

Appendix 1: York University Libraries Annual Statistics 2016-17

LIBRARY INSTRUCTION	2013/2014		2015/2016		2016/2017	
	Classes	Participants	Classes	Participants	Classes	Participants
Archives	28	590	19	125	33	547
Bronfman	101	4,287	92	4,512	116	5,594
Frost	79	1,699	77	1,848	50	1,113
Maps	22	1,108	22	624	18	469
Scott	310	11,306	290	10,872	251	10,699
Steacie	104	4,145	128	3,423	99	4,266
Total	**644**	**23,135**	**628**	**21,404**	**567**	**22,688**

LIBRARY ACCESSIBILITY SERVICES	2014/2015	2015/2016	2016/2017
Total Texts Provided	1,730	2571	2887

STUDY SEATS	2014/2015	2015/2016	2016/2017
Scott	2,108	2,108	**2,108**
Bronfman	321	321	**321**
Frost	247	247	**247**
Steacie	337	337	**337**
Total	**3,013**	**3,013**	**3,013**

Turnstile Count	2014/2015	2015/2016	2016/2017
Scott	2,262,666	2,209,087	2,136,478
Bronfman	292,726	275,211	287,526
Frost	83,737	89,261	82,821
Steacie	128,472	289,398	276,109
Total	**2,767,601**	**2,862,957**	**2,782,934**

OPERATING BUDGET	2014/2015	2015/2016	2016/2017
Salaries	$ 11,426,013	$ 11,564,144	$ 11,711,207
Part Time Assistance	$ 875,189	$ 715,435	$ 734,578
Benefits	$ 2,684,614	$ 2,747,151	$ 3,115,743
Subtotal	**$ 14,985,816**	**$ 15,026,730**	**$ 15,561,528**
Collections	$ 9,989,296	$ 11,684,041	$ 11,746,068
Binding	$ 46,527	$ 56,107	$ 46,650
Subtotal	**$ 10,035,823**	**$ 11,740,148**	**$ 11,792,718**
General operating	$ 1,869,197	$ 1,850,577	$ 1,772,805
Total Expenses	$ 26,854,658	$ 28,617,454	$ 29,127,051
Recovery	-$ 790,731	-$ 806,852	-$ 644,437
Total Expenses less recovery	**$ 26,063,928**	**$ 27,810,602**	**$ 28,482,614**
Gifts in Kind	$ 704,842	$ 358,900	$ 1,825,253

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DIVISION OF STUDENTS

Office of the University Registrar

Lucy Bellissimo
Interim University Registrar

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roinfo@yorku.ca

March 5, 2019

To: Academic Standards, Curriculum and Pedagogy Committee

RE: Proposed B.Sc. Sp. Hons. Neuroscience

The proposal for the establishment of a Specialized Honours, Bachelor of Science program in Neuroscience by the Faculty of Science and the Faculty of Health has been reviewed by the Office of the University Registrar.

I am supportive of the proposed program and look forward to collaborating with both Faculties to work through the implementation details in support of their requirements for admission and progression. I can also confirm that the requested program subject rubric of "NRSC" used in the proposal is available for use of the program and courses.

Sincerely,

L Bellissimo

Lucy Bellissimo, M.Ed.
Interim University Registrar
York University

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October 22, 2018

Dear Professor Murtha,

University Information Technology (UIT) is committed to the support of eLearning for the academic community and supports many technologies that underpin those efforts, include Moodle as York's primary learning management system. Within Moodle, a wide array of tools are made available to support pedagogical needs for information delivery, communications between course participants, assessment, collaboration and others. Additionally, within UIT Learning Technology Services (LTS) provides primary support to courses and instructors within the Faculty of Health.

With these supports in place I'm happy to confirm UIT support for the following course proposals:
Frontiers of Neuroscience
Fundamental Molecular and Cellular Neuroscience
Systems, Behavioral and Cognitive Neuroscience
Neuroscience Techniques
Molecular and Cellular Basis of Perception and Cognition
Neuroscience Capstone Experience

Support for many of course requirements which require technology can be found within the Moodle LMS, including delivery of course content (with videos and simulations), assignment submission, discussion, reflection and assessment activities, peer review, and knowledge construction through Wikis. These and other activities to support student-to-student and student-to-course instructor interaction are all within the scope of the support UIT provides as are support for lecture capture and timely feedback with iClicker..

I wish you well on your proposal for this exciting and engaging set of courses.

Sincerely,

Rob Finlayson

Manager, Learning Technology Services
University Information Technology