PSCB90H3 Physical Sciences Research Experience – Fall 2022

This course provides an opportunity for students to work with a faculty member and carry out original research. Students will provide assistance with one of the faculty member's research projects, while also earning credit. Students will gain first-hand exposure to current research methods, and share in the excitement of discovery of knowledge acquisition. Progress will be monitored by regular meetings with the faculty member and through a reflective journal. Final results will be presented in a written report and/or a presentation at the end of the term. Approximately 120 hours of work is expected for the course.

Prerequisite: Permission of the Course Coordinator (Dr. Effie Sauer, effie.sauer@utoronto.ca)

Recommended Preparation: Completion of at least 4.0 credits in a relevant discipline.

Breadth Requirements: Natural Sciences

Link to UTSC Timetable: https://utsc.calendar.utoronto.ca/section/physical-sciences

Note: Students must send an application to the course Coordinator (Dr. Effie Sauer, effie.sauer@utoronto.ca) for admission into this course. Applications must be received by the **end of August for Fall enrolment**, December 15th for Winter enrolment, and April 30th for Summer enrolment. Typically, students enrolled in a program offered by the Department of Physical and Environmental Sciences and students who have a CGPA of at least 2.5 or higher are granted admission. Approved students will receive a signed course enrolment form to be submitted to the Office of the Registrar.

Applications must include:

1) A letter of intent indicating the student's wish to enroll in the course
2) A list of preferred projects, ranked in order of preference (see project descriptions below)
3) A list of relevant courses successfully completed by the student, their grades, as well as any relevant courses to be taken during the upcoming semester
4) Any additional materials requested by the project supervisor (see below)

Project 1 (Chemistry)

Supervisor: Prof. Shadi Dalili (sdalili@utsc.utoronto.ca)

Title: Developing New Tutorial Material for CHMB41H

Project Description: Students involved in this project will be expected to develop new tutorial worksheets and quizzes based on current CHMB41H course content, using reputable scientific resources and textbooks. Students in this placement will work with the course instructor to select appropriate questions and exercises from the chemistry education literature, textbooks, and online resources to prepare tutorial material and quizzes, along with demonstrator notes. Students will learn skills such as literature searching and analysis, and proper design of problem sets and questionnaires. Students will also develop written scientific and communication skills through developing problem sets, quizzes, and TA documents for each tutorial section.

Qualifications: Completion of CHMB42 with a minimum course grade of B+.

Number of Positions: 1-2 students

Additional Application Instructions: Please send updated resume and transcript to sh.dalili@utoronto.ca

Project 2 (Chemistry)

Supervisor: Prof. Shadi Dalili (sdalili@utsc.utoronto.ca)

Title: Developing New Lab Material for CHMB41H

Project Description: Students involved in this project will be expected to develop and modify new laboratory experiments for Introductory Organic Chemistry I (CHMB41H). Students will work with the course instructor to select new experiments from the chemistry education literature, test the experiments, and prepare accompanying lab manual instructions and demonstrator notes. Students will learn skills such as literature searching and analysis, and utilize essential lab techniques such as extraction, distillation, recrystallization, reflux, etc. to develop new labs for the course. Students will also develop written scientific and communication skills through preparing lab manual writeups, quizzes, and TA documents for each experiment developed.

Qualifications: Completion of CHMB42 with a minimum course grade of B+ and lab grade of A.

Number of Positions: 1-2 students

Additional Application Instructions: Please send updated resume and transcript to sh.dalili@utoronto.ca

Project 3 (Chemistry)

Supervisor: Prof. Effie Sauer (effie.sauer@utoronto.ca)

Title: Development of New Laboratory Experiments for CHMB42

Project Description: Students involved in this project will work closely with the faculty supervisor to research, test and troubleshoot new experiments for use in Organic Chemistry II (CHMB42). New experiments will be evaluated for safety, reliability, and alignment with key course topics. In addition to testing and troubleshooting the experiments, students will participate in the development of accompanying lab materials including lab manual pages, demonstrator notes and quiz questions.

Qualifications: Completion of CHMB42 with a minimum course grade of B+ and minimum lab grade of A.

Number of Positions: 1-2 students

Project 4 (Chemistry)

Supervisor: Prof. Effie Sauer (effie.sauer@utoronto.ca)

Title: Development of Online Learning Aids for CHMB42

Project Description: The student involved in this project will work closely with the course instructor to prepare online resources to support student learning in Organic Chemistry. In particular, three sets of online practice tests will be created, one for each term test and another for the final exam. These quizzes will be designed to help students practice answering questions which are pulled from various topics in the course (a notable challenge for many students). Online quiz questions will be drafted to include feedback for wrong answers. Time permitting, the students will also be involved in the creation of online modules to support students in writing up their formal lab reports.

Qualifications: Completion of CHMB42 with a minimum course grade of A-.

Number of Positions: 1 student

Project 5 (Chemistry)

Supervisor: Dr. Nirusha Thavarajah (nirusha.thavarajah@utoronto.ca)

Title: Development of New Lab Materials for Introductory Chemistry II (CHMA11)

Project Description: Students will develop new lab materials based on the existing CHMA11 content, textbooks and other reliable resources. Students will work with the instructor to develop the lab manual, lab work sheets, quizzes, and lab demonstrator notes.

Learning Skills: Literature searching, critical thinking, problem solving & scientific writing skills.

Qualifications: Completion of CHMB42 with a minimum course grade of B+. Please send updated CV & transcript to nirusha.thavarajah@utoronto.ca.

Number of Positions: 2 students

Project 6 (Interdisciplinary)

Supervisor: Dr. Nirusha Thavarajah (nirusha.thavarajah@utoronto.ca)

Title: Sustainable Agriculture: An Interdisciplinary and International Experiential Learning Project

Project Description: The purpose of this project is for UTSC chemistry students enrolled in PSCB90H and students enrolled in a management course (MGHC23 or MGHC53) to engage in an international work-integrated learning (WIL) group project with faculty, students, and community partners from Sri Lanka and India to solve their current crisis in farming. This is a real-time crisis-management work-integrated experiential-learning team project for students. Interdisciplinary teams will collaborate to develop sustainable solutions to problems in farming using knowledge and skills gained from chemistry and human resource management curricula respectively. UTSC students will also work with a domestic community partner (i.e., Training in the Association for the Study of Medical Education's (TASME) Women in STEM Leadership Program, a Toronto-based non-profit organization), international institutional partners (i.e., Eastern Universities of Sri Lanka and a USA-based non-profit organization, Care for Education) to build relations with the local Sri Lankan and Indian farming community.

Learning Skills: Literature searching, critical thinking, problem solving & scientific writing skills.

Qualifications: Completion of CHMB42 with a minimum course grade of B+. Please send updated CV & transcript to nirusha.thavarajah@utoronto.ca.

Number of Positions: 2 students