Students admitted to the Research Opportunity Programs must fulfil all program requirements as established at the beginning of the 299Y/399Y course. The purpose of this contract is to clarify your responsibilities and the responsibilities of your supervisor in ENV299 and ENV399.

**STUDENT'S NAME**

**SUPERVISOR'S NAME** Brad Bass

**DEPARTMENT** School of the Environment

**STUDENT NUMBER**

**PROJECT NUMBER**

**NUMBER OF HOURS PER WEEK REQUIRED:** 8 - 10 hrs/week (240 hours maximum)

**Course description**

Complexity is an interdisciplinary concern that emerges in every field with interactions between system components as they cope with a change in the gradient of energy or information. The nature of these interactions is often quite simple, but the patterns that emerge in system behaviour can be quite unexpected. The emergence of specific patterns is hard to predict, but software such as COBWEB allows us to represent the system by representing the behaviour and interactions of individual components. To learn about complexity across multiple disciplines requires us to encourage dialogue and collaboration between students in the natural sciences, social sciences, and the humanities. The models that you develop will also be your virtual laboratory, your experimental platform and a visualization of your system. Conducting actual experiments with your systems is costly, time consuming and in some cases not even possible. Although many of you will not be able to tell me if your model could reproduce an actual system outcome, you will be able to know if you are representing the dynamics of your system. With sufficient experiments, we can extract signals from the noise in many cases, but in others, these models are a very practical means to learn about systems behaviour in light of changing gradients.

Models that can act as virtual labs will be a vital tool in medicine, public policy, economics, ecology and other areas. These models will provide the first, quick answer to the question “What if?” and will provide the answer at no cost. Your future career may involve making or advising on decisions or proposing changes to policy and practice in your field. To be effective as professional in your field, they must know how to answer that “What if” question on the fly, within ranges of uncertainty and with some confidence that you do understand how your system will respond to interventions.

ENV299 and ENV399 are designed as a practical introduction to research in complexity across multiple disciplines. Even though the connections might not seem obvious to you now, these multiple disciplines give us an understanding of the complexity of the environment and how changes to our environment will affect our health and well-being at different scales. More
specifically, it aims to familiarize you with the methods and techniques used in research, allow you to develop a basic set of skills to write proposals, literature reviews, develop and conduct experiments, work with other professionals from a myriad of disciplines and communicate results to suitable audiences. The course is inspired by a philosophy of “learning by doing” and collaboration. The main topics discussed include: understanding and explaining modelling, subject selection and the formulation of a research question, using the literature including articles outside of your expertise, design thinking - translating systems into the language of models, model development and assessment, and communication skills in different media. The course consists primarily of working meetings, modelling complexity, designing and completing a large, multipart research project, enhanced by active-learning activities in mentoring, teamwork and communication. By the end of the course, you will have the confidence to generate, evaluate, and communicate reliable and relevant information, either individually, as part of team or as a team leader.

Learning Objectives
This course will allow students to develop basic skills that will enable them to locate and critically assess existing research, design a model of their system to answer a question, conduct and report on a complex research project on a complex system involving modelling, experimentation and analysis. More concretely, by the end of the course students should be able to:

• Understand how to develop a testable research question that can guide research.
• Communicate the basics of modelling.
• Design a research project.
• Identify available information and a suitable means for model development
• Synthesizing the available research literature
• Translate a system into model components.
• Conduct experiments with a model.
• Communicate research results effectively through different forms (orally, written and visually).
• Develop the ability to work collaboratively with a partner or a research team.
• Develop strong writing skills.
• Mentorship and training.

COURSE REQUIREMENTS
1. Journal - or another mode of documentation of progress agreed upon with the professor
2. Meetings - weekly with ROP supervisor, and record dates and times in the journal.
3. Attend any demonstrations, orientations, etc., that the supervisor may require. Special modules focused on bibliographic searching and citation practices, accessing the map and data library, and developing archival research skills are available at Robarts Library, upon request of faculty supervisors.
4. The supervisor will complete a written assessment of the student’s progress and discuss it with the student BEFORE THE DEADLINE FOR DROPPING COURSES WITHOUT PENALTY.
5. Students will participate in the Spring 299Y/399Y Undergraduate Research Forum

MEANS OF EVALUATION and MARKING SCHEME (Please describe for both terms the various means of evaluating student progress and providing feedback in relation to the research project; include specifically the role of the faculty supervisor in this evaluation, aassignments with weight and due date; no ONE assignment may be worth more than 50%).
Note on modelling software: Most of you will conduct your research with the COBWEB (Complexity and Organized Behaviour Within Environmental Bounds) software. It is hosted in the Gerstein Library and has a long history of use in this ROP as well as by other students outside of the ROP.

Note on grading of group work: You will receive a grade for your literature review, poster and final report. Each member of the research team will receive the same grade unless you have not met your commitments to your partner(s). Students who fail to fulfill their commitments with fellow group members will receive a lower grade; group members whose contributions to the project are outstanding will have points added accordingly. There are sufficient opportunities for observation to make his assessment. This discretionary component will be determined at the end of the course; these are not simply bonus points and will be applied at my discretion. Please note that severe lack of participation in group work may lead to an individual zero grade on the group project and, as such, likely a failing grade for the course. The modeling lab will be available to you on Mondays from 5:00 – 6:30/7:00 and Thursdays after 5:00 PM.

| Journal and/or documentation of research process | 10% |
| Participation in weekly meetings includes attendance and discussion of research ideas. | 10% |
| Two-page Startup Guide (October 25th 2019) | 10% |
| Literature Review and proposal based on Annotated Bibliography (December 6th, 2018) | 20% |
| Lit Review will be returned with comments. Revised Literature Review (January 29th, 2019) | 5% |
| Spring 299Y/399Y Undergraduate Research Poster (shared posters) March 20th 2020 | 5% |
| COBWEB Guide (will be Appendix to Final Report) Due last class meeting | 10% |
| Final Report/Code documentation, First Draft (March 25th 2020) | 25% |
| Report will be returned with comments. Revised Final Report (April 17th 2020) | 5% |

COURSE POLICIES AND STUDENT RESPONSABILITIES
Lectures and classroom policies
• Punctuality: Our meetings will start on time (i.e., 5:10 PM). If you have to come into class late, please do so in the least disruptive manner possible. As a sign of respect to the instructor and the rest of the class, please let the instructor know if you need to arrive late.
• Attendance: Students are expected to come to class meetings. Attendance will be noted. Meetings typically last until 6:30. Please let the instructor know if you have to depart early.
• Class preparation and student participation: Physical presence in the lab is not sufficient. Students are expected to engage in the course, work outside of the meetings and be prepared to participate in discussions and provide help to others. I want this class to foster an environment that encourages student participation and questions. Student participation in class and in-class activities counts towards your evaluation.
• Course manners: Students are expected to handle themselves with respect toward the instructor, peer assistants, and your peers in all matters related to the course, including participation in class, group work, student presentations, communications regarding course content or evaluation, and assisting other students.

• Etiquette regarding the use of computers and other electronic devices: The use of your own computers and other electronic devices in the lab is allowed and most student have used their own computers in this ROP. Phones ringing, earphones, web surfing, watching unrelated videos and texting are disruptive to your peers and the instructor. As such, they are unacceptable.

Written assignments
• Formatting: Coursework must be word processed double-spaced, 12 point font size, unless otherwise noted. Assignments must be proofread prior to submission to insure that they are free of grammatical and spelling errors, and must include a list of all references cited in the text, using the APA citation style (see “UofT Libraries Research Services” link in the resources section below). All coursework must also include the student’s name and the last 5 digits of your ID number, the course’s code and name and that of the instructor in order to avoid loss or improper identification. Note, however, that there is no need to use cover page to do so.

Submission guidelines:
• Submission guidelines: All assignments must be submitted electronically through Quercus by 11:59 PM on the date specified by the instructor, unless otherwise noted. It is recommended that you keep copies of your assignments and early drafts until you receive your graded assignment.

• Late submissions: Work submitted late will be accepted with a 5% daily penalty (including weekend days), up to seven days after the due date. If needed, you may submit your assignment during the weekend as a way to minimize late penalties. In such cases, the date/time of submission will be considered, using 11:59 PM as time of reference. In case of an outstanding valid situation you must contact me, preferably in advance. I cannot consider a particular situation unless I know about it, so do not wait until the end of the term to communicate with me if something did come up. For health reasons, a completed University of Toronto Verification of Student Illness or Injury form must be submitted (http://www.illnessverification.utoronto.ca/); other proof may be required by the instructor for nonmedical reasons (see general guidelines and form put together by FAS available at: http://www.artsci.utoronto.ca/current/petitions/process#documentation ). The required form must be submitted within a week of the missed deadline. No extensions will be granted unless you have communicated with the instructor and your reasons have been deemed valid.

Communication with the instructor
My preference is to meet with you in person. I will grant some unusual access if necessary, but I ask you to be flexible if you do need to speak with me. I have a lot of interest in new communication technologies, and I am willing to learn from you in this respect. I will make myself available for you on Monday evenings, in the modeling lab at the Gerstein Library. For work on modeling, you will have access to the lab and to assistance at 5:00 PM, but might not have access for other issues until 6:30 PM. For urgent matters or simple questions, you may also contact me via email, but the rule of thumb is that email should not be a substitute for
lab meetings. I will make an effort to respond to you within 48 hours. I am not on campus full time, but you will find that I am very committed to your success and your ability to complete your research.

Email
Please make sure to use your University of Toronto email account (i.e., @mail.utoronto.ca). I will accept email from other e-mail addresses, but they may be filtered as spam and thus I may be unable to respond to them. If you have to use another another email account, that is not readily identifiable to your name, let me know when you need to do this, and I will look out for your message. I will be sending you messages from my utoronto account and my cobweb.ca account.

Quercus
A Quercus site has been set for this course. I will use the site to post, additional readings, assignments and other useful materials. Quercus will also be used by the instructor to communicate with the class. Please make sure to check it regularly. To access the ENV299 and 599 Quercus, go to the UofT login page at: https://q.utoronto.ca/ and login using your UTORid and password. Once you have logged in, click on the Dashboard module on the right margin of your screen. You will then be able to see the tab for ENV223 course (along with all your other Quercus-based courses).

Accessibility Needs
Accessibility Needs: The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible: disability.services@utoronto.ca or http://studentlife.utoronto.ca/as You may also want to contact Accessibility Services Office if you have problems arising from chronic issues or injuries sustained during the term that affect your ability to do tests or course work.

Academic integrity
Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves. Familiarize yourself with the University of Toronto’s Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm) It is the rule book for academic behaviour at the U of T, and you are expected to know the rules. Potential offences include, but are not limited to:
In papers and assignments:
- Using someone else’s ideas or words without appropriate acknowledgement
- Copying material word-for-word from a source (including lecture and study group notes) and not placing the words within quotation marks
- Submitting your own work in more than one course without the permission of the instructor
- Making up sources or facts
- Including references to sources that you did not use
- Obtaining or providing unauthorized assistance on any assignment including:
  - working in groups on assignments that are supposed to be individual work
- having someone rewrite or add material to your work while “editing”
- Lending your work to a classmate who submits it as his/her own

Misrepresentation:
- Falsifying or altering any documentation required by the University, including doctor’s notes
- Falsifying institutional documents or grades
Please note that potential offences will be addressed in accordance with institutional procedures.

Useful UofT Resources

UofT Libraries
- Library Catalogue (search for books, journal articles, documents, databases):
  http://search1.library.utoronto.ca/UTL/search.jsp
- Research services for students (e.g., research guides, citation resources, refworks, etc.):
  https://onesearch.library.utoronto.ca/research

UofT Writing (for advice on: planning and organizing, reading and researching, using sources, types of writing, style and editing and English as a second language):
- http://advice.writing.utoronto.ca/ ; http://writing.utoronto.ca/support/english-language-support/

Evaluation criteria for written work
The primary criteria used in evaluating written work are the following:
1. Mechanics: Your work must be completely free of grammatical and spelling errors. Students are expected to include thorough, accurate and consistent references in an established academic referencing style that includes page numbering.
2. Writing style: Your papers should be written in a clear, concise and unambiguous style, which assists, rather than impedes, communication with the reader.
3. Structure: Defined as coherence of the organization of the paper. The logic of the structure is determined by the purpose, which is to test a hypothesis, answer a research question or defend a thesis statement.
4. Precision and accuracy: Precision means saying exactly and specifically what you mean, avoiding vague generalities. Accuracy refers to absence of major factual errors.
5. Analysis: Student essays are expected to include critical distance, reflection and originality of thought.

Evaluation criteria for poster presentations
The primary criteria used in evaluating presentations are the following:
1. Success in communicating key concepts succinctly and accurately, thereby demonstrating sound understanding of the work being presented, both in the poster and orally.
2. Mechanics of communication, such as manner of speaking (including good diction and tone), structure of the poster and level of organization, neatness, effective use of color and visuals and proper referencing.
3. Ability to respond appropriately and fairly to questions.