Introduction

What will we study?
This course will introduce students to the many dynamic geological processes that shape the Earth and its environments. The course begins with an examination of the composition of the Earth, plate tectonics, earthquakes and volcanism.

Students will learn the principles of mineral and rock identification, Earth movement and structure, and relative and absolute determination of geologic time. We will also explore surface processes connected with rivers, glaciers, and coastal environments and their impact on human populations and activities. The course is richly illustrated with both local and ‘global’ case studies and environmental applications.

Skills Development
Students will gain rock and mineral identification skills in both field and lab settings and will learn how to visualize and interpret 3-dimensional geologic structures. Topographic map reading skills will also be introduced and are required for labs involving topographic feature identification and interpretation. Students will gain valuable field skills in geological observation, recording, and interpretation through 2 field-based labs: geologic field work on campus and a hydrologic investigation at the Dundas Valley Conservation Area.

Textbooks
3. Mineral Kit – Available at Campus Store
Lectures
Lectures will occur on Tuesday, Wednesday and Friday (9:30-10:20) in CNH 104. All students are expected to attend all lectures. Lectures will be made available on Avenue. **It is the responsibility of the student to ensure that notes are obtained for any classes missed.**

Labs
Attendance at labs is mandatory, and you must attend the section assigned to you by the Registrar’s Office. Students who miss lab without appropriate documentation (ex. MSAF) will not be allowed to complete the lab.

Submitted Assignments will need to include ALL of the following information: name, student ID number, course name and number (i.e. Envir Sc 1G03), assignment number (e.g. Lab 1), name of your Teaching Assistant (TA), Lab section number or day/time of your lab section, and date. Assignments submitted without this information will be penalized; 10% of the mark obtained will be subtracted. No late assignments will be accepted.

Avenue Information ([http://avenue.mcmaster.ca](http://avenue.mcmaster.ca))
Avenue is an online system that will be used in this class for communicating information relating to the course (e.g. previous years’ tests and exams, field trip arrangements, quiz instructions, lab preparation etc.). Quizzes will be completed on Avenue. To log into Avenue, use your MUGSI login and password. See the Avenue homepage address above for more instructions if you need them. **You are required to log on to Avenue at least twice a week for course updates.**

If you encounter any technical problems with this service go to the following website for support: [http://avenue.mcmaster.ca/help/](http://avenue.mcmaster.ca/help/).

_Evaluation_
<table>
<thead>
<tr>
<th>Labs (4 @ 2.5%, 5 @ 5%)</th>
<th>35%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm (2 @ 15%)</td>
<td>30% (January 31, March 7)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
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</tbody>
</table>

Please note that it is not the responsibility of the teaching staff of EARTH SC / ENVIR SC 1G03 to assist you with Avenue issues.
# Earth Sc / Envir Sc 1G03
## Lecture and Lab Schedule 2017

<table>
<thead>
<tr>
<th>Week of:</th>
<th>Week-day</th>
<th>Lecture Topics</th>
<th>Labs, Quizzes, and Field Trips</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 2nd</td>
<td>Tu, We,</td>
<td>Introduction to Course</td>
<td>No labs</td>
<td>Chapter 2</td>
</tr>
<tr>
<td></td>
<td>Fri</td>
<td>Plate Tectonics I</td>
<td><strong>AIR QUIZ</strong> — due by Friday, January 20th at 4:30pm</td>
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<tr>
<td></td>
<td></td>
<td>Plate Tectonics II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan. 9th</td>
<td>Tu, We,</td>
<td>Plate Tectonics III</td>
<td>No labs</td>
<td>Chapters 2, 3</td>
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<tr>
<td></td>
<td>Fri</td>
<td>Plate Tectonics IV</td>
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<td></td>
<td></td>
<td><em>Lab 1 Intro: Mineral ID</em></td>
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<tr>
<td>Jan. 16th</td>
<td>Tu, We,</td>
<td><em>Lab 2 Intro: Igneous Rocks</em></td>
<td><strong>Lab 1: Mineral ID</strong> — due at the end of your lab period</td>
<td>Interlude A</td>
</tr>
<tr>
<td></td>
<td>Fri</td>
<td>Igneous Rocks and Volcanoes I</td>
<td></td>
<td>Chapters 4, 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Volcanoes II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan. 23rd</td>
<td>Tu, We,</td>
<td>Earthquakes I</td>
<td><strong>Lab 2: Igneous Rock ID</strong> — due at the end of your lab period</td>
<td>Interlude B</td>
</tr>
<tr>
<td></td>
<td>Fri</td>
<td><em>Lab 3 Intro: Sedimentary Rocks</em></td>
<td></td>
<td>Chapters 6, 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Midterm Review</strong></td>
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</tr>
<tr>
<td>Jan. 30th</td>
<td>Tu, We,</td>
<td>MIDTERM 1</td>
<td><strong>Lab 3: Sedimentary Rock ID</strong> — due at the end of your lab period</td>
<td>Chapter 7</td>
</tr>
<tr>
<td></td>
<td>Fri</td>
<td>Earthquakes II</td>
<td></td>
<td>Interlude C</td>
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<tr>
<td></td>
<td></td>
<td>*Lab 4 Intro: Metamorphic Rocks</td>
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<tr>
<td>Feb. 6th</td>
<td>Tu, We,</td>
<td>Geologic Structures I</td>
<td><strong>Lab 4: Metamorphic Rock ID</strong> — due at end of lab period</td>
<td>Chapters 9, 10</td>
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<tr>
<td></td>
<td>Fri</td>
<td>Geologic Time I</td>
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<td></td>
<td></td>
<td>Geologic Time II</td>
<td></td>
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<tr>
<td>Feb. 13th</td>
<td>Tu, We,</td>
<td>Geologic Resources I</td>
<td><strong>Lab 5: McMaster Rock ID</strong> — due at the end of your lab period</td>
<td>Chapter 12</td>
</tr>
<tr>
<td></td>
<td>Fri</td>
<td>Geologic Resources II</td>
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<td>Interlude F</td>
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<td><em>Lab 6 Intro: Topographic Maps</em></td>
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<tr>
<td>Date</td>
<td>Tu</td>
<td>We</td>
<td>Fri</td>
<td>Labs/Assignments</td>
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<tr>
<td>Feb. 20th</td>
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<td></td>
<td><strong>BREAK WEEK</strong></td>
</tr>
<tr>
<td>Feb. 27th</td>
<td>Tu</td>
<td>We</td>
<td>Fri</td>
<td>Streams I</td>
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<td>Streams II</td>
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<td></td>
<td>Groundwater I</td>
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<td>No Lab</td>
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<td></td>
<td><strong>Lab 6 Pre-Lab QUIZ</strong> – due by Monday, March 6th at 8:30am</td>
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<td>Chapter 12, Interlude F Box 9.1</td>
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<tr>
<td>March 6th</td>
<td>Tu</td>
<td>We</td>
<td>Fri</td>
<td><strong>MIDTERM 2</strong></td>
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<td></td>
<td></td>
<td>Groundwater II</td>
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<td></td>
<td></td>
<td>Lab 7 Intro: Geologic Structures*</td>
</tr>
<tr>
<td>March 13th</td>
<td>Tu</td>
<td>We</td>
<td>Fri</td>
<td>Mass Movement I, Video: Rissa Quick Clay</td>
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<td>Mass Wasting II</td>
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<td>Oceans and Coasts I</td>
</tr>
<tr>
<td>March 20th</td>
<td>Tu</td>
<td>We</td>
<td>Fri</td>
<td>Oceans and Coasts II</td>
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<td></td>
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<td></td>
<td></td>
<td>Lab 7 Intro: McMarsh*</td>
</tr>
<tr>
<td>March 27th</td>
<td>Tu</td>
<td>We</td>
<td>Fri</td>
<td>Careers and GIS</td>
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<td>Glaciers II</td>
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<td>Lab 9 Intro: Mcmarsh*</td>
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<tr>
<td>April 3rd</td>
<td>Tu</td>
<td>We</td>
<td></td>
<td>Global Change II</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No labs</td>
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</tbody>
</table>

This lecture schedule is only a guideline and may be modified during the course of the class.

* Please note that Lab introductions do not always occur in the week before the lab. Before attending labs, please review lab introductions, relevant lectures, and read through the lab material.
Missed Work
If you are absent from the university for a medical or non-medical (personal) reason, lasting fewer than 3 days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form (MSAF). Absences for a longer duration must be reported to your Faculty/Program office, with documentation, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to paddenm@mcmaster.ca. You must then contact your instructor (Dr. Maureen Padden) immediately (normally within 2 working days) by email at paddenm@mcmaster.ca to learn what relief may be granted for the work you have missed, and relevant details such as revised deadlines, or time and location of a make-up exam. Please note that the MSAF may not be used for term work worth 25% or more, nor can it be used for the final examination. For more information see the section ‘Request for Relief of Missed Academic Term Work’.

Course Contract and Academic Integrity
All students are required to read and understand the Student Responsibility Contract included in this outline (a copy can also be found in your courseware). This contract is a component of the course outline, and extends as well as specifies a number of course policies students must be aware of.

Academic Integrity is an important issue at McMaster University and it is the responsibility of all students to understand what constitutes Academic Dishonesty. All students must agree to the course policies and demonstrate an understanding of what constitutes Academic Dishonesty by completing the Academic Integrity and Responsibility (AIR) Quiz. All students are required to complete the AIR Quiz on Avenue and score a grade of greater or equal to 90% by Friday, January 20th 2017 at 4:30pm. Students will receive a grade of zero on Lab 1 if the AIR Quiz has not been completed successfully by the deadline.

Academic Dishonesty
You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the University.
It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at http://www.mcmaster.ca/academicintegrity
The following illustrates only three forms of academic dishonesty:
1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

In this course we will be using Avenue. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

Requests for Relief for Missed Academic Term Work

The University recognizes that students periodically require relief from academic work for medical or other personal situations. This academic regulation aims to manage these requests by taking into account the needs and obligations of students, instructors and administrators. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course. Any concerns regarding the granting of relief should be directed to the respective Faculty Office. Requests for relief should be made with a commitment to academic integrity in mind. Requests that deviate from this commitment will be handled under the Academic Integrity Policy and Student Code of Conduct, where appropriate.

1. Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
   - Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.
   - Students may submit requests for relief using the MSAF once per term.
   - An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
• The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
• The MSAF cannot be used for academic work that has already been completed/attempted.
• An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
• The MSAF cannot be used to apply for relief for any final examination or its equivalent. See Petitions for Special Consideration above.

2. For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:
   • Students must report to their Faculty Office to discuss their situation and will be required to provide appropriate supporting documentation (see Documentation Requirements below).
   • If warranted, the Faculty Office will approve the absence, and the instructor will determine appropriate relief.

Documentation Requirements
If the reason for a request for relief is medical, the approved McMaster University Medical Form covering the relevant dates must be submitted. The student must be seen by a doctor at the earliest possible date, normally on or before the date of the missed work and the doctor must verify the duration of the illness.
If the reason is non-medical, appropriate documentation with verifiable origin covering the relevant dates must be submitted, normally within three working days.

In some circumstances, students may be advised to submit a Petition for Special Consideration (Form A) seeking relief for missed academic work. In deciding whether or not to grant a petition, adequacy of the supporting documentation, including the timing in relation to the due date of the missed work and the degree of the student’s incapacitation, may be taken into account. Failure to do so may negate the opportunity for relief.

If the petition is approved, the Faculty Office will notify the instructor(s) recommending relief. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.

ENVIR SC 1G03 - Student Responsibility Contract

Being a university student requires you to assume a level of responsibility towards your academic career. Rules and Regulations regarding coursework
change during the transition from high school to university as well and vary between Faculties and courses at McMaster. We want to ensure that you (the student) understand and acknowledge certain aspects of how this course operates.

All students are required to read and understand this course contract. This contract is a component of the course outline, and extends as well as specifies a number of course policies students must be aware of. All students must agree to the course policies and demonstrate their understanding of Academic Integrity by completing the Academic Integrity and Responsibility (AIR) Quiz on Avenue. Students will receive a grade of zero on Lab 1 if they have not successfully completed (grade of ≥ 90%) the AIR Quiz.

Assignment Submission and Late Assignments:
I am aware that all submitted assignments need to include ALL of the following information: name, student ID number, course name and number (i.e. Envir Sc 1G03), assignment number (e.g. Lab 1), name of my T.A., Lab section number or day/ time of my lab section, and due date. I am aware that assignments submitted without this information will be penalized; 10% of the mark I obtained will be subtracted.

I am aware that the timeline for the submission of each assignment is specified in the Custom Courseware. I understand that labs due at the start of the lab period are due within the first 15 minutes of the lab period. I also understand that no late assignments will be accepted in this course, unless supporting documentation is provided and arrangements are made with the course instructor (see ‘Illness’ below).

☐ I understand and agree to the course policies with respect to Assignment Submission.

Illness:
If I have a medical or non-medical (personal) situation that results in my missing course-work (e.g. deadlines), it is my responsibility to get proper medical (or other) documentation. I understand that absences that last up to 3 days must be reported using the McMaster Student Absence Form (MSAF). I also understand that a maximum of 1 MSAF may be filed per term and MSAFs cannot be filed for term work worth 25% or more, or during examination periods. I understand that when using the MSAF, absences must be reported to paddenm@mcmaster.ca. I must then contact the Instructor (Dr. Maureen Padden) immediately (normally within 2 working days) by email at paddenm@mcmaster.ca to learn what relief may be granted for the work I have missed, and relevant details such as revised deadlines, or time and location of a make-up exam.
If I am absent for more than 3 days or exceed the maximum of 1 request per term, I must visit my Associate Dean’s Office with supporting documentation. It is my responsibility, after submitting this documentation, to immediately email the Instructor to discuss what, if any, accommodations will be made with respect to any missed work. I am not to assume that I do not have to complete any missed work; it is up to my Instructor to determine what, if any, accommodations will be made. I have one week from the date in which the assignment was originally due to complete this process; otherwise I will receive a mark of zero.

If accommodations are made for missed work and an extension is granted, I understand that there is an EnvirSc 1G03 dropbox located on the second floor of GSB where the missed work may be submitted.

☐ I understand and agree to the course policies with respect to Illness.

**Mark Appeals and Avenue Grades:**

I have one week from the date that an assignment (or test) is returned to class to appeal my mark. If I wish to appeal a grade, I must submit to my T.A. a written note justifying why I wish to have the assignment remarked, with the assignment attached. If my T.A. considers the written justification to be insufficient (e.g. simply wanting a higher grade is insufficient), the assignment will not be re-graded. If the justification is considered sufficient, the entire assignment will get re-graded. I therefore understand that my mark can increase or decrease.

My marks will be recorded on Avenue. It is my responsibility to check that all grades entered into Avenue are recorded properly. I must notify my T.A. about any errors with regards to how my mark was entered. I have until 48 hours prior to the final exam to discuss any Avenue mark issues.

☐ I understand and agree to the course policies with respect to Appeals and Avenue Grades.

**Academic Integrity:**

Academic Integrity is a very important issue at McMaster University. It is my responsibility to understand what constitutes Academic Dishonesty. Among possible forms of academic dishonesty are: cheating on tests or exams by using unauthorized aids; inappropriately collaborating in group work; and plagiarism. This extends to Avenue as well, and sharing of answers on the Discussion Board constitutes a form of academic dishonesty. For more information on what constitutes Academic Dishonesty, I should consult the University policy, and its interpretation by the Faculty of Science as included in the Custom Courseware of the course.
Furthermore, I am aware that I must source ALL information that is not my own. If I submit an assignment with inadequate referencing I may face serious academic consequences (e.g. mark deductions, grade of zero, notation on my transcript, etc.).

☐ I understand and agree to the course policies with respect to Academic Integrity.

**Lab Attendance/T.A. Emails:**
Labs are held to enhance the lectures, as well as to provide essential information for my assignments. I am aware that if I miss a lab I will receive a grade of zero on the lab unless a MSAF or approved documentation is provided to my Associate Dean's office and arrangements are made with the course Instructor. If I am late for a lab or miss a lab, it is not the T.A.'s responsibility to go over the missed work with me.

It is not appropriate to use email to ask detailed questions (including asking about what was discussed in lab). T.A.'s are not expected to answer emails on weekends or late in the evening. Rather, emails will typically be responded to during regular working hours on weekdays, and as schedule allows. Emails on assignment due dates will not be answered.

As a courtesy, and to ensure that emails reach my T.A., Instructional Assistant, or the Instructor, I will use the following subject line: ENVIR SC 1G03 - my name and student ID number. My name and student ID number should also be included in the email signature. Emails must be sent from McMaster email accounts or they will not be read or responded to. Emails should be written in a professional manner, spell-checked and proof-read before sending them. Online discussion terminology must be avoided.

☐ I understand and agree to the course policies with respect to Attendance & Email.

**Student Conduct:**
I acknowledge that my behaviour in all aspects of this course should meet the standards of the McMaster University Student Code of Conduct. I understand that any inappropriate behaviour directed against any of my colleagues, my T.A., or the instructor will not be tolerated. Disruptive behaviour during labs such as talking while a T.A. presents information, or constantly being late to lab, will also not be tolerated.

Students are encouraged to check the course discussion board on Avenue on a regular basis and to ask questions in this forum rather than via email. If a question arises, in all likelihood many other students in the course will have it as
well. This also means that the Avenue Discussion Board is an extension of the classroom. These spaces are to be considered inclusive and safe. Abuse, ridicule, slander, inappropriate language, and discrimination towards the instructor, teaching staff, and other students will not be tolerated in any capacity.

☐ I understand and agree to the course policies with respect to Student Conduct.

Acknowledgement of Understanding of Course Policies:
☐ I have read the Student Responsibility Contract and acknowledge that I fully understand and will abide by these course policies. I understand that it is my responsibility to ask for clarification on any policies that I do not understand.

Careers for Earth Scientists

After you finish your Earth and Environmental Science degree, you may choose to continue research in a graduate program or as a government scientist. But for earth scientists with an undergraduate degree, there are also many jobs available in the private sector.

Students graduating from our Earth and Environmental Science program have the academic requirements to be certified as Professional Geoscientists. Our students become members of a professional association (Association of Professional Geoscientists of Ontario: www.apgo.net) and the process is similar to certifying Professional Engineers. This is the only program in the Faculty of Science where you can become a certified professional.

Earth Science graduates are especially in demand in 3 sectors:

1. Environmental Consulting
2. Energy Resources
3. Mineral Resources

The need in these sectors for qualified earth and environmental scientists means that our students are often able to find well-paid summer work in their discipline and virtually all of our students find related work after completing an honours B.Sc. degree.

We'll be posting information on the avenue site to give you some idea of the positions available in this field and some websites to explore career options.

Association of Professional Geoscientists of Ontario

All geoscientists working in Ontario must be certified as Professional Geoscientists (P.Geo). The Honours Earth & Environmental Sciences (B.Sc.)
fulfills educational requirements for professional certification. Students who registered in this program prior to January 2008, must meet the Minimum Knowledge requirements of the APGO (Association of Professional Geoscientists of Ontario). These requirements can be found here (include link to www.apgo.net).

Students who registered in the Honours Earth and Environmental Sciences (B.Sc.) as of January 2008, must meet the new knowledge requirements adopted by the CGSB (Canadian Geoscience Standards Board) in November 2007.

These requirements are indicated below, with the relevant courses offered by the School of Geography and Earth Sciences indicated between parentheses.

Compulsory Foundation Science (1 course in each area): Chemistry, Mathematics, Physics

Additional Foundation Science (6 courses in total, with no more than 2 courses in any one subject): Biology, Chemistry, Mathematics, Physics, Statistics

Compulsory Geoscience (1 course in each area):
- Field Techniques (Earth Sc 3FE3)
- Mineralogy and Petrology (Earth Sc 2K03)
- Sedimentation and Stratigraphy (Earth Sc 2E03)
- Structural Geology (Earth Sc 3Z03)

Additional Geoscience courses must be taken (minimum of 5 from 3 sub-groups in total; a minimum of 1 and at most 2 from each sub-group).

For the CGSB Geology specialization, the subgroups are:
- Geochemistry (Earth Sc 2Q03) or Geophysics (Earth Sc 3V03)
- Igneous or Metamorphic Petrology (Earth Sc 3K03)
- Sedimentology (Earth Sc 3E03), Glacial Geology (Earth Sc 4G03)/, Remote Sensing (Earth Sc 3SR3)

For the CGSB Environmental Geoscience specialization, the subgroups are:
- Geochemistry (Earth Sc 2Q03) or Geophysics (Earth Sc 3V03)
- Hydrogeology (Earth Sc 3W03) or Hydrology (Earth Sc 2W03)
- Glacial Geology (Earth Sc 4G03), Geomorphology (Earth Sc 2G03), Remote Sensing (Earth Sc 3SR3)

A minimum of 9 other Geoscience courses must be taken. Extra courses not used to meet the requirements listed above can be used to satisfy this set of knowledge requirements.
APGO Knowledge Requirement Tool Kit
We encourage students to register for Student Membership (it’s free) so that they can continually update/save their progress in the Knowledge Requirement Toolkit, and it also allows them to correspond with the Registrar should they have any questions about their courses/self-assessment. The link to the Student application is as follows: https://portal.apgo.net/mpower/ktoolkit/toolkit-register.action

Non-student members can access the Knowledge Requirement Tool kit at the following link: https://portal.apgo.net/mpower/ktoolkit/public-requirements.action (Non-student members are not able to update/save their progress, but can save/print it for their own records.)