

STUDENT GUIDE

GEOLOGICAL ENGINEERING PROGRAM

University of British Columbia

2011-2012

Introduction

The purpose of this guide is to give you information about the structure and course requirements in the Geological Engineering program. You should use this guide to help you plan your degree program. However, as our program evolves, curriculum changes will be made and this guide may become outdated. The official program is the one posted online in the UBC Calendar. [Click here to access 2011 - 2012 Geological Engineering Program in the UBC Calendar.](#)

Our program is structured as one set of course requirements that all students must fulfill. If you fulfill the requirements, you can apply to graduate. There are a number of electives that you may choose to help you tailor the program to your individual interests. This guide will help you select those electives.

Administrative Structure of the Program

Geological Engineering is an interdisciplinary program that is housed in the Department of Earth and Ocean Sciences (Faculty of Science), but is under the jurisdiction of the Dean of Applied Science, and administered by a Board of Study. The undergraduate program leads to the B.A.Sc. or "Engineering" Degree. This degree can be obtained with or without participation in the Co-op program. All graduates from the program will receive the designation "B.A.Sc. in Geological Engineering" on their degree.

Details of the Program and regulations of the Faculty are provided on-line at UBC Calendar, Geological Engineering Section [Click here to access 2010 - 2011 Calendar.](#)

Getting Help

There are four sources of help and advising for the program. For questions about course selection, career directions and approval of technical electives, contact the **Director of Geological Engineering Program, Dr. Erik Eberhardt**. For questions related to time tabling, registration, course conflicts or degree standing, contact the **undergraduate secretary** in the Department of Earth and Ocean Sciences, the kind and most helpful **Teresa Woodley**. For questions related to complementary studies electives and registration problems for courses in other departments, contact **Engineering Student Services** in the lobby of Kaiser Building (tel 604 822 6556). Last, for the real scuttlebutt on courses, talk to **senior students** in the program.

Field Schools and Time Tabling

There are at least three field-related courses in the program: CIVL 235 Plane Surveying, EOSC 223 Field Techniques, and one of either EOSC 328 Field Geology or EOSC 428 Field Techniques in Groundwater Hydrology. These field schools all run after final exams in April. Although CIVL 235 is formally a second year course, most students cannot take it after exams in their second year because it conflicts with EOSC 223. Accordingly, CIVL 235 and one of EOSC 328 or 428 are typically taken after spring exams in third or fourth year. So, do not worry if you cannot take CIVL 235 after second year. You can take it as late as after your fourth year. The grades are provided in time for spring graduation.

Tailoring the Program to Your Interests

The graduation requirements for the program are provided in the calendar or here in Table 1. If there are any discrepancies, assume that the online calendar is correct. As you will see, in second year all courses are core and there are no electives. The second year courses serve as the foundation for your third and fourth years. In third and fourth year you can select from relatively wide range of courses and technical electives.

It is by choosing your electives that you can tailor the program to your interests. In Table 5 of this document we have provided a list of technical elective courses that have been approved for the program in the past. This list is not comprehensive, however. We encourage you to seek the formal approval of the director of the program in writing via email before you enroll in a technical elective course to ensure that it meets program requirements.

Examples

You will graduate as a geological engineer as long as you satisfy the requirements of the program as described in the calendar. That is, there is only one program. We describe three areas of interest in geological engineering: i) Geotechnical, ii) Environmental, and iii) Fuels and Minerals Exploration. You may choose to follow these suggestions, or to mix and match. In situations where there is no preferred choice of courses, we have not made a suggestion and you are free to choose. What follows is a description of the example areas of interest.

Geotechnical interest:

Broadly speaking, this is the application of engineering and geological skills to the needs of planning, civil engineering design, construction and environmental management and control. You will gain skills relevant to site investigation, design of foundations, tunnels, excavations, dams, reservoirs, landfills, roads, railway grade, slope stabilization, mine excavations, forestry and many other important projects. You will be able to find employment in consulting companies, construction, mining and energy production firms, as well as government.

Environmental interest:

The courses of interest are similar to those for Geotechnical, so you will be able to work on many of the same projects as mentioned above. However, you will know less of such things as rock mechanics and advanced soil mechanics, but more about groundwater flow, contaminant migration, design of landfills, environmental cleanup and similar. Your employment prospects will also be similar to those of your Geotechnical colleagues.

Minerals and petroleum exploration interest:

This specialization trains Professional Engineers for work in the Mining or Petroleum industry. You will still obtain basic engineering skills to allow you to work in functions described under Geotechnical and Environmental, but you will get somewhat less soil mechanics and rock mechanics. Instead, you will have some special skills in petrology as well as geology and economics of ore deposits or petroleum and coal. You will be able to find employment with companies involved directly in exploration, development and production, or with companies providing services such as consulting.

Mix and match interest:

If you are not sure about what you want to do, you can mix and match electives as your interests dictate. This is in fact what most students do and ensures that you will be able to work in a number of industries.

Degree Planning

Table 1, below is the program curriculum (as outlined in the Calendar). Where possible, we have tried to avoid course conflicts, particularly with core courses. However, as our program contains courses from many departments, it is impossible to ensure that all elective courses will fit into your schedule. We therefore encourage you to look at 3rd and 4th year courses together, and plan your electives far in advance so you know that your program is feasible right to the end. You may, for instance, find it easier to take a fourth year course in third year so that you can fit a technical elective into your time table in fourth year. **It is your responsibility to check that your courses will fit together into a credible time table and that you will have the required pre-requisites for courses that you want to take in the future.** Remember, it is your responsibility to check that your program can be scheduled and completed in four years.

Hint: Make a few photocopies and highlight courses you wish to take, according to the curriculum table. Then look at the course schedules. You will see right away whether they fit together. Then, check that all your pre-requisites are OK.

Technical Electives

There are two types of technical electives: i) **constrained electives** where you must choose one or two courses from a list and ii) **unconstrained technical electives**. At the end of this document you will find a list of some of the courses that qualify as unconstrained technical electives. Note also that courses in the list of constrained technical electives may also be used to satisfy an unconstrained technical elective requirement. For example in third year you have the following constrained elective:

Select one of:

EOSC 328 (Field Geology) (3)

EOSC 428 (Field Techniques in Groundwater Hydrology) (3)

You may select EOSC 328 to satisfy this constrained elective and then choose EOSC 428 to satisfy an unconstrained technical elective.

NEW IN 2011-2012

Engineering Design Project and Thesis

All students entering fourth year will henceforth take EOSC 445 Engineering Design Project. This two-term course is our capstone design experience and will involve team work, design, analysis, and communication (presentation and report writing). This is our first time running the course and we are excited to develop it together with the students.

The thesis course EOSC 447 is no longer part of the core, but can serve as a technical elective. The thesis will remain in the core for those students who entered fourth year before 2011 – they are not obliged to take EOSC 445. The thesis can be the most rewarding or most frustrating course in your program. It is crucial that you plan your thesis well in advance and then, once defined, work steadily on your thesis through your final year. You should think about your thesis topic at the end of your third year, and if possible, identify a topic in the summer before fourth year. The best topics are based upon industry projects with real-world data sets.

CIVL 316, CIVL 411 moved to core

In an effort to introduce more engineering design into the program, two Civil Engineering Courses have been moved into the core of the program. CIVL 316 Hydrology and Open Channel Flow and CIVL 411 Foundation Engineering II-Case histories are both rich in engineering content. We have also adjusted the constrained elective lists in third and fourth year to accommodate these changes.

Table 1. Geological Engineering Curriculum

(note: If this disagrees with the current [Calendar](#), assume the Calendar to be correct)

2nd year

APSC 201 (Technical Communications) (3)
 CIVL 210 (Soil Mechanics) (4)
 CIVL 215 (Fluid Mechanics) (4)
 CIVL 230 (Solid Mechanics I) (4)
 CIVL 231 (Solid Mechanics II) (3)
 CIVL 235 (Plane Surveying) (4)
 EOSC 210 (Earth Science for Engineers) (3)
 EOSC 220 (Introductory Mineralogy) (3)
 EOSC 221 (Introductory Petrology) (3)
 EOSC 223 (Field Techniques) (3)
 MATH 253 (Multivariable Calculus) (3)
 MATH 255 (Ordinary Differential Equations) (3)
Total Credits: 40

3rd year

CIVL 311 (Soil Mechanics II) (4)
 CIVL 316 (Hydrology and Open Channel Flows) (4)
 EOSC 323 (Structural Geology) (3)
 EOSC 329 (Groundwater Hydrology) (3)
 EOSC 330 (Principles of Geomorphology) (3)
 MATH 257 (Partial Differential Equations) (3)
 MINE 303 (Rock Mechanics Fundamentals) (3)
 Select one of:
 EOSC 328 (Field Geology) (3)
 EOSC 428 (Field Techniques in Groundwater Hydrology) (3)
 Earth Sciences Technical Elective:
 Choose one 300 or 400 science course from Earth and Ocean Sciences (3)
 Select one of (Engineering and Society [Complimentary Studies Elective \(3\)](#)):
 APSC 262 (Technology and Society) (3)
 GEOG 310 (Environment and Sustainability) (3)
[Humanities Complimentary Studies Elective \(3\)](#)
 Unconstrained Technical Electives (6)
Total credits: 41

4th year

CIVL 402 (Engineering Law and Contracts) (2)
 Select one of:
 CIVL 403 (Engineering Economic Analysis) (3)
 MECH 431 (Engineering Economics) (3)
 CIVL 410 (Foundation Engineering I) (3)
 CIVL 411 (Foundation Engineering II) (3)
 EOSC 350 (Environmental and Geotechnical Exploration Geophysics I) (3)

- EOSC 433 (Geotechnical Engineering Practice) (3)
- EOSC 434 (Principles of Geological Engineering) (3)
- EOSC 445 (Engineering Design Project) (6)
- STAT 251 (Elementary Statistics) (3)

Select two of the following:

- CIVL 405 (Environmental Impact Studies) (3)
- EOSC 331 (Introduction to Mineral Deposits) (3)
- EOSC 429 (Groundwater Contamination) (3)
- EOSC 430 (Groundwater Geochemistry) (3)
- MINE 403 (Rock Mechanics Design) (3)
- MINE 480 (Mine Waste Management) (3)

Select one of:

- CIVL 406 (Water Treatment and Wastewater Management) (3)
- CIVL 408 (Geo-Environmental Engineering) (3)
- CIVL 415 (Water Resource Engineering) (3)
- CIVL 417 (Coastal Engineering) (3)
- CIVL 418 (Engineering Hydrology) (3)
- EOSC 431 (Groundwater Remediation) (3)
- MINE 488 (Heavy Oil Sand Mining and Processing) (3)
- MINE 491 (Mine and Plant Feasibility Study) (4)

Unconstrained Technical Elective (3)

Total Credits: 41

Table 2. Incomplete List of Technical Electives *

1. Courses recently used as Technical Electives

GEOB	308	Quaternary and Applied Geomorphology	T2
	370	Advanced Geographic Information Science	T1
	373	Introductory Remote Sensing	T2
	406	Watershed Geomorphology	T1
	407	Vegetation Dynamics: Disturbance, Climate & Human Impacts	T2
	408	Snow and Ice processes	T1
	479	Research in Advanced Geographic Information Systems	T2
GEOG	497	The Arctic	T2
CIVL	315	Fluid Mechanics II	T1
	322	Project Based Learning in Civil Engineering Materials	T2
	400	Construction Engineering and Management	T1
	405	Environmental Impact Studies	T1
	406	Water Treatment and Waste Management	T2
	408	Geo-Environmental Engineering	T2
	416	Environmental Hydraulics	T1
	417	Coastal Engineering	T2
	418	Engineering Hydrology	T1
	445	Engineering Design and Analysis I	T1
FORP	363	Forest Soil Mechanics	T2
	388	Analytical Methods in Forest Hydrology	T1
FRST	385	Watershed Hydrology	T1
	386	Aquatic Ecosystems and Fish in Forested Watersheds	T2
	443	Remote Sensing in Forestry and Agriculture	T1
	485	Forest Watershed Management	T2
MINE	304	Rock Fragmentation	T2
	310	Surface Mining and Design	T1
	331	Physical Mineral Processes	T1
	403	Rock Mechanics Design	T1
	486	Mining and the Environment	T2
	488	Heavy Oil Sand Mining and Processing	T2

2. In 3rd and 4th year, any courses in constrained elective lists can generally be used as technical electives.
3. Many 3rd and 4th year courses in Applied Science.
4. Most 3rd and 4th year science courses in EOS.

In all cases, courses should be approved via email by the Director of Geological Engineering

Complementary Studies Courses

Students must take complementary studies courses totalling at least 20 credits. The minimum requirements are as follows:

1. Professional development: APSC 450 (2) or equivalent.
2. Communication (6): APSC 176 (3) or ENGL 112 (3) or another first-year English course, and one of APSC 201 (3), APSC 202 (2) and APSC 203 (1), or IGEN 201 (3).
3. Engineering economics (3). All engineering programs include a 3-credit engineering economics course, usually taken in third or fourth year. Approved courses include: CHBE 459, CIVL 403, EECE 450, MECH 431, MINE 396, and MTRL 455.
4. Impact of technology on society (3). Acceptable courses include: APSC 261 (3), APSC 262 (3), APSC 263 (3), CIVL 200 (3), CPSC 430 (3), GEOG 310 (3), SOCI 260 (3). Students may seek approval from the Dean's Office for other courses in this area. Note: Civil Engineering students will cover this 3-credit requirement in CIVL 201 and 202.
5. Humanities and social sciences electives (minimum 3 credits). This elective(s) must deal with central issues, methodologies, and thought processes of the humanities and social sciences. A course from the Faculty of Arts that satisfies the "impact of technology on society" requirement above may also be used to satisfy this requirement. Most courses offered within the Faculty of Arts are acceptable with the exception of scientific geography courses, statistics courses and studio/performance courses in fine arts, music, and theatre. Courses that teach language skills are not acceptable. In addition, ANTH 140, CLST 301, PHIL 120, 125, 220, and PSYC 218 do not satisfy this requirement.