

# MASTER OF ENGINEERING IN GEOLOGICAL ENGINEERING

## 2023-2024 GUIDE

The M.Eng. in Geological Engineering provides students with a professional development experience that exposes them to new tools in geotechnical engineering and hydrogeology as used in engineering design, with an emphasis on the need to recognize and manage geological variability, uncertainty and geo-risk. These integrate new developments in field techniques targeting better ground characterization and monitoring of ground responses to engineering activities, with advanced numerical modelling to better understand the importance of underlying processes, mechanisms, and interactions that can affect engineering designs. Emphasis in our courses is often placed on case histories and examples taken from industry experience.

Prior to registering for courses, students should consult with their supervisor. Students interested in the Co-Op option should consult with the Program Director. The minimum requirements for completion of the M.Eng. in Geological Engineering program are as follows:

Core Credits	(3)
Constrained Elective Credits	(9)
Unconstrained Electives Credits	(18)
<b>Total Credits</b>	<b>(30)</b>

The following courses are those required and/or suggested for the M.Eng. program. *Note that some classes are only offered in alternative years.* Those in light gray text are tentatively not scheduled for 2023/24. However, this sometimes changes and students are advised to consult with the UBC Calendar to confirm which courses are being offered or not.

CORE PROGRAM (REQUIRED)		CREDITS	TERM
EOSC 598	M.Eng. Graduating Paper	3	1 or 2*

\*The MEng paper is normally worked on after all other courses are completed (but not always). Students should discuss with their faculty advisor the best time to work on their MEng paper relative to their particular study plan.

CONSTRAINED ELECTIVES (MUST TAKE MINIMUM OF 9 CREDITS FROM THIS LIST)		CREDITS	TERM
EOSC 429 <sup>1</sup>	Groundwater Contamination	3	2
EOSC 433 <sup>1</sup>	Geological Engineering Practice I - Rock Engineering	3	1
EOSC 434 <sup>1</sup>	Geological Engineering Practice II - Soil Engineering	3	2
EOSC 527 <sup>OL</sup>	Instrumentation & Monitoring for Applied Geotechnics	3	2
EOSC 529	Topics in Geohazard Risk Management	3	2
EOSC 532 <sup>2</sup>	Field Laboratory in Groundwater Hydrology	3	2
EOSC 533 <sup>OL</sup>	Advanced Groundwater Hydrology	3	1
EOSC 534 <sup>3</sup>	Geological Engineering: Soils and Weak Rocks	3	2
EOSC 535	Transport Processes in Porous Media	3	2
EOSC 536 <sup>OL,4</sup>	Advanced Rock Engineering	3	2
EOSC 537	Topics in Groundwater Hydrology	3	1
EOSC 540 <sup>5</sup>	Advanced Groundwater Geochemistry	3	1
EOSC 541	Multi-component Reactive Transport Modelling in Groundwater	3	2
EOSC 546	Advanced Field Methods in Earth Science	3	2
EOSC 547	Tunneling and Underground Engineering	3	2
EOSC 562	Mechanics of Earthquakes and Faulting	3	1
EOSC 595 <sup>6</sup>	Directed Studies	3 to 6	1 or 2

<sup>OL</sup> Taught online only (asynchronous learning).

<sup>1</sup> A maximum of 6 credits of 300/400 level courses may be counted towards the overall program requirements.

<sup>2</sup> Co-taught with EOCS 428. Not eligible if already taken during undergraduate/graduate degrees.

<sup>3</sup> Co-taught with EOCS 434. Not eligible if already taken during undergraduate/graduate degrees.

<sup>4</sup> Only one of EOCS 536 and 433 can be counted. Students interested in in-person learning should take EOCS 433.

<sup>5</sup> Co-taught with EOCS 430. Not eligible if already taken during undergraduate/graduate degrees.

<sup>6</sup> A maximum of 6 credits of Directed Studies may be counted towards the overall program requirements.

<b>UNCONSTRAINED ELECTIVES</b> <b>(OTHER COURSES NOT LISTED HERE MAY ALSO BE ELIGIBLE; PLEASE REQUEST FOR APPROVAL)</b>		<b>CREDITS</b>	<b>TERM</b>
APSC 540	Entrepreneurial Thinking for Applied Scientists	3	1
APSC 541	Technology Entrepreneurship for Engineers	3	2
CIVL 504	Seismicity and Seismic Design Parameters	3	1
CIVL 505	Seismic Response of Structures	3	2
CIVL 519	Risk and Decision Analysis for Infrastructure Management	3	1
CIVL 522	Project and Construction Economics	3	2
CIVL 523	Project Management for Engineers	3	2
CIVL 524	Legal Aspects of Project and Construction Management	3	1
CIVL 526	Virtual Design and Construction	3	2
CIVL 529	Condition Assessment and Rehabilitation of Civil Infrastructure	3	1
CIVL 537	Computational Mechanics I	3	1
CIVL 538	Computational Mechanics II	3	2
CIVL 540	Advanced Coastal Engineering	3	1
CIVL 541	Environmental Fluid Mechanics	3	2
CIVL 547	Estuary Hydraulics	2	3
CIVL 551	Advanced Hydrology	3	1
CIVL 559	Advanced Water and Wastewater Treatment Technology	3	1
CIVL 561	Risk and Remediation in Geo-environment	3	2
CIVL 562	Environmental Data Collection and Analysis	3	1
CIVL 570	Advanced Soil Mechanics	2	1
CIVL 572	Contaminated Site Investigation and Management	3	2
CIVL 574	Experimental Soil Mechanics	3	2
CIVL 575	Constitutive Models for Soil	3	2
CIVL 579	Geosynthetics	2	1
CIVL 580	Geotechnical Earthquake Engineering	3	1
CIVL 581	Soil Dynamics for Design Practice	3	2
CONS 505	Ecological Restoration	3	2
CPSC 504	Data Management	3	2
CPSC 540	Machine Learning	3	1
EOSC 510	Data Analysis in Atmospheric, Earth and Ocean Sciences	3	1
EOSC 512	Advanced Geophysical Fluid Dynamics	3	2
EOSC 514	Introduction to Geological Fluid Mechanics	3	2
EOSC 515 <sup>1</sup>	Graduate Seminar Course	1	1
EOSC 523	Isotope Geology	3	1
EOSC 525	Magmatic Ore Deposits	3	2
EOSC 542	Advanced Volcanology	3	1
EOSC 543	Topics in Solid Earth Sciences	3	1 or 2
EOSC 545	Advanced Models in Mineral Deposits	3	2
EOSC 546	Advanced Field Methods in Earth Science	3	1
GEOS 503	Topics in Geomorphology and Hydrology	3	2
GEOS 504A	Topics in Climate Studies	3	1
GEOS 505	Permafrost	3	1
GEOG 508	Advanced Seminar in Geomorphology	3	2
MINE 504 <sup>2</sup>	Rock Fragmentation	2	2
MINE 505	Advanced Topics in Rock Engineering	3	1
MINE 506	Mining Methods	3	2
MINE 507 <sup>3</sup>	Block Caving Systems	3	2
MINE 515	Mining in the Future	3	2
MINE 541	Environmental Risk Assessments in Relation to Mining	3	2

MINE 552 <sup>4</sup>	Mining Geostatistics	3	2
MINE 554	Mine Economics and Finance	3	2
MINE 555	Mining and Society	3	1
MINE 556	Rock Slope Engineering	2	1
MINE 559 <sup>5</sup>	Indigenous Peoples and Mining in Canada	3	1
MINE 581	Safety of Tailings Storage Facilities	3	1
MINE 585	Risk Management of Tailings Storage Facilities	3	2
MINE 586	Advanced Mine Waste Management	3	1
MINE 587	Advanced Mine Site Management	3	1
MINE 590 <sup>6</sup>	Directed Studies	3 to 6	1 or 2
PPGA 542	Science, Technology, and Public Policy	3	2
PPGA 543	Sustainable Water Systems	3	1
PPGA 544	Economic Foundations of Environmental Policies	3	1
PPGA 584	Policy Responses to Global Climate Change	3	1
PPGA 591W	Special Topics in Public Policy - Heavy Metal	3	2
SOIL 515	Watershed Science	3	1
SOIL 516	Urban Watershed Management	3	1
SOIL 517	Land and Water Resource Evaluation	3	1
<sup>1</sup> Seminar courses taken for credit require the approval of the Program Director and are only allowed where a student is 1 or 2 credits short of the degree requirements due to having taken one or two 2-credit courses.			
<sup>2</sup> Co-taught with MINE 304. Not eligible if already taken during undergraduate/graduate degrees.			
<sup>3</sup> Co-taught with MINE 485. Not eligible if already taken during undergraduate/graduate degrees.			
<sup>4</sup> Co-taught with MINE 420. Not eligible if already taken during undergraduate/graduate degrees.			
<sup>5</sup> Co-taught with MINE 470. Not eligible if already taken during undergraduate/graduate degrees.			
<sup>6</sup> A maximum of 6 credits of Directed Studies may be counted towards the overall program requirements. This includes any Directed Studies courses taken in EOAS or other departments.			

<b>UNCONSTRAINED ELECTIVES – UNDERGRADUATE<sup>1</sup></b> <b>(OTHER COURSES NOT LISTED HERE MAY ALSO BE ELIGIBLE; PLEASE REQUEST FOR APPROVAL)</b>		<b>CREDITS</b>	<b>TERM</b>
APSC 461	Global Engineering Leadership	3	Summer
ATSC 313	Renewable Energy Meteorology	3	2
CIVL 311	Soil Mechanics II	4	1
CIVL 315	Fluid Mechanics II	4	1
CIVL 316	Hydrology and Open Channel Flow	4	2
CIVL 402	Professionalism and Law in Civil Engineering	3	1
CIVL 403	Engineering Economic Analysis	3	2
CIVL 406	Water Treatment and Waste Management	3	1
CIVL 407	Environmental Laboratory Analysis	3	1
CIVL 408	Geo-Environmental Engineering	3	2
CIVL 410	Foundation Engineering I	3	1
CIVL 411	Foundation Engineering II	3	2
CIVL 413	Design of Earth Dams and Containment Structures	3	2
CIVL 415	Water Resource Engineering	3	2
CIVL 416	Environmental Hydraulics	3	1
CIVL 417	Coastal Engineering	3	1
CIVL 418	Engineering Hydrology	3	2
CIVL 475	Environmental Stewardship in Civil Engineering	3	1
CONS 330	Conservation Science and Sustainability	3	2
CONS 425	Sustainable Energy: Policy and Governance	3	2
CONS 440	Conservation Decision-Making and Policy	3	1
CONS 481	Conservation Planning in Practice	3	1
CPSC 330	Applied Machine Learning	3	1 or 2

CPSC 340	Machine Learning and Data Mining	3	1 or 2
CPSC 440	Advanced Machine Learning	3	2
ENVR 410	Energy, Environment, and Society	3	1
ENVR 430	Ecological Dimensions of Sustainability	3	1
ENVR 440	Analytical Methods in Sustainability Science	3	2
EOSC 320	Sedimentology	3	2
EOSC 321	Igneous Petrology	3	1
EOSC 322	Metamorphic Petrology	3	2
EOSC 323	Structural Geology I	3	1
EOSC 328	Field Geology	3	2
EOSC 329	Groundwater Hydrology	3	1
EOSC 330	Principles of Geomorphology	3	1
EOSC 331	Introduction to Mineral Deposits	3	1
EOSC 332	Tectonic Evolution of North America	3	2
EOSC 333	Elemental and Isotopic Geochemistry	3	2
EOSC 340	Global Climate Change	3	1 or 2
EOSC 350	Environmental, Geotechnical, and Exploration Geophysics	3	1
EOSC 352	Geophysical Continuum Dynamics	3	2
EOSC 353	Seismology	3	2
EOSC 354	Analysis of Time Series and Inverse Theory for Earth Scientists	3	1
EOSC 410	Geoscientific Data Analysis and Empirical Modelling	3	1
EOSC 420	Volcanology	3	1
EOSC 421	Advanced Sedimentology	3	1
EOSC 422	Structural Geology II	3	2
EOSC 424	Advanced Mineral Deposits	3	2
EOSC 430	Aqueous Geochemistry	3	1
EOSC 431	Groundwater Remediation	3	2
EOSC 432	Fossil Fuels	3	2
EOSC 442	Climate Measurement and Analysis	1	1 or 2
EOSC 454	Applied Geophysics	4	2
GEOG 310	Environment and Sustainability	3	1 or 2
GEOG 312	Climate Change: Science and Society	3	1
GEOG 313	Environmental Justice and Social Change	3	2
GEOG 314	Analysing Environmental Problems	3	2
GEOG 316	Geography of Natural Hazards	3	1
GEOG 318	Sustainability in a Changing Environment	3	2
GEOG 319	Environmental Impact Assessment	3	1
GEOG 410	Environment and Society	3	1 or 2
GEOG 412	Water Management: Theory, Policy, and Practice.	3	1 or 2
GEOG 497	The Arctic	3	1
GEOS 300	Microscale Weather and Climate	3	2
GEOS 305	Introduction to Hydrology	3	2
GEOS 308	Quaternary and Applied Geomorphology	3	2
GEOS 370	Advanced Geographic Information Science	3	1 or 2
GEOS 373	Introductory Remote Sensing	3	2
GEOS 405	Fluvial Geomorphology	3	2
GEOS 406	Watershed Geomorphology	3	1 or 2
GEOS 408	The Changing Cryosphere	3	1
GEOS 415	River Restoration: Science and Society	3	2
IGEN 450	Pipeline Engineering	3	1
IGEN 452	Pipeline Design	3	2
MINE 302	Underground Mining and Design	4	2

MINE 303	Rock Mechanics Fundamentals	4	2
MINE 304	Rock Fragmentation	3	2
MINE 310	Surface Mining and Design	4	1
MINE 380	Mine Waste Management	3	2
MINE 403	Rock Mechanics Design	3	2
MINE 404	Strategic Issues in Mining	3	2
MINE 406	Mine Project Valuation and Risk Assessment	3	2
MINE 420	Applied Geostatistics	3	2
MINE 455	Mine Water Management	3	2
MINE 470	Indigenous Peoples and Mining in Canada	3	1
MINE 480	Mine Waste Management	3	2
MINE 485	Cave Mining Systems: Design and Planning	3	2
MINE 486	Mining and The Environment	3	2
<sup>1</sup> A maximum of 6 credits of 300/400 level courses may be counted towards the overall program requirements. This includes 300/400 courses taken as constrained electives.			

**ADVICE TO ASSIST YOU WITH REGISTRATION:**

- Please check the [UBC Course Calendar](#) for course availability as **some of the listed courses are not offered every year.**
- M.Eng. students are encouraged to take a selection of elective credits that best reflect their professional development interests.
- Students must **obtain permission from the host department** for courses they would like to take that are outside EOAS.
- Students may take a **maximum of six (6) credits of 300/400 level Undergraduate Courses.**
- Students may register for a **maximum of six (6) credits** towards **directed studies coursework.**
- All students are individually responsible for ensuring that they meet all requirements for graduation.