

GEOPHYSICS, B.SC. HONOURS

Degree Regulations for B.Sc. (Honours) in Geology, Geophysics or Environmental Geoscience

The Honours programs are the most heavily concentrated programs offered and lead most directly to graduate studies. A student is required to achieve higher grade standards than in the Major degree program. The Honours degree may be pursued on a part-time basis, although it must be recognized that students will require additional terms to complete degree requirements. Students must complete the degree program within 8 years of gaining initial admission to the Honours program. Failure to complete the Honours degree within the 8-year time limit may require a student to transfer into the Major program.

Students admitted to the Honours program will normally have completed six credit hours of courses from the Faculty of Arts. Students who do not meet this requirement within their first 30 credit hours must do so within the Honours program.

A student will normally begin the Honours program in second year and must meet the entrance requirements set out below. Students in full-time study can expect to complete the prescribed courses in four years. Honours programs lead to either the B.Sc. (Hons.) in Geology, the B.Sc. (Hons.) in Geophysics or the B.Sc. (Hons.) in Environmental Geoscience.

To be eligible for any award granted exclusively on the basis of academic performance, a student must normally be enrolled in a full-time program as defined by the department.

Students must complete the University Written English and Mathematics requirement (<https://catalog.umanitoba.ca/undergraduate-studies/general-academic-regulations/>) as described in the, General Academic Regulations, of this Calendar.

Entrance to Honours

To enter the Honours program in Geology, Geophysics or Environmental Geoscience, a student must have completed at least 24 credit hours with the minimum Degree Grade Point Average as stipulated in the Entrance and Continuation Requirements Table. In addition, the student must attain the minimum grade requirements specified for individual Year 1 courses according to the degree requirements for Honours Geology (<https://catalog.umanitoba.ca/undergraduate-studies/environment-earth-resources/earth-sciences/geology-bsc-honours/#overviewtext>), Honours Geophysics (p. 1) or Honours Environmental Geoscience (<https://catalog.umanitoba.ca/undergraduate-studies/environment-earth-resources/earth-sciences/environmental-geoscience-bsc-honours/>). Students who are ineligible to enter Honours with their admission to the Riddell Faculty may establish eligibility the following year on the basis of their second year of academic performance.

Continuation in Honours

A student's academic performance is assessed first with his/her application for admission to the Riddell Faculty and then following each term in which the student is registered. To be in **good standing** and permitted to continue in the degree program, a student must maintain the performance requirement as stipulated in the Entrance and Continuation Requirements Table. Students who do not meet the

minimum performance requirements will be placed on academic warning, probation or academic suspension as outlined in the Faculty Regulations (<https://catalog.umanitoba.ca/undergraduate-studies/environment-earth-resources/#facultyacademicregulationstext>); Academic Warning, Probation, Academic Suspension and Special Students (Academic Standing) in this Chapter. Students who do not maintain this minimum average to remain in the program will be required to withdraw from the Honours program and, if eligible, will be placed in the Major program. Students will have the notation 'Required to Withdraw from the Honours Program' recorded on their transcript.

Failed courses: Students cannot exceed 18 credit hours of failed courses (F's) as calculated on courses applicable to the degree program (DGPA).

Repeating GEOL 4870: The course may be repeated only once after a grade of F.

Program Approval

A Riddell Faculty student advisor (<https://umanitoba.ca/faculties/environment/undergraduate/advice/>) in the Faculty Dean's Office must approve a student's Honours program each term. Students must also obtain departmental approval for all revisions to their programs. The Advanced/Major/Honours Program Approval forms are available on the Riddell Faculty web page (<https://umanitoba.ca/environment-earth-resources/>).

Residence Requirement for Honours Students

A student must successfully complete a minimum of 60 credit hours at the University of Manitoba. The courses used to satisfy the requirement must be acceptable for credit in the Clayton H. Riddell Faculty of Environment, Earth, and Resources. Residence requirements apply both to first and second-degree students.

Graduation from Honours

In order to graduate from the Honours Geology, Geophysics or Environmental Geoscience programs, students must complete all degree program and faculty requirements as stipulated in Faculty Regulations (<https://catalog.umanitoba.ca/undergraduate-studies/environment-earth-resources/#facultyacademicregulationstext>) and in the additional regulations for Earth Sciences. Students must also achieve the minimum performance requirements as outlined in the Earth Sciences-Graduation-Requirements (p.). This is defined for the Honours Geology program as a minimum Degree Grade Point Average of 3.00 on 120 credit hours which constitute the degree, for Honours Geophysics as a minimum Degree Grade Point Average of 2.80 on the 120 credit hours which constitute the degree and for Honours Environmental Geoscience as a minimum Degree Grade Point Average of 3.00 on 120 credit hours which constitute the degree.

Recognition of Academic Merit

First Class Honours

To graduate with **First Class Honours**, a student must achieve a Degree Grade Point Average of 3.50. The term 'First Class Honours' will appear both on the parchment and on the student's transcript.

Honours Program Notes

Double Honours Programs

Double Honours programs may be available. The program must be arranged in consultation with the departments concerned.

Honours Requirements and Options

Students who do not obtain the entrance requirements for the Honours program in their first year but who are interested in obtaining an Honours

degree should consult with the department before registering for their second year.

Honours Geology Options

For students who wish to increase the focus of their knowledge, recommended electives are listed below:

Environmental Geoscience:

Course	Title	Hours
BIOL 2300 or AGEC 2370	Principles of Ecology	3
CIVL 4250	Groundwater Hydrology	4
SOIL 4060	Physical Properties of Soils	3
SOIL 4130	Soil Chemistry and Mineralogy	3
SOIL 4500	Remediation of Contaminated Land	3
GEOL 4370	Global Change	3
GEOG 3390	Introduction to Climate Change and Its Causes (PS)	3
ENVR 2180 or BIOL 2380/ AGRI 2180	Introductory Toxicology	3
ENVR 3110	Environmental Conservation and Restoration	3
ENVR 3250	Environmental Assessment	3

Or others approved by the department

(Students are responsible for completion of prerequisites for these courses.)

Honours Geophysics Option

Students who wish to enter the Honours Geophysics Option and have not taken 6 credit hours of introductory Earth Sciences (eg., GEOL 1340 and one of GEOL 1400, GEOL 1410, or GEOL 1420) may arrange with the department to make up this credit. Students must contact the department during the spring preceding entrance to the Honours program. All course choices in the Honours program should be made after consultation with the coordinator of the Geophysics program.

Earth Sciences Advanced Entry Entrance and Continuation Requirements

Degree Program	Minimum Degree GPA Entrance	Minimum Degree GPA Continuation
Major (Geology, Environmental Geoscience)	2.50 ¹	2.50 ¹
Major (Geophysics)	2.50 ¹	2.50 ¹
Honours (Geology, Environmental Geoscience)	3.00 ¹	3.00 ¹
Honours (Geophysics)	2.80 ¹	2.80 ¹
General (Earth Sciences)	2.00 ¹	2.00 ¹

¹ In addition to the minimum degree grade point average noted in this chart, specific courses (with minimum grades) are required for entry and these are noted in the program chart for each program.

Earth Sciences Graduation Requirements (p.)

Degree Program	Minimum Degree Grade Point Average
Major (Geology, Environmental Geoscience) (120)	2.50
Major (Geophysics) (120)	2.50
Honours (Geology, Environmental Geoscience) (120)	3.00
Honours (Geophysics) (120)	2.80
General (Earth Sciences) (90)	2.00

Degree Requirements

Course	Title	Hours
Year 1		
GEOL 1340	The Dynamic Earth (B)	3
MATH 1210	Techniques of Classical and Linear Algebra ²	3
CHEM 1100	Introductory Chemistry 1: Atomic and Molecular Structure and Energetics	3
CHEM 1120	Introduction to Chemistry Techniques	3
One of the following: ¹		3
GEOL 1400	Time-Trekker's Travelog: Our Evolving Earth	
GEOL 1410	Natural Disasters and Global Change	
GEOL 1420	Exploring the Planets	
One of the following:		3
PHYS 1050	Physics 1: Mechanics (B)	
PHYS 1020	General Physics 1 (B+)	
One of the following:		3
PHYS 1070	Physics 2: Waves and Modern Physics (B)	
PHYS 1030	General Physics 2 (B+)	
One of the following:		3
MATH 1510	Applied Calculus 1 (B) ²	
MATH 1500	Introduction to Calculus (B)	
One of the following:		3
MATH 1710	Applied Calculus 2 (B) ²	
MATH 1700	Calculus 2 (B)	
		Hours
		27
Year 2		
GEOL 2060	Introductory Geophysics	3
GEOL 2440	Structural Geology 1	3
GEOL 2500	Introduction to Mineralogy	3
GEOL 2520	Igneous and Metamorphic Petrology	3
GEOL 2530	Introductory Sedimentary Petrology and Stratigraphy	3
GEOL 2800	Optics and Spectroscopy of Minerals	3
MATH 2130	Engineering Mathematical Analysis 1 ⁴	3
MATH 2132	Engineering Mathematical Analysis 2 ⁴	3
3 credit hours from the Faculty of Arts ⁶		3
		Hours
		27
Years 3-4		
GEOL 3130	Communication Methods in the Geological Sciences	3
GEOL 3740	Exploration Seismology	3

GEOL 3810	Applied Geophysics	3
GEOL 4250	Theory and Application of Geophysical Inversion Methods	3
GEOL 4320	Physics of the Earth: Seismology and Heat Flow	3
GEOL 4330	Physics of the Earth: Geomagnetism and Gravity	3
GEOL 4670	Global Tectonics	3
GEOL 4740	Geophysics Field Course ⁵	6
GEOL 4810	Geophysical Data Analysis	3
GEOL 4870	Honours Thesis	6
COMP 1012	Computer Programming for Scientists and Engineers	3
PHYS 2600	Electromagnetic Field Theory	3
MATH 3132	Engineering Mathematical Analysis 3 ⁴	3
3 credit hours from Physical Science Course Electives List		3
6 credit hours from Earth Science Course Electives List		6
3 credit hours from the Faculty of Arts ⁶		3
Enough elective credit to total 120 credit hours for the program		9
Hours		66
Total Hours		120

¹ GEOL 1400 is highly recommended to be taken in Year 1, but GEOL 1410 or GEOL 1420 may be substituted.

² MATH 1690 may be taken in place of MATH 1230 or MATH 1500 (or MATH 1510) and MATH 1700 (or MATH 1710); MATH 1300 may be taken in place of MATH 1210. Selection of MATH 1300 or MATH 1210 will determine the prerequisite background for Mathematics courses required in years 2, 3 and 4.

³ The former CHEM 1300 may be used in lieu of CHEM 1100 and CHEM 1120. CHEM 1122 and CHEM 1126 may be used in lieu of CHEM 1120.

⁴ MATH 2720 may be taken in place of MATH 2130. PHYS 2496 may be taken in place of MATH 2132. PHYS 3496 may be taken in place of MATH 3132. Normally, students select (MATH 2130, MATH 2132, and MATH 3132) or (MATH 2720, PHYS 2496, and PHYS 3496).

⁵ GEOL 4740 will normally be taken immediately following the Winter term examinations and will continue for approximately three weeks. Registration will show as Summer Term. **Note:** Students are expected to contribute to the costs of transportation, lodging, and food. Contact the Department for further information.

⁶ The course selected must meet the University's Written English requirement (<https://catalog.umanitoba.ca/undergraduate-studies/general-academic-regulations/#Residence-Written-English>).

The courses required in this program will satisfy the University Mathematics Requirement (<https://catalog.umanitoba.ca/undergraduate-studies/general-academic-regulations/#Residence-Written-English>).

Important: The Honours and Major programs need not be completed in the manner prescribed in the chart above. The chart indicates one possible arrangement of the required courses and is meant to be a guide around which students can plan their program. (Letters in brackets indicate the minimum prerequisite standing required for further study)

Notes:

- To fulfil prerequisite requirements, a grade of 'C' must be achieved in any course stipulated as prerequisite to a further course in Earth Sciences, unless a higher prerequisite grade is stipulated in a course description.
- All courses are not offered every year. The course schedule for the current academic term is available from the Class Schedule (https://aurora.umanitoba.ca/banprod/bwckschd.p_disp_dyn_sched/) in Aurora
- Students registering in certain courses may be required to pay a portion of the costs associated with field trips. For details, contact the Department general office.
- Equivalent courses offered through Université de Saint-Boniface may be used in lieu of the specified courses identified in the degree program chart.

Geophysics Electives Lists

Geophysics Course Electives List

- Major students must complete a minimum of 9 credit hours from the following courses:

Course	Title	Hours
GEOL 4250	Theory and Application of Geophysical Inversion Methods	3
GEOL 4320	Physics of the Earth: Seismology and Heat Flow	3
GEOL 4330	Physics of the Earth: Geomagnetism and Gravity	3
GEOL 4920	Technical Report	3

Earth Science Course Electives List

- Honours students are required to complete a minimum of 6 credit hours;
- Major students must complete a minimum of 6 credit hours from the following courses:

Course	Title	Hours
GEOL 2390	Environmental Geology	3
GEOL 2570	Energy and Mineral Resources	3
GEOL 2770	Principles of Inorganic Geochemistry	3
GEOL 3110	Petrogenesis of Igneous Rocks	3
GEOL 3420	Engineering Geology	3
GEOL 3440	Structure and Metamorphism	3
GEOL 3450	Hydrogeology	3
GEOL 3490	Glacial Geology	3
GEOL 3750	Geology and Geophysics of the Planets	3
GEOL 3900	Sedimentology	3
GEOL 3910	Introduction to Field Mapping	3
GEOL 4270	Advanced Studies in Earth Sciences	3
GEOL 4300	Mineral Deposits	3
GEOL 4360	Mineral Exploration Techniques	3
GEOL 4370	Global Change	3
GEOL 4380	Mineral Resource Development	3
GEOL 4520	Petroleum Geology	3
GEOL 4890	Basin Analysis	3
GEOL 4910	Advanced Field Mapping	3
ENVR 2550	Environmental Chemistry	3

GEOG 2300	Atmospheric Thermodynamics, Clouds and Precipitation (PS)	3
GEOG 2310	Introduction to Process Hydrology (PS)	3
GEOG 2550	Geomorphology (PS)	3
GEOG 2930	Introduction to Oceanography	3
GEOG 3200	Introduction to Remote Sensing (TS)	3
GEOG 3310	Atmospheric Dynamics, Storms and Radar (PS)	3
GEOG 3320	Introduction to Microclimates and Micrometeorology (PS)	3
GEOG 3730	Geographic Information Systems (TS)	3

Any course from the Geophysics Course Electives List or the Physical Science Course Electives List not already taken, or any advanced level Geological Sciences, Physics or Mathematics course(s) approved by department

Physical Science Course Electives List

Course	Title	Hours
ASTR 2000	Foundations of Astrophysics	3
ASTR 3180	Stars	3
CHEM 2600	Physical Chemistry 1	3
CHEM 3600	Physical Chemistry 2	3
PHYS 2152	Modern Physics for Engineers	3
PHYS 2260	Optics	3
PHYS 2610	Circuit Theory and Introductory Electronics	3
PHYS 2650	Classical Mechanics 1	3
PHYS 3630	Electro - and Magnetostatic Theory	3
PHYS 3670	Classical Thermodynamics	3
MECH 2262	Fundamentals of Fluid Mechanics	4
Or alternate physical science course(s) approved by department		