

# GEOPHYSICS, B.SC. HONOURS

## Degree Requirements

Course	Title	Hours
<b>Year 1</b>		
GEOL 1340	The Dynamic Earth (B)	3
MATH 1210	Techniques of Classical and Linear Algebra <sup>2</sup>	3
CHEM 1100	Introductory Chemistry 1: Atomic and Molecular Structure and Energetics	3
CHEM 1120	Introduction to Chemistry Techniques	3
One of the following: <sup>1</sup>		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) <sup>2</sup>	
MATH 1500	Introduction to Calculus (B)	
One of the following:		3
MATH 1710	Applied Calculus 2 (B) <sup>2</sup>	
MATH 1700	Calculus 2 (B)	
	<b>Hours</b>	<b>27</b>
<b>Year 2</b>		
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 <sup>4</sup>	3
MATH 2132	Engineering Mathematical Analysis 2 <sup>4</sup>	3
3 credit hours from the Faculty of Arts <sup>6</sup>		3
	<b>Hours</b>	<b>27</b>
<b>Years 3-4</b>		
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 <sup>5</sup>	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 <sup>4</sup>	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 <sup>6</sup>		3
Enough elective credit to total 120 credit hours for the program		9
	<b>Hours</b>	<b>66</b>
	<b>Total Hours</b>	<b>120</b>

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

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>4</sup> 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).

<sup>5</sup> 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.

<sup>6</sup> 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