EARTH OBSERVATION AND GEOGRAPHIC INFORMATION SCIENCE (EO)

Department of Geography, Environment and Geomatics, College of Social and Applied Human Sciences

In this program, students gain breadth and depth in environmental science and build hands-on experience in the fields of earth observation, geomatics and geographic information science. Graduates of the program will have a unique background and skillset that combines knowledge of earth processes and environmental systems with technical know-how in remote sensing, spatial analysis and data science.

Major Requirements (Honours)

This is a major within the degree: Bachelor of Science in Environmental Sciences.

Code	Title	Credits
Semester 1		
BIOL*1070	Discovering Biodiversity	0.50
CHEM*1040	General Chemistry I	0.50
ENVS*1030	Introduction to Environmental Sciences	1.00
MATH*1080	Elements of Calculus I	0.50
Semester 2		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1050	General Chemistry II	0.50
FARE*1040	Introduction to Environmental Economics, Law and Policy	1.00
GEOG*1300	Introduction to the Biophysical Environment	0.50
Semester 3		
CIS*1300	Programming	0.50
GEOG*2000	Geomorphology	0.50
GEOG*2420	The Earth From Space	0.50
GEOG*2460	Analysis in Geography	0.50
0.50 electives or restricted electives		0.50
Semester 4		
GEOG*2110	Climate and the Biophysical Environment	0.50
GEOG*2210	Environment and Resources	0.50
GEOG*2480	Mapping and GIS	0.50
1.00 electives or restricted electives		1.00
Semester 5		
GEOG*3000	Fluvial Processes	0.50
GEOG*3480	GIS and Spatial Analysis	0.50
1.50 electives or restricted electives		1.50
Semester 6		
GEOG*3420	Remote Sensing of the Environment	0.50
GEOG*3610	Environmental Hydrology	0.50
1.50 electives or restricted electives		1.50
Semester 7		
ENVS*4001	Project in Environmental Sciences	0.50
2.00 electives or restricted electives		2.00
Semester 8		
ENVS*4002	Project in Environmental Sciences	0.50
GEOG*4480	Applied Geomatics	1.00
1.00 electives or restricted electives		1.00

Restricted Electives

Students are required to complete 5.00 restricted electives credits as prescribed by lists A-D below.

LIST A: PHYSICS & COMPUTATION

Code	Title	Credits
Select 1.00 credits from:		
CIS*2500	Intermediate Programming	0.50
MATH*1090	Elements of Calculus II	0.50
MATH*2130	Numerical Methods	0.50
PHYS*1080	Physics for Life Sciences	0.50
or PHYS*1300	Fundamentals of Physics	

LIST B: PHYSICAL GEOGRAPHY & EARTH SCIENCES

Code	Title	Credits
Select 1.50 credits from:		
ENVS*2060	Soil Science	0.50
ENVS*2240	Fundamentals of Environmental Geology	0.50
GEOG*3110	Biogeography	0.50
ENVS*2250	Geology of Natural Disasters	0.50
or GEOG*1350	Earth: Hazards and Global Change	

LIST C: DATA, ANALYTICS & DECISION-MAKING

Code	Title	Credits
Select 1.50 credits from:		
ENVS*3340	Environmental Data Analysis	0.50
GEOG*3020	Global Environmental Change	0.50
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
GEOG*3430	Geomatics for Environmental Analysis	0.50
GEOG*3440	GIS for Decision-Making	0.50
GEOG*4230	Environmental Impact Assessment	0.50

LIST D: ADVANCED RESEARCH & REAL-WORLD APPLICATIONS

Code	Title	Credits
Select 1.00 credits from:		
ENVS*4390	Soil Variability and Land Evaluation	0.50
GEOG*4110	Environmental Systems Analysis	1.00
GEOG*4150	Catchment Processes	0.50
GEOG*4690	Geography Field Course	1.00
GEOG*4990	Independent Study in Geography	0.50

Credit Summary

(20.00 Total Credits)

Code	Title	Credits
Environmental Sciences Core		7.00
Earth Observation & Geographic Information Science Required Courses		5.50
Earth Observation & Geographic Information Science Restricted Electives		5.00
Free Electives		2.50
Total Credits		**20**

Students are reminded that 6.00 credits of their B.Sc.(Env.) degree must be at the 3000-4000 level**,** and no program may include more than 7.00 credits at the 1000 level.

Students are encouraged to plan each year carefully and seek advice from their faculty advisor about choices and course selection.

Co-op Requirements (Honours)

This is a major within the degree: Bachelor of Science in Environmental Sciences.

The Co-op program in Earth Observation and Geographic Information Science is a five year program including four work terms. Students must complete a Fall, Winter and Summer work term, and must follow the academic work schedule as outlined below (also found on the Co-operative Education website: https://www.recruitguelph.ca/cecs/). Please refer to the Co-operative Education program policy with respect to adjusting this schedule.

Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2 COOP*1100	Off
2	Academic Semester 3	Academic Semester 4	COOP*1000 Work Term I
3	Academic Semester 5	Academic Semester 6	Off
4	COOP*2000 Work Term II	COOP*3000 Work Term III	COOP*4000 Work Term IV
5	Academic Semester 7	Academic Semester 8	N/A

Please refer to the Co-operative Education program policy with respect to work term performance grading, work term report grading and program completion requirements.

For additional program information students should consult with their Co-op Co-ordinator and Co-op Faculty Advisor, listed on the Co-operative Education web site.

Credit Summary

(22.00 Total Credits)

Code	Title	Credits
Environmental Sciences Core		7.00
Earth Observation & Geographic Information Science Required Courses		5.50
Earth Observation & Geographic Information Science Restricted Electives		5.00
Free Electives		2.50
Co-op Work Terms		2.00
Total Credits		**22**

Students are reminded that 6.00 credits of their B.Sc.(Env.) degree must be at the 3000-4000 level**,** and no program may include more than 7.00 credits at the 1000 level.

A minimum of three Co-op work terms including a Summer, Fall and Winter are necessary to complete the Co-op requirement.

Students are encouraged to plan each year carefully and seek advice from their faculty advisor about choices and course selection.

Recommended Program Sequence

Code	Title	Credits
Semester 1 - Fall		
BIOL*1070	Discovering Biodiversity	0.50
CHEM*1040	General Chemistry I	0.50
ENVS*1030	Introduction to Environmental Sciences	1.00
MATH*1080	Elements of Calculus I	0.50
Semester 2 - Winter		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1050	General Chemistry II	0.50
COOP*1100	Introduction to Co-operative Education	0.00
FARE*1040	Introduction to Environmental Economics, Law and Policy	1.00
GEOG*1300	Introduction to the Biophysical Environment	0.50
Summer Semester		
No academic semester or work term		
Semester 3 - Fall		
CIS*1300	Programming	0.50
GEOG*2000	Geomorphology	0.50
GEOG*2420	The Earth From Space	0.50
GEOG*2460	Analysis in Geography	0.50
0.50 electives or restricted electives		0.50
Semester 4 - Winter		
GEOG*2110	Climate and the Biophysical Environment	0.50
GEOG*2210	Environment and Resources	0.50
GEOG*2480	Mapping and GIS	0.50
1.00 electives or restricted electives		1.00
Summer Semester		
COOP*1000	Co-op Work Term I	0.50
Semester 5 - Fall		
GEOG*3000	Fluvial Processes	0.50
GEOG*3480	GIS and Spatial Analysis	0.50
1.50 electives or restricted electives		1.50
Semester 6 - Winter		
GEOG*3420	Remote Sensing of the Environment	0.50
GEOG*3610	Environmental Hydrology	0.50
1.50 electives or restricted electives		1.50
Summer Semester		
No academic semester or work term		

Fall Semester		
COOP*2000	Co-op Work Term II	0.50
Winter Semester		
COOP*3000	Co-op Work Term III	0.50
Summer Semester		
COOP*4000	Co-op Work Term IV	0.50
Semester 7 - Fall		
ENVS*4001	Project in Environmental Sciences	0.50
2.00 electives or restricted electives		2.00
Semester 8		
ENVS*4002	Project in Environmental Sciences	0.50
GEOG*4480	Applied Geomatics	1.00
1.00 electives or restricted electives		1.00

Restricted Electives

Students are required to complete 5.00 restricted electives credits as prescribed by lists A-D below.

LIST A: PHYSICS & COMPUTATION

Code	Title	Credits
Select 1.00 credits from:		
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MATH*1090	Elements of Calculus II	0.50
MATH*2130	Numerical Methods	0.50
PHYS*1080	Physics for Life Sciences	0.50
or PHYS*1300	Fundamentals of Physics	

LIST B: PHYSICAL GEOGRAPHY & EARTH SCIENCES

Code	Title	Credits
Select 1.50 credits from:		
ENVS*2060	Soil Science	0.50
ENVS*2240	Fundamentals of Environmental Geology	0.50
GEOG*3110	Biogeography	0.50
ENVS*2250	Geology of Natural Disasters	0.50
or GEOG*1350	Earth: Hazards and Global Change	

LIST C: DATA, ANALYTICS & DECISION-MAKING

Code	Title	Credits
Select 1.50 credits from:		
ENVS*3340	Environmental Data Analysis	0.50
GEOG*3020	Global Environmental Change	0.50
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
GEOG*3430	Geomatics for Environmental Analysis	0.50
GEOG*3440	GIS for Decision-Making	0.50
GEOG*4230	Environmental Impact Assessment	0.50

LIST D: ADVANCED RESEARCH & REAL-WORLD APPLICATIONS

Code	Title	Credits
Select 1.00 credits from:		
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GEOG*4110	Environmental Systems Analysis	1.00
GEOG*4150	Catchment Processes	0.50
GEOG*4690	Geography Field Course	1.00
GEOG*4990	Independent Study in Geography	0.50