

ENVIRONMENTAL ENGINEERING (ENVE)

College of Engineering

Environmental engineering requires a deep understanding of the pressures on local environments and the planet caused by human activities. Environmental engineers develop solutions to meet human needs while protecting environmental quality and natural resources for future generations. Students in our program are challenged to work towards solutions that equitably distribute opportunities and resources while ensuring that the less affluent or powerful do not suffer greater risks and harms due to environmental degradation. The program includes analysis, monitoring, design and simulation of environmental systems. It prepares graduates to: remediate contaminated sites; manage wastes to recover resources and minimize risks to human health and the environment; deliver safe drinking water; protect indoor and outdoor air quality; design products, processes and systems that minimize environmental impacts and use of water, energy and materials; and protect environmental quality to support healthy communities.

Major Requirements (Honours)

This is a major within the degree: Bachelor of Engineering.

Credit Summary (23.00 Total Credits)

Code	Title	Credits
Required Core Courses		18.50
Technical Electives		3.00
Complementary Studies Electives ¹		1.50
Total Credits		23

¹ Consult BENG degree overview page for a full list of courses eligible for Complementary Studies Electives.

All students are admitted into the Co-op stream. Students who withdraw from the Co-op stream must speak with their Academic Advisor about completing the other program requirements. At least one summer academic semester will be required for students who complete the non-Co-op stream.

Core Courses

Code	Title	Credits
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1040	General Chemistry I	0.50
CHEM*1050	General Chemistry II	0.50
CIS*1500	Introduction to Programming	0.50
ENGG*1100	Engineering and Design I	0.75
ENGG*1210	Engineering Mechanics I	0.50
ENGG*1500	Engineering Analysis	0.50
ENGG*2230	Fluid Mechanics	0.50
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2560	Environmental Engineering Systems	0.50
ENGG*2800	Civil Engineering Sustainability and Design	0.75
ENGG*2820	Material Science for Civil Engineers	0.50

ENGG*3100	Engineering and Design III	0.75
ENGG*3180	Air Quality	0.50
ENGG*3220	Groundwater Engineering	0.50
ENGG*3240	Engineering Economics	0.50
ENGG*3260	Thermodynamics	0.50
ENGG*3430	Heat and Mass Transfer	0.50
ENGG*3440	Process Control	0.50
ENGG*3470	Mass Transfer Operations	0.50
ENGG*3590	Water Quality	0.50
ENGG*3650	Hydrology and Hydraulics	0.50
ENGG*3670	Soil Mechanics and Site Characterization	0.50
ENGG*3880	Field Methods in Civil, Environmental and Water Resources Engineering	0.25
ENGG*4000	Proposal for Engineering Design IV	0.00
ENGG*4130	Environmental Engineering Design IV	1.00
ENGG*4340	Solid and Hazardous Waste Management	0.50
ENGG*4960	Water Infrastructure Design for Cities	0.50
MATH*1200	Calculus I	0.50
MATH*1210	Calculus II	0.50
MATH*2130	Numerical Methods	0.50
MATH*2270	Applied Differential Equations	0.50
PHYS*1010	Introductory Electricity and Magnetism	0.50
PHYS*1130	Physics with Applications	0.50
STAT*2120	Probability and Statistics for Engineers	0.50
ENGG*2540	Water and Climate Justice	0.50
or HIST*1250	Science and Technology in a Global Context	

Technical Electives

Some courses appear on both ENVE-1 and ENVE-2 Technical Elective Lists. Please note courses can only satisfy requirements from one of the lists and may not be double counted.

Code	Title	Credits
ENVE-1: Environmental Engineering Electives		
Select 1.00 credits from the following:		
BIOL*1070	Discovering Biodiversity	0.50
BIOM*2000	Concepts in Human Physiology	0.50
ENGG*2160	Engineering Mechanics II	0.50
ENGG*3080	Energy Resources and Technologies	0.50
ENGG*3250	Energy Management and Utilization	0.50
ENGG*3340	Geographic Information Systems in Environmental Engineering	0.50
ENGG*4070	Life Cycle Assessment for Sustainable Design	0.50
ENGG*4230	Energy Conversion	0.75
ENGG*4240	Site Remediation	0.50
ENGG*4250	River Hydraulic Design for Sustainability and Resiliency	0.50
ENGG*4440	Computational Fluid Dynamics	0.50
ENGG*4510	Assessment and Management of Risk	0.50
ENGG*4580	Sustainable Energy Systems Design	0.75
ENGG*4760	Biological Wastewater Treatment Design	0.50
ENGG*4770	Physical and Chemical Water and Wastewater Treatment Design	0.50

ENGG*4810	Control of Atmospheric Particulates	0.50
ENGG*4820	Atmospheric Emission Control: Combustion Systems	0.50
ENVS*1060	Discovering Planet Earth	0.50
ENVS*2030	Meteorology and Climatology	0.50
FOOD*2010	Principles of Food Science	0.50
GEOG*1350	Earth: Hazards and Global Change	0.50
GEOG*2480	Mapping and GIS	0.50
MICR*2420	Introduction to Microbiology and Immunity	0.50

ENVE-2: Environmental Engineering Electives

Select 2.00 credits from the following list of all ENVE-2 Electives:

Select at least 0.50 credits from the following:

ENGG*4810	Control of Atmospheric Particulates	0.50
ENGG*4820	Atmospheric Emission Control: Combustion Systems	0.50

Select at least 0.50 credits from the following:

ENGG*4760	Biological Wastewater Treatment Design	0.50
ENGG*4770	Physical and Chemical Water and Wastewater Treatment Design	0.50

Select additional 1.00 credits from ENVE-2 courses above or below including the following:

ENGG*4070	Life Cycle Assessment for Sustainable Design	0.50
ENGG*4240	Site Remediation	0.50
ENGG*4510	Assessment and Management of Risk	0.50

Co-op Requirements (Honours)

This is a major within the degree: Bachelor of Engineering.

The Co-op program in Environmental Engineering is a five year program, including five work terms. Students must follow the academic work schedule as outlined below (also found on the Co-operative Education website: <https://www.recruitguelph.ca/cecs/>).

Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2	Off
2	Academic Semester 3 COOP*1100	Academic Semester 4	COOP*1000 Work Term I
3	COOP*2000 Work Term II	Academic Semester 5	Academic Semester 6
4	COOP*3000 Work Term III	COOP*4000 Work Term IV	COOP*5000 Work Term V
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

(25.50 Total Credits)

Code	Title	Credits
Required Core Courses		18.50
ENVE-1	Environmental Engineering Electives	1.00
ENVE-2	Environmental Engineering Electives	2.00
Complementary Studies Electives		1.50
Co-op Work Terms		2.50
Total Credits		25.50

Recommended Program Sequence

Code	Title	Credits
Semester 1 - Fall		
CHEM*1040	General Chemistry I	0.50
ENGG*1100	Engineering and Design I	0.75
ENGG*1500	Engineering Analysis	0.50
MATH*1200	Calculus I	0.50
PHYS*1130	Physics with Applications	0.50
Semester 2 - Winter		
CHEM*1050	General Chemistry II	0.50
CIS*1500	Introduction to Programming	0.50
ENGG*1210	Engineering Mechanics I	0.50
MATH*1210	Calculus II	0.50
PHYS*1010	Introductory Electricity and Magnetism	0.50
Summer Semester		
No academic semester or work term		
Semester 3 - Fall		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
COOP*1100	Introduction to Co-operative Education	0.00
ENGG*2230	Fluid Mechanics	0.50
ENGG*2800	Civil Engineering Sustainability and Design	0.75
ENGG*2820	Material Science for Civil Engineers	0.50
MATH*2270	Applied Differential Equations	0.50
Semester 4 - Winter		
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2560	Environmental Engineering Systems	0.50
ENGG*3670	Soil Mechanics and Site Characterization	0.50
STAT*2120	Probability and Statistics for Engineers	0.50
ENGG*2540	Water and Climate Justice	0.50
or HIST*1250	Science and Technology in a Global Context	
0.50 restricted electives		0.50
Summer Semester		
COOP*1000	Co-op Work Term I	0.50
Fall Semester		
COOP*2000	Co-op Work Term II	0.50
Semester 5 - Winter		
ENGG*3180	Air Quality	0.50
ENGG*3220	Groundwater Engineering	0.50
ENGG*3260	Thermodynamics	0.50
ENGG*3590	Water Quality	0.50
ENGG*3650	Hydrology and Hydraulics	0.50

MATH*2130	Numerical Methods	0.50
Semester 6 - Summer		
ENGG*3100	Engineering and Design III	0.75
ENGG*3240	Engineering Economics	0.50
ENGG*3430	Heat and Mass Transfer	0.50
ENGG*3440	Process Control	0.50
ENGG*3880	Field Methods in Civil, Environmental and Water Resources Engineering	0.25
ENGG*4960	Water Infrastructure Design for Cities	0.50
Fall Semester		
COOP*3000	Co-op Work Term III	0.50
Winter Semester		
COOP*4000	Co-op Work Term IV	0.50
Summer Semester		
COOP*5000	Co-op Work Term V	0.50
Semester 7 - Fall		
ENGG*3470	Mass Transfer Operations	0.50
ENGG*4000	Proposal for Engineering Design IV	0.00
ENGG*4340	Solid and Hazardous Waste Management	0.50
1.50 restricted electives		1.50
Semester 8 - Winter		
ENGG*4130	Environmental Engineering Design IV	1.00
2.00 restricted electives		2.00

Restricted Electives

(see Program Guide for more information)

The Engineering Program requires Environmental Engineering students to complete the following combination of elective [credits, totaling a minimum of 4.50 credits, credits](#) to complete their [program, program](#):

[Some courses appear on both ENVE-1 and ENVE-2 Technical Elective Lists. Please note courses can only satisfy requirements from one of the lists and may not be double counted](#)

Code	Title	Credits
Credits 1.50 credits from Complementary Studies Electives:		
Consult the Program Guide for a full list of courses eligible for Complementary Studies Electives.		
1.00 credits from ENVE-1: Environmental Engineering Electives		
BIOL*1070	Discovering Biodiversity	0.50
BIOM*2000	Concepts in Human Physiology	0.50
ENGG*2160	Engineering Mechanics II	0.50
ENGG*3080	Energy Resources and Technologies	0.50
ENGG*3250	Energy Management and Utilization	0.50
ENGG*3340	Geographic Information Systems in Environmental Engineering	0.50
ENGG*4070	Life Cycle Assessment for Sustainable Design	0.50
ENGG*4230	Energy Conversion	0.75
ENGG*4240	Site Remediation	0.50
ENGG*4250	River Hydraulic Design for Sustainability and Resiliency	0.50
ENGG*4440	Computational Fluid Dynamics	0.50
ENGG*4510	Assessment and Management of Risk	0.50

ENGG*4580	Sustainable Energy Systems Design	0.75
ENGG*4760	Biological Wastewater Treatment Design	0.50
ENGG*4770	Physical and Chemical Water and Wastewater Treatment Design	0.50
ENGG*4810	Control of Atmospheric Particulates	0.50
ENGG*4820	Atmospheric Emission Control: Combustion Systems	0.50
ENVS*1060	Discovering Planet Earth	0.50
ENVS*2030	Meteorology and Climatology	0.50
FOOD*2010	Principles of Food Science	0.50
GEOG*1350	Earth: Hazards and Global Change	0.50
GEOG*2480	Mapping and GIS	0.50
MICR*2420	Introduction to Microbiology and Immunity	0.50

2.00 credits from ENVE-2: Environmental Engineering Electives

Must take at least one of:

ENGG*4810	Control of Atmospheric Particulates	0.50
ENGG*4820	Atmospheric Emission Control: Combustion Systems	0.50

Must take at least one of:

ENGG*4760	Biological Wastewater Treatment Design	0.50
ENGG*4770	Physical and Chemical Water and Wastewater Treatment Design	0.50

Remaining 1.00 credits from ENVE-2 courses including options below:

ENGG*4070	Life Cycle Assessment for Sustainable Design	0.50
ENGG*4240	Site Remediation	0.50
ENGG*4510	Assessment and Management of Risk	0.50

Minor Requirements (Honours)

This minor is only available to students registered in the degree: Bachelor of Engineering.

This minor cannot be combined with a major in Environmental Engineering.

A Minor in Environmental Engineering consists of at least 5.00 course credits. A maximum of 2.50 course credits taken as part of the Environmental Engineering Minor may also be applied toward the requirements of the B.Eng. Major specialization.

Code	Title	Credits
CHEM*1050	General Chemistry II	0.50
ENGG*2560	Environmental Engineering Systems	0.50
ENGG*3180	Air Quality	0.50
ENGG*3590	Water Quality	0.50
Select at least 2.00 credits from the following:		
BIOC*2580	Introduction to Biochemistry	0.50
CHEM*2700	Organic Chemistry I: Fundamentals	0.50
CHEM*3360	Environmental Chemistry and Toxicology	0.50
ENGG*3080	Energy Resources and Technologies	0.50
ENGG*3250	Energy Management and Utilization	0.50
ENGG*3470	Mass Transfer Operations	0.50
ENGG*4070	Life Cycle Assessment for Sustainable Design	0.50

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ENGG*4240	Site Remediation	0.50
ENGG*4340	Solid and Hazardous Waste Management	0.50
ENGG*4510	Assessment and Management of Risk	0.50
ENGG*4760	Biological Wastewater Treatment Design	0.50
ENGG*4770	Physical and Chemical Water and Wastewater Treatment Design	0.50
ENGG*4810	Control of Atmospheric Particulates	0.50
ENGG*4820	Atmospheric Emission Control: Combustion Systems	0.50
ENVS*2030	Meteorology and Climatology	0.50
Select at least 1.00 credits from the following:		
ECON*2100	Economic Growth and Environmental Quality	0.50
ENVS*2270	Impacts of Climate Change	0.50
GEOG*1220	Explaining Environmental Change	0.50
GEOG*2210	Environment and Resources	0.50
GEOG*3020	Global Environmental Change	0.50
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
PHIL*2070	Philosophy of the Environment	0.50
POLS*3370	Environmental Politics and Governance	0.50
SOC*2280	Society, Knowledge Systems and Environment	0.50