

ENVIRONMENTAL SYSTEMS ENGINEERING, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

It is an interdisciplinary program with two options. One option is Environmental Systems Engineering and it is concerned with the impact of industrial activities on the environment and the choice of cost-effective remediation strategies. The other option is Environmental Health and Safety Engineering and it is concerned with safe and healthful design of industrial systems such that workers are protected from potentially high-risk exposures associated with today's industries. The program is unique as it is designed to address critical environmental, safety and health problems of the basic industries such as those involved in the extraction, conversion, and utilization of energy and mineral resources. The courses are sequenced so that students acquire an appropriate blend of theory, applications, and design and are equipped with the fundamentals necessary to maintain lifelong professional growth. Graduates are prepared to enter both the private and public sectors as environmental systems engineers or health and safety engineers or to pursue further education at the graduate level.

During the first two years, the program shares many common features with other more traditional engineering disciplines. Students then take a series of special courses that introduce engineering concepts in the extractive and process industries. Process engineering and a variety of solid-solid, solid-fluid, and fluid-fluid separations play a major and often dominant role in the prevention and/or remediation of environmental damage or the prevention of health and safety hazards resulting from industrial activity. Students then specialize in the particular problems associated with air, land, or water; environmental health and safety engineering; or select a hybrid program. Specialization is accomplished through a combination of additional designated courses and selection from an extensive list of relevant elective courses. The curriculum is structured so as to integrate design concepts into the various subject areas covered in the program.

The human, societal, economic, ethical, and regulatory aspects of the industrial impact on the environment and on the workers themselves are addressed through a combination of specific courses and components of other more general courses. This aspect of the program is designed to provide students with a deeper understanding, both of the impact of environmental degradation on society and of the effects on industrial activity of society's demands for protection of workers and the environment. The program culminates with the capstone design course, which is an integrated, problem-based, multi-faceted project in which students, working in a team setting, utilize fundamental concepts to design an environmental remediation system or an environmental health and safety protection system (or incorporate these design requirements into other associated designs).

What is Environmental Systems Engineering?

Protecting the health of workers and the environment, often during challenging projects, is the job of an environmental systems engineer. They understand, demonstrate, and apply systems engineering principles

to environmental issues related to industrial activities and to the extraction of energy and mineral resources. These engineers work closely with project leaders, utilizing process systems engineering and environmental systems approaches, to evaluate and address the environmental impact of projects. Often these engineers work in the government sector and offer expertise in big-picture projects facing cities, regions, nations, and the globe.

You Might Like This Program If...

- You want to minimize the environmental impact of industrial activities and protect the health of workers.
- You have strong math, science, and engineering skills and want to apply that to improving worker and environmental safety.

Entrance to Major

In addition to the minimum grade point average (GPA) requirements described in the University Policies, the Environmental Systems Engineering entrance-to-major requirement must also be completed with a minimum grade of C: MATH 140, MATH 141, MATH 251, PHYS 211, PHYS 212, CHEM 110.

Degree Requirements

For the Bachelor of Science degree in Environmental Systems Engineering, a minimum of 131 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	113-114

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GWS courses; 6 credits of GQ courses; 9 credits of GN courses; 3 credits of GS courses.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<http://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Knowledge Domains

- **Arts (GA):** 6 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 6 credits
- **Social and Behavioral Sciences (GS):** 6 credits
- **Natural Sciences (GN):** 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)

- **Inter-Domain or Approved Linked Courses:** 6 credits

University Degree Requirements**First Year Engagement**

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 202	Fundamentals of Organic Chemistry I	3
EMSC 100S	Earth and Mineral Sciences First-Year Seminar ¹	3

EMCH 211	Statics	3
EMCH 212	Dynamics	3
EME 460	Geo-resource Evaluation and Investment Analysis	3
ENVSE 404	Surface and Interfacial Phenomena in Environmental Systems	3
ENVSE 406	Sampling and Monitoring of the Geo-Environment	3
ENVSE 450	Environmental Health and Safety	3
ENVSE 470	Engineering Risk Analysis	3
ENVSE 480	Environmental Systems Engineering Process Design	3
GEOSC 452	Hydrogeology	3
MATH 251	Ordinary and Partial Differential Equations	4
MNG 401	Introduction to Mining Operations	1
PHYS 212	General Physics: Electricity and Magnetism	4
PNG 411	Introduction to Petroleum and Natural Gas Extraction	1

Prescribed Courses: Require a grade of C or better

CE 370	Introduction to Environmental Engineering	3
CHEM 110	Chemical Principles I	3
EME 301	Thermodynamics in Energy and Mineral Engineering	3
EME 303	Fluid Mechanics in Energy and Mineral Engineering	3
ENGL 202C	Effective Writing: Technical Writing	3
ENVSE 427	Pollution Control in the Process Industries	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MNPR 301	Elements of Mineral Processing	3
PHYS 211	General Physics: Mechanics	4

Additional Courses

ENGL 15	Rhetoric and Composition	3
or ENGL 30	Honors Freshman Composition	
MATH 220	Matrices	2
or MATH 231	Calculus of Several Variables	
Select 3-4 credits of the following:		3-4
CMPSC 201	Programming for Engineers with C++	
CMPSC 203	Introduction to Spreadsheets and Databases	

Additional Courses: Require a grade of C or better

GEOSC 1	Physical Geology	3
or GEOSC 71	Physical Geology for Engineers	

Supporting Courses and Related Areas

Select 6 credits in consultation with adviser. Students who complete Basic ROTC may substitute 6 credits of ROTC for 3 credits of GHW courses and 3 credits of Supporting Courses and Related Areas.

Requirements for the Option

Select an option 16

¹ The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 can be substituted for EMSC 100S.

Requirements for the Option**Environmental Systems Engineering Option (16 credits)**

Code	Title	Credits
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Prescribed Courses

EGEE 470	Air Pollutants from Combustion Sources	3
ENVSE 412	Environmental Systems Engineering Laboratory	1
GEOG 30N	Environment and Society in a Changing World	3
MICRB 106	Elementary Microbiology	3

Additional Courses

Select one of the following:		3
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ENVSE 408	Contaminant Hydrology	
METEO 455	Atmospheric Dispersion	
SOILS 401	Soil Composition and Physical Properties	

Select one of the following:		3
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METEO 454	Introduction to Micrometeorology	
MNPR 401	Mineral Process Engineering	
MNPR 426	Aqueous Processing	

Environmental Health and Safety Engineering Option (16 credits)

Code	Title	Credits
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Prescribed Courses

BIOL 141	Introductory Physiology	3
ENVSE 400	Safety Engineering	3
ENVSE 440	Industrial Ventilation for Contaminant Control	3
ENVSE 457	Industrial Hygiene Measurements	3
ENVSE 458	Industrial Hygiene Measurements Laboratory	1
PSYCH 100	Introductory Psychology	3

Integrated B.S. in Environmental Systems Engineering (ENVSE) and M.S. in Energy and Mineral Engineering (EME)

The integrated undergraduate-graduate (IUG) program between the environmental systems engineering undergraduate program and the energy and mineral engineering graduate program enables academically superior and research-focused ENVSE undergraduate students to also obtain an M.S. degree in Energy and Mineral Engineering in five years of study. Students should refer to the Energy and Mineral Engineering graduate program in the Graduate Program Bulletin (<http://bulletins.psu.edu/graduate/programs/majors/energy-mineral-engineering>) for the IUG admission and degree requirements.

Integrated B.S. in Environmental Systems Engineering (ENVSE) and M.S. in Energy and Mineral Engineering (EME) Course Substitutions

As many as twelve of the credits required for the master's degree may be applied to both the B.S. and M.S. degrees. A minimum of six credits counted for both the B.S. and M.S. degrees must be at the 500-level. Thesis and culminating/capstone experience credits may not be double counted. The undergraduate degree program officer will determine the specific undergraduate required courses for which the 500-level courses may be used to substitute to meet institutional and accreditation requirements.

Program Educational Objectives

Our graduates will:

- Enter the private or public sectors as environmental systems engineers to solve a broad range of environmental or health and safety problems associated with the resource recovery and general and process industries or pursue an advanced degree.
- Address critical environmental or health and safety problems of the basic industries, especially those involved with the extraction, conversion, and utilization of energy and mineral resources; design effective and economic engineering systems to alleviate such problems, individually and in a team setting; and communicate the results effectively.
- Determine the impact of environmental pollution control on the viability of industrial operations, including health and safety, social, and ethical aspects, and an awareness of environmental regulations; evaluate novel strategies for minimizing pollution control costs in the process industries.
- Recognize the need to maintain professional competency and the value of lifelong learning.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Environmental Systems Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy>)

University Park

William Groves

Program Chair, Environmental Systems Engineering
223 Hosler Building
University Park, PA 16802
814-863-1618
wag10@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2019-20 academic year. To access previous years' suggested academic plans, please visit the archive (<http://bulletins.psu.edu/undergraduate/archive>) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contain suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

Environmental Systems Engineering Option at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
MATH 140 or 140G (GQ) ^{†‡†}	4 MATH 141 or 141G (GQ) ^{†‡†}	4
CHEM 110 (GN) ^{*#†}	3 CHEM 112 (GN)	3
CHEM 111 [†]	1 PHYS 211 (GN) ^{*#†}	4
EMSC 100S (or CAS 100 by substitution) (GWS) ^{††1}	3 ENGL 15, 30, or ESL 15 (GWS) ^{††}	3
GEOG 30N (GN/GS, US/IL) [†]	3	
	14	14

Second Year

Fall	Credits Spring	Credits
PHYS 212 (GN) ^{*#}	4 CHEM 202	3
EMCH 211	3 MATH 220 or 231	2
MATH 251 ^{*#}	4 CMPSC 201, 202, or CMPSC 203	3-4
GEOG 1 or 71 [*]	3 EMCH 212	3
General Education Knowledge Domain	3 MICRB 106	3
	General Education Knowledge Domain	3
	17	17-18

Third Year

Fall	Credits Spring	Credits
EME 301 [*]	3 MNPR 301 [*]	3
EME 303 [*]	3 ENGL 202C (GWS) ^{*††}	3
GEOG 452	3 EGEE 470	3
CE 370 [*]	3 ENVSE 406	3

PNG 411	1 EME 460	3
MNG 401	1 ENVSE 412	1
General Education Knowledge Domain	3 General Education Health and Wellness (GHW) ²	1.5
	17	17.5

Fourth Year

Fall	Credits Spring	Credits
ENVSE 404 (Writing across the curriculum)	3 ENVSE 480	3
ENVSE 427 [*]	3 ENVSE 470	3
ENVSE 450	3 Supporting course from approved department list ^{2,3}	3
Supporting Course from approved department list ^{2,3}	3 Additional course from approved list for option ³	3
Additional course from approved list for option ³	3 General Education Knowledge Domain	3
General Education Knowledge Domain	3 General Education Health and Wellness (GHW)	1.5
	18	16.5

Total Credits 131-132

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

All incoming Schreyer Honors College first-year students at University Park will take ENGL/CAS 137 in the fall semester and ENGL/CAS 138 in the spring semester. These courses carry the GWS designation and replace both ENGL 30 and CAS 100. Each course is 3 credits.

¹ Students who begin their studies at non-UP locations and/or join the college after their first year should substitute CAS 100, CAS 100A, CAS 100B, or CAS 100C (GWS) for EMSC 100S (GWS). EMSC 100S Earth and Mineral Sciences First year Seminar (3) is a required course only for students who begin their studies at UP in the College of Earth and Mineral Sciences.

² Students who complete Basic ROTC may substitute 6 credits of ROTC for 3 credits of GHW courses and 3 credits of Supporting Courses and Related Areas.

³ At least 2 courses (total of 6 credits minimum) of a student's selections for additional courses and supporting courses must be engineering topics courses. These courses should be selected in consultation with an ENVSE faculty adviser. Possible additional courses for the option include: ENVSE 408, SOILS 401, METEO 455, METEO 454, MN PR 401, MN PR 426

Advising Notes:

To enter the major, students need a minimum 2.00 grade point average, third semester standing, and a C or better grade in MATH 140, MATH 141, CHEM 110 and PHYS 211.

Courses required for the major may be offered fall semester only, spring semester only, or both fall and spring semesters. Consult with your adviser and department to discuss your academic progress and course sequencing.

Environmental Systems Engineering Option at Commonwealth Campuses

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits	Spring	Credits
MATH 140 (GQ) ^{*‡#†}	4	MATH 141 (GQ) ^{*‡#†}	4
CHEM 110 (GN) ^{*#†}	3	CHEM 112 (GN)	3
CHEM 111 [†]	1	PHYS 211 (GN) ^{*#†}	4
ENGL 15, 30, or ESL 15 (GWS) ^{††}	3	General Education Knowledge Domain	3
General Education Knowledge Domain	3	General Education Health and Wellness (GHW)	1.5
	14		15.5

Second Year

Fall	Credits	Spring	Credits
PHYS 212 (GN) ^{*#†}	4	CHEM 202	3
EMCH 211	3	MATH 220 or 231	2
MATH 251 ^{*#}	4	CMPSC 201, 202, or CMPSC 203	3-4
CAS 100, 100A, 100B, or 100C (GWS) ^{††1}	3	EMCH 212	3
General Education Knowledge Domain	3	ENGL 202C (GWS) ^{††}	3
		General Education Knowledge Domain	3
	17		17-18

Third Year

Fall	Credits	Spring	Credits
EME 301 [*]	3	MNPR 301 [*]	3
EME 303 [*]	3	CE 370 [*]	3
MICRB 106	3	EGEE 470	3
GEOG 30N (GN/GS, US/IL) [†]	3	ENVSE 406	3
PNG 411	1	EME 460	3

GEOSC 1 or 71 [*]	3	ENVSE 412	1
MNG 401	1		
	17		16
Fourth Year			
Fall	Credits	Spring	Credits
ENVSE 404 (Writing across the curriculum)	3	ENVSE 480	3
ENVSE 427 [*]	3	ENVSE 470	3
ENVSE 450	3	Supporting course from approved department list ^{2,3}	3
GEOSC 452	3	Additional course from approved list for option ³	3
Supporting Course from approved department list ^{2,3}	3	General Education Knowledge Domain	3
Additional course from approved list for option ³	3	General Education Health and Wellness (GHW)	1.5
	18		16.5

Total Credits 131-132

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
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University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

- ¹ Students who begin their studies at non-UP locations and/or join the college after their first year should substitute CAS 100, CAS 100A, CAS 100B, or CAS 100C (GWS) for EMSC 100S (GWS). EMSC 100S Earth and Mineral Sciences First year Seminar (3) is a required course only for students who begin their studies at UP in the College of Earth and Mineral Sciences.
- ² Students who complete Basic ROTC may substitute 6 credits of ROTC for 3 credits of GHW courses and 3 credits of Supporting Courses and Related Areas.
- ³ At least 2 courses (total of 6 credits minimum) of a student's selections for additional courses and supporting courses must be engineering topics courses. These courses should be selected in consultation with an ENVSE faculty adviser. Possible additional courses for the option include: ENVSE 408, SOILS 401, METEO 455, METEO 454, MN PR 401, MN PR 426

Advising Notes:

To enter the major, students need a minimum 2.00 grade point average, third semester standing, and a C or better grade in MATH 140, MATH 141, CHEM 110 and PHYS 211.

Courses required for the major may be offered fall semester only, spring semester only, or both fall and spring semesters. Consult with your adviser and department to discuss your academic progress and course sequencing.

Environmental Health and Safety Option at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits	Spring	Credits
MATH 140 or 140G (GQ) ^{*†#†}	4	MATH 141 or 141G (GQ) ^{*†#†}	4
CHEM 110 (GN) ^{*#†}	3	CHEM 112 (GN)	3
CHEM 111 [†]	1	PHYS 211 (GN) ^{*#†}	4
EMSC 100S (or CAS 100 by substitution) (GWS) ^{††1}	3	ENGL 15, 30, or ESL 15 (GWS) ^{††}	3
PSYCH 100 (GS) [†]	3		
	14		14

Second Year

Fall	Credits	Spring	Credits
PHYS 212 (GN) ^{*##}	4	CHEM 202	3
EMCH 211	3	MATH 220 or 231	2
MATH 251 ^{*#}	4	CMPSC 201, 202, or CMPSC 203	3-4
GEOSC 1 or 71 [*]	3	EMCH 212	3
General Education Knowledge Domain	3	BIOL 141	3
		General Education Knowledge Domain	3
	17		17-18

Third Year

Fall	Credits	Spring	Credits
EME 301 [*]	3	MNPR 301 [*]	3
EME 303 [*]	3	ENGL 202C (GWS) ^{*††}	3
GEOSC 452	3	EME 460	3
CE 370 [*]	3	ENVSE 406	3
ENVSE 400	3	ENVSE 440	3
General Education Knowledge Domain	3	General Education Health and Wellness (GHW) ²	1.5
	18		16.5

Fourth Year

Fall	Credits	Spring	Credits
ENVSE 404 (Writing across the curriculum)	3	ENVSE 457	3
ENVSE 427 [*]	3	ENVSE 458	1

ENVSE 450	3	ENVSE 470	3
PNG 411	1	ENVSE 480	3
MNG 401	1	Supporting course from approved department list ²	3
Supporting course from approved department list ²	3	General Education Knowledge Domain	3
General Education Knowledge Domain	3	General Education Health and Wellness (GHW) ²	1.5
	17		17.5

Total Credits 131-132

- * Course requires a grade of C or better for the major
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Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

- 1 Students who begin their studies at non-UP locations and/or join the college after their first year should substitute CAS 100, CAS 100A, CAS 100B, or CAS 100C (GWS) for EMSC 100S (GWS). EMSC 100S Earth and Mineral Sciences First year Seminar (3) is a required course only for students who begin their studies at UP in the College of Earth and Mineral Sciences.
- 2 Students who complete Basic ROTC may substitute 6 credits of ROTC for 3 credits of GHW courses and 3 credits of Supporting Courses and Related Areas.

Advising Notes:

To enter the major, students need a minimum 2.00 grade point average, third semester standing, and a C or better grade in MATH 140, MATH 141, CHEM 110 and PHYS 211.

Courses required for the major may be offered fall semester only, spring semester only, or both fall and spring semesters. Consult with your adviser and department to discuss your academic progress and course sequencing.

Environmental Health and Safety Option at Commonwealth Campuses

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any

time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year		
Fall	Credits Spring	Credits
MATH 140 (GQ) ^{*‡††}	4 MATH 141 (GQ) ^{*‡††}	4
CHEM 110 (GN) ^{*‡†}	3 CHEM 112 (GN)	3
CHEM 111 [†]	1 PHYS 211 (GN) ^{*‡†}	4
ENGL 15 (GWS) ^{††}	3 General Education Knowledge Domain	3
PSYCH 100 (GS) [†]	3 General Education Health and Wellness (GHW) ²	1.5
	14	15.5

Second Year		
Fall	Credits Spring	Credits
PHYS 212 (GN) ^{*‡††}	4 CHEM 202	3
EMCH 211	3 MATH 220 or 231	2
MATH 251 ^{*‡}	4 CMPSC 201, 202, or CMPSC 203	3-4
CAS 100, 100A, 100B, or 100C (GWS) ^{††1}	3 EMCH 212	3
General Education Knowledge Domain	3 ENGL 202C (GWS) ^{††}	3
	BIOL 141	3
	17	17-18

Third Year		
Fall	Credits Spring	Credits
EME 301 [*]	3 MNPR 301 [*]	3
EME 303 [*]	3 GEOSC 452	3
CE 370 [*]	3 ENVSE 406	3
ENVSE 400	3 ENVSE 440	3
GEOSC 1 or 71 [*]	3 EME 460	3
General Education Knowledge Domain	3 General Education Knowledge Domain	3
	18	18

Fourth Year		
Fall	Credits Spring	Credits
ENVSE 404 (Writing across the curriculum)	3 ENVSE 457	3
ENVSE 427 [*]	3 ENVSE 458	1
ENVSE 450	3 ENVSE 470	3
PNG 411	1 ENVSE 480	3
MNG 401	1 Supporting course from approved department list ²	3
General Education Health and Wellness (GHW) ²	1.5 General Education Knowledge Domain	3
Supporting course from approved department list ²	3	
	15.5	16

Total Credits 131-132

- * Course requires a grade of C or better for the major
 ‡ Course requires a grade of C or better for General Education

- # Course is an Entrance to Major requirement
 † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

¹ Students who begin their studies at non-UP locations and/or join the college after their first year should substitute CAS 100, CAS 100A, CAS 100B, or CAS 100C (GWS) for EMSC 100S (GWS). EMSC 100S Earth and Mineral Sciences First year Seminar (3) is a required course only for students who begin their studies at UP in the College of Earth and Mineral Sciences.

² Students who complete Basic ROTC may substitute 6 credits of ROTC for 3 credits of GHW courses and 3 credits of Supporting Courses and Related Areas.

Advising Notes:

To enter the major, students need a minimum 2.00 grade point average, third semester standing, and a C or better grade in MATH 140, MATH 141, CHEM 110 and PHYS 211.

Courses required for the major may be offered fall semester only, spring semester only, or both fall and spring semesters. Consult with your adviser and department to discuss your academic progress and course sequencing.

Career Paths

Graduates are prepared to enter both the private and public sector as environmental systems engineers, or health and safety engineers or to pursue further education at the graduate level.

Careers

Our graduates may be candidates for careers in a wide range of industries in both the private and public sector. They may be employed to address the environmental or health and safety problems related to extraction, conversion, and utilization of energy and mineral resources while being stewards of the environment.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ENVIRONMENTAL SYSTEMS ENGINEERING PROGRAM (<http://www.eme.psu.edu/career>)

Opportunities for Graduate Studies

Graduates may be well suited to pursue graduate-level studies. Further study toward an M.S. or Ph.D. can lead to research, university, or management positions.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.eme.psu.edu/academics/graduate>)

Professional Resources

- Society of Environmental Systems Engineers (SESE) (<http://www.eme.psu.edu/academics/student-orgs/sese>)
- Engineers Without Borders (<http://www.engr.psu.edu/ewb>)

Accreditation

The Environmental Systems Engineering B.S. program in the John and Willie Leone Family Department of Energy and Mineral Engineering (EME) at Penn State is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org/>.

MORE INFORMATION ABOUT ABET ACCREDITATION (<http://www.abet.org>)

Contact

University Park

JOHN AND WILLIE LEONE FAMILY DEPARTMENT OF ENERGY AND
MINERAL ENGINEERING

113 Hosler Building
University Park, PA 16802
814-865-3437
eme@ems.psu.edu

<http://www.eme.psu.edu>