ECOLOGICAL ENGINEERING MAJOR

Program Curriculum

Code	Title	Credits
Degree Core Requirements		
BIOL 2604	General Microbiology	3
BSE 2004	Introduction to Biological Systems Engineering	3
BSE 3144	Engineering Analysis for Biological Systems using Numerical Methods	2
BSE 3154	Thermodynamics of Biological Systems	3
BSE 3504	Transport Processes in Biological Systems	3
BSE 4125	Comprehensive Design Project	2
ESM 2104	Statics	3
ESM 3024	Introduction to Fluid Mechanics	3
ISE 2014	Engineering Economy	2
Subtotal		24
Major Requirements		
BIOL 1105	Principles of Biology	3
BIOL 1106	Principles of Biology	3
BIOL 2804	Ecology	3
CHEM 1036	General Chemistry	3
CHEM 2514	Survey of Organic Chemistry	3
MATH 2114	Introduction to Linear Algebra	3
MATH 2204	Introduction to Multivariable Calculus	3
PHYS 2306	Foundations of Physics	4
STAT 3704	Statistics for Engineering Applications	2
BSE 2304	Landscape Measurements and Modeling	3
BSE 3324	Small Watershed Hydrology	3
BSE 3334	Nonpoint Source Pollution Assessment and Control	3
BSE 4126	Comprehensive Design Project	3
BSE 4324	Applied Fluvial Geomorphology	3
BSE 4344	Geographic Information Systems for Engineers	3
ENGR 3124	Introduction to Green Engineering	3
ENGR 4134	Environmental Life Cycle Assessment	3
ENSC 3134	Soils in the Landscape	3
Subtotal		54
Restricted Electives		
Select 1 Ecological Engineering Elective		3
Subtotal		3
Pathways to General Education		
Pathways Concept 1 - Discourse		
ENGL 1105	First-Year Writing (1F)	3
ENGL 1106	First-Year Writing (1F)	3
ISE 3034	Technical Communication for Engineers (1A)	3
Pathways Concept 2 - Critical Thinking in the Humanities		
Select six hours in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02)		6
Pathways Concept 3 - Reasoning in the Social Sciences		
Select six hours in Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03)		6
Pathways Concept 4 - Reasoning in the Natural Sciences		
CHEM 1035 & CHEM 1045	General Chemistry and General Chemistry Laboratory	4
PHYS 2305	Foundations of Physics	4
Pathways Concept 5 - Quantitative and Computational Thinking		
MATH 1225	Calculus of a Single Variable (5F ; C-)	4
MATH 1226	Calculus of a Single Variable (5F ;)	4
MATH 2214	Introduction to Differential Equations (5A)	3
Pathways Concept 6 - Critique and Practice in Design and the Arts		
Select three Arts credits in Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A)		3
ENGE 1215 & ENGE 1216	Foundations of Engineering and Foundations of Engineering (6D ;)	4
or ENGE 1414	Foundations of Engineering Practice	
Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States		
Pathway 7 should be double-counted with either Pathways 2, 3, or 6a to avoid taking additional credit hours.		
Subtotal		47
Total Credits		**128**

Ecological Engineering Electives

(3 credit hours required – students must request to be force-added to major-restricted courses)

Code	Title	Credits
AAEC 3314	Environmental Law	3
AAEC 3324	Environment and Sustainable Development Economics	3
ALS 3404	Ecological Agriculture: Theory and Practice	3
ALS 4614	Watershed Assessment, Management, and Policy	2
BCHM 3114	Biochemistry for Biotechnology and the Life Sciences	3
BCHM 4115	General Biochemistry	4
BIOL 4004	Freshwater Ecology	4
BIOL 4314	Plant Ecology	4
BIOL 4334	Chemical Ecology	3
BSE 4224	Field Methods in Hydrology	3
BSE 4304	Introduction to Watershed Modeling	3
BSE 4394	Water Supply and Sanitation in Developing Countries	3
BSE 4554	Creating the Ecological City	3
CSES 2244	Agriculture, Global Food Security and Health	3
CSES 3124	Soils Laboratory	1
CSES 3614	Soil Physical and Hydrological Properties	3
CSES 4064	Soil Microbiology	3
CSES 4324	Water Quality Laboratory	1
CSES 4854	Wetland Soils and Mitigation	3
ECE 4194	Engineering Principles of Remote Sensing	3
ECE 4364	Alternate Energy for Climate Sustainability	3
ENSC 3604	Fundamentals of Environmental Science	3
ENSC 3634	Physics of Pollution	3
ENSC 3644	Plant Materials for Environmental Restoration	3

ENSC 4244	Ecological Restoration	3
ENSC 4414	Monitoring and Analysis of the Environment	2
ENSC 4734	Environmental Soil Chemistry	3
ENSC 4764	Bioremediation	3
ENSC 4774	Reclamation of Drastically Disturbed Lands	3
ESM 4194	Sustainable Energy Solutions for a Global Society	3
FIW 4324	Genetics of Natural and Mangaged Populations	3
FIW 4614	Fish Ecology	3
FIW 4624	Marine Ecology	3
FREC 4354	Forest Soil and Watershed Management	3
FREC 4374	Forested Wetlands	3
FREC 4464	Water Resources Policy and Economics	3
FREC 4784	Wetland Hydrology and Biogeochemistry	3
GEOG 3104	Environmental Problems, Population, and Development	3
GEOG 3304	Geomorphology	3
GEOG 4354	Introduction to Remote Sensing	3
GEOS 3014	Environmental Geosciences	3
GEOS 3034	Oceanography	3
GEOS 4634	Environmental Geochemistry	3
GEOS 4804	Groundwater Hydrology	3
SBIO 2124	Structure and Properties of Sustainable Biomaterials	3
SBIO 2504	Circular Economy Analytics for Sustainable Systems	3
SBIO 3434	Chemistry and Conversion of Sustainable Biomaterials	3
SBIO 3444	Sustainable Biomaterials and Bioenergy	3
SPES 2244	World Crops: Food and Culture	3
SYSB 2024	Fundamentals of Systems Biology	3
SYSB 2034	Mathematical Methods in Systems Biology	3
SYSB 3115	Network Dynamics and Cell Physiology	4
UAP 3354	Introduction to Environmental Policy and Planning	3
UAP 4344	Law of Critical Environmental Areas	3
UAP 4374	Land Use and Environment: Planning and Policy	3

Satisfactory Progress Towards Degree

University Policy 91 outlines university-wide minimum criteria to determine if students are making satisfactory progress towards the completion of their degrees. The BSE Department fully supports this policy. Specific expectations for satisfactory progress for BSE majors are as follows:

- Maintain overall and in-major GPAs of at least 2.0 (in-major GPA based on all BSE-prefix courses taken); and,
- Be registered for at least one BSE-prefix course per semester

Graduation Requirements

1. Students must pass all required courses, with a minimum of a C- in all BSE prefix courses.
2. Both the overall and in-major GPA must be at least a 2.0, where in-major GPA is based on all BSE-prefix courses taken.
3. Only free electives and courses only offered on a Pass/Fail basis may be taken as Pass/Fail.

Additional Notes:

1. Students are strongly encouraged to take CHEM 1036 General Chemistry first year Spring semester.
2. Students are encouraged to take BIOL 1105 Principles of Biology and BIOL 1106 Principles of Biology during the first year if their schedule permits.

Acceptable Substitutions

MATH 2405H Mathematics in a Computational Context may be substituted for MATH 2114 Introduction to Linear Algebra

MATH 2405H Mathematics in a Computational Context and MATH 2406H Mathematics in a Computational Context may be substituted for MATH 2114 Introduction to Linear Algebra and MATH 2204 Introduction to Multivariable Calculus and MATH 2214 Introduction to Differential Equations

Foreign Language Requirement

Students must have had 2 years of a foreign language in high school or one year at the college level (6 credit hours) of the same language. College-level credits used to meet this requirement do not count towards the degree.

Roadmap

First Year		
Fall Semester		**Credits**
CHEM 1035	General Chemistry	3
CHEM 1045	General Chemistry Laboratory	1
ENGL 1105	First-Year Writing	3
MATH 1225	Calculus of a Single Variable (C-)	4
ENGE 1215	Foundations of Engineering (C-)	2
Pathways 2 or 3 or 6A or 7		3
	Credits	**16**
Spring Semester		
CHEM 1036	General Chemistry	3
ENGL 1106	First-Year Writing	3
MATH 1226	Calculus of a Single Variable	4
PHYS 2305	Foundations of Physics	4
ENGE 1216	Foundations of Engineering	2
	Credits	**16**
Second Year		
Fall Semester		
BSE 2004	Introduction to Biological Systems Engineering	3
BIOL 1105	Principles of Biology	3
MATH 2204	Introduction to Multivariable Calculus	3
MATH 2114	Introduction to Linear Algebra	3
ESM 2104	Statics	3
ISE 2014	Engineering Economy	2
	Credits	**17**
Spring Semester		
BIOL 1106	Principles of Biology	3
CHEM 2514	Survey of Organic Chemistry	3
MATH 2214	Introduction to Differential Equations	3
BSE 2304	Landscape Measurements and Modeling	3
ENSC 3134	Soils in the Landscape	3
	Credits	**15**
Third Year		
Fall Semester		
BSE 3154	Thermodynamics of Biological Systems	3

BSE 3324	Small Watershed Hydrology	3
ESM 3024	Introduction to Fluid Mechanics	3
BIOL 2604	General Microbiology	3
PHYS 2306	Foundations of Physics	4
	Credits	**16**
Spring Semester		
BIOL 2804	Ecology	3
BSE 3144	Engineering Analysis for Biological Systems using Numerical Methods	2
BSE 3334	Nonpoint Source Pollution Assessment and Control	3
BSE 3504	Transport Processes in Biological Systems	3
BSE 4344	Geographic Information Systems for Engineers	3
ISE 3034	Technical Communication for Engineers	3
	Credits	**17**
Fourth Year		
Fall Semester		
BSE 4125	Comprehensive Design Project	2
BSE 4324	Applied Fluvial Geomorphology	3
ENGR 3124	Introduction to Green Engineering	3
STAT 3704	Statistics for Engineering Applications	2
Pathways Core Concept 2, 3, 6a, or 7		6
	Credits	**16**
Spring Semester		
BSE 4126	Comprehensive Design Project	3
Ecological Engineering Elective		3
ENGR 4134	Environmental Life Cycle Assessment	3
Pathways Core Concept 2, 3, 6a, or 7		6
	Credits	**15**
	Total Credits	**128**