

ECOLOGICAL ENGINEERING UNDERGRADUATE MAJOR (BS, HBS)

Ecological engineering (EcoE) is the design of sustainable systems consistent with ecological principles that integrate human activities into the natural environment to the benefit of both. Our systems-approach to engineering emphasizes diversity, resilience, and adaptation to maintain sustainability. Ecological engineering deals with both fundamental processes and engineering applications on scales that range from microscopic to watersheds and beyond. This discipline is rapidly developing as an important new area of engineering based on the science of ecological systems, with a number of dedicated journals, national and international professional societies, and new application areas emerging over the last decade. The Biological and Ecological Engineering Department at OSU has considerable expertise in this area and is among the national leaders in this discipline.

The Bachelor of Science and Honors Bachelor of Science degrees in Ecological Engineering are accredited by the Engineering Accreditation Commission of ABET, <http://www.ABET.org>.

The EcoE program is the first of its kind nationally, reflecting Oregon's leadership in this new and exciting multidisciplinary field. The curriculum is divided into an ecological engineering core and a set of upper-division science and engineering electives. The ecological engineering core contains the introductory and upper-division course work that provides the common engineering and scientific basis for our students. The core consists of pre-professional courses, baccalaureate core requirements, required upper-division engineering courses, and required science courses. Selections are made to a total of 23 credits of engineering and science/public policy electives. This organization provides students with considerable flexibility in selecting their degree path.

Graduates with an Ecological Engineering degree will work to optimize the interface between humankind and the environment. Example activities undertaken might include river and wetland restoration, optimizing sensor arrays for ecological monitoring, improving productivity at agricultural and aquaculture facilities, managing the quality and quantity of water leaving farms, urban areas, landfills and industrial sites, and projection and adaptation of natural and anthropogenic systems to global climate and land use changes. Oregon State University has strong programs in many of the basic and engineering sciences that underpin the Ecological Engineering degree program.

Graduates with an ecological engineering skill set may find employment with industrial clients, engineering consulting companies, governmental agencies, and entrepreneurial start-ups.

Program Educational Objectives and Student Outcomes are posted on the BEE website: <https://bee.oregonstate.edu/biological-and-ecological-engineering/programs/undergraduate>

For further information, please contact:

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Major Code: 450

- Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 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.
- Communicate effectively with a range of audiences.
- 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.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Code	Title	Credits
BEE 102	ECOLOGICAL ENGINEERING II	3
BEE 103	ECOLOGICAL ENGINEERING III	3
Select one of the following:		3-5
CH 231 & CH 261	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 231	
CH 121	GENERAL CHEMISTRY ¹	
CH 201	CHEMISTRY FOR ENGINEERING MAJORS (For major transfers only, with CH 202 and CH 205 only)	
COMM 111 or COMM 114 or COMM 218	*PUBLIC SPEAKING *ARGUMENT AND CRITICAL DISCOURSE *INTERPERSONAL COMMUNICATION	3
ENGR 211	STATICS	3
ENGR 213	STRENGTH OF MATERIALS	3
MTH 251	*DIFFERENTIAL CALCULUS	4
MTH 252	INTEGRAL CALCULUS	4
MTH 254	VECTOR CALCULUS I	4
MTH 256	APPLIED DIFFERENTIAL EQUATIONS	4
Select one of the following:		4-7
MTH 264 & MTH 265	INTRODUCTION TO MATRIX ALGEBRA and INTRODUCTION TO SERIES	
MTH 253 & MTH 341	INFINITE SERIES AND SEQUENCES and LINEAR ALGEBRA I	
PH 211 & PH 212 & PH 213	*GENERAL PHYSICS WITH CALCULUS and *GENERAL PHYSICS WITH CALCULUS and *GENERAL PHYSICS WITH CALCULUS	12
WR 121	*ENGLISH COMPOSITION	3
Additional Courses		
BEE 101	ECOLOGICAL ENGINEERING I	3
BEE 221	FUNDAMENTALS OF ECOLOGICAL ENGINEERING	3
BEE 222	ECOLOGICAL ENGINEERING COMPUTATION	2
BEE 270	ECOLOGY FOR ENGINEERS	3
Select one of the following:		5
CH 232 & CH 262	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 232	
CH 122	*GENERAL CHEMISTRY ¹	
Select one of the following:		5
CH 233 & CH 263	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 233	
CH 123	*GENERAL CHEMISTRY ¹	

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HHS 231 & HHS 241	*LIFETIME FITNESS FOR HEALTH and *LIFETIME FITNESS (or any PAC course)	3
SOIL 205 & SOIL 206	SOIL SCIENCE and *SOIL SCIENCE LABORATORY FOR SOIL 205	4
ST 314 or ST 421 or ST 422	INTRODUCTION TO STATISTICS FOR ENGINEERS INTRODUCTION TO MATHEMATICAL STATISTICS INTRODUCTION TO MATHEMATICAL STATISTICS	3-4
WR 327	*TECHNICAL WRITING	3
Total Credits		87-93

Code	Title	Credits
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Baccalaureate Core

Select 51 credits

Professional Core Courses (62 credits)

BEE 311	ECOLOGICAL FLUID MECHANICS	4
BEE 312	ECOHYDRAULICS	4
BEE 313	ECOHYDROLOGY	4
BEE 320	BIOSYSTEMS ANALYSIS AND MODELING	4
BEE 322	ECOLOGICAL ENGINEERING THERMODYNAMICS AND TRANSFER PROCESS	4
BEE 361	ECOLOGICAL ENGINEERING LABORATORY	3
BEE 362	ECOLOGICAL ENGINEERING MICROBIAL PROCESSES	3
BEE 468	BIOREMEDIATION ENGINEERING	4
BEE 481	*ECOLOGICAL ENGINEERING DESIGN I	4
BEE 482	ECOLOGICAL ENGINEERING DESIGN II	3
BEE 483	ECOLOGICAL ENGINEERING DESIGN III	2

Upper-Division Science and Engineering Electives (23 credits)

Professional Skills Courses

BEE 415	PROFESSIONAL DEVELOPMENT	1
FE 208	FOREST SURVEYING	4
FE 257	GIS AND FOREST ENGINEERING APPLICATIONS	3

Science and Public Policy

AEC 250 or ECON 201	*INTRODUCTION TO ENVIRONMENTAL ECONOMICS AND POLICY *INTRODUCTION TO MICROECONOMICS	3-4
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Ethics

Select one course from the following:		3
IE 380	*THE RESPONSIBLE ENGINEER	
PHL 205/PHL 205H	*ETHICS	
PHL 440/PHL 440H	*ENVIRONMENTAL ETHICS	
PHL 443/PHL 443H	*WORLD VIEWS AND ENVIRONMENTAL VALUES	

Additional Perspectives and Synthesis Courses

*Cultural Diversity		3
*Difference, Power, and Discrimination		3
*Literature and the Arts		3
*Western Culture		3
*Social Policies and Institutions		3
*Synthesis—Science, Technology, and Society		3
*Synthesis—Contemporary Global Issues		3

Upper-Division Science and Engineering Electives (23 credits)

Engineering Electives

Select at least 10 non-blanket credits of the following:		10
BEE 401	RESEARCH	
BEE 410	ECOLOGICAL ENGINEERING INTERNSHIP	
BEE 433	IRRIGATION SYSTEM DESIGN	
BEE 446	RIVER ENGINEERING	
BEE 458	NONPOINT SOURCE POLLUTION ASSESSMENT AND CONTROL	
CE 411	OCEAN ENGINEERING	
CE 413	GIS IN WATER RESOURCES	
CE 415	COASTAL INFRASTRUCTURE	
CE 417	HYDRAULIC ENGINEERING DESIGN	
CE 465	OREGON LAND SURVEY LAW	

CE 469	PROPERTY SURVEYS	
CCE 201	CIVIL AND CONSTRUCTION ENGINEERING GRAPHICS AND DESIGN	
ENVE 421	DRINKING WATER TREATMENT PROCESSES	
ENVE 422	WASTEWATER TREATMENT PROCESSES	
ENVE 425	AIR POLLUTION CONTROL	
ENVE 431	FATE AND TRANSPORT OF CHEMICALS IN ENVIRONMENTAL SYSTEMS	
ENVE 456	SUSTAINABLE WATER RESOURCES DEVELOPMENT	
FE 310	FOREST ROUTE SURVEYING	
FE 315	SOIL ENGINEERING	
FE 316	SOIL MECHANICS	
FE 371	HARVESTING PROCESS ENGINEERING	
FE 423	UNMANNED AIRCRAFT SYSTEM REMOTE SENSING	
FE 430	WATERSHED PROCESSES	
FE 434	FOREST WATERSHED MANAGEMENT	
FE 457/FOR 457	TECHNIQUES FOR FOREST RESOURCE ANALYSIS	
FE 479/CE 479	SLOPE AND EMBANKMENT DESIGN	
<i>Science and Public Policy Electives</i>		
Select at least 9 non-blanket credits from the following courses:		9
AEC 351	*NATURAL RESOURCE ECONOMICS AND POLICY	
AEC 432	ENVIRONMENTAL LAW	
ANS 121	*INTRODUCTION TO ANIMAL SCIENCES	
ANS 251	PRINCIPLES OF ANIMAL FOODS TECHNOLOGY	
ANS 315	*CONTENTIOUS SOCIAL ISSUES IN ANIMAL AGRICULTURE	
ANS 351	ADVANCED PRINCIPLES OF ANIMAL FOODS TECHNOLOGY	
BA 362	SOCIAL ENTREPRENEURSHIP AND SOCIAL INITIATIVES	
BA 432	*ENVIRONMENTAL LAW, SUSTAINABILITY AND BUSINESS	
BB 350	ELEMENTARY BIOCHEMISTRY	
BI 301	*HUMAN IMPACTS ON ECOSYSTEMS	
BI 348	*HUMAN ECOLOGY	
BI 420	*VIRUSES IN MODERN SOCIETY	
BOT 313	PLANT STRUCTURE	
BOT 331	PLANT PHYSIOLOGY	
BOT 341	PLANT ECOLOGY	
BOT 442	PLANT POPULATION ECOLOGY	
CH 324	QUANTITATIVE ANALYSIS	
CH 331 & CH 332	ORGANIC CHEMISTRY and ORGANIC CHEMISTRY	
CH 337	ORGANIC CHEMISTRY LABORATORY	
COMM 440	THEORIES OF CONFLICT AND CONFLICT MANAGEMENT	
COMM 442	BARGAINING AND NEGOTIATION PROCESSES	
COMM 444	THIRD PARTIES IN DISPUTE RESOLUTION: MEDIATION AND ARBITRATION	
FE 460	*FOREST OPERATIONS REGULATIONS AND POLICY ISSUES	
FES 435/TOX 435	*GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK	
FES 445/FW 445	ECOLOGICAL RESTORATION	
FES 485	*CONSENSUS AND NATURAL RESOURCES	
FOR 441	SILVICULTURE PRINCIPLES	
FOR 329	FOREST RESOURCE ECONOMICS I	
FOR 460	*FOREST POLICY	
FOR 462	NATURAL RESOURCE POLICY AND LAW	
FST 210	FRUIT AND VEGETABLE PROCESSING	
FST 212	DAIRY PROCESSING	
FST 213	DAIRY PROCESSING LABORATORY	
FST 421	*FOOD LAW	
FST 460	CHEMISTRY AND BIOCHEMISTRY OF BEER	
FST 461	PRODUCTION AND ANALYSIS OF BEER	

FST 466	WINE PRODUCTION PRINCIPLES
FST 479/MB 479	FERMENTATION MICROBIOLOGY
FST 490	FOOD PROCESSING CALCULATIONS
FST 491	FOOD PROCESSING CALCULATIONS LABORATORY
FW 251	PRINCIPLES OF FISH AND WILDLIFE CONSERVATION
FW 326	INTEGRATED WATERSHED MANAGEMENT
FW 350	*ENDANGERED SPECIES, SOCIETY AND SUSTAINABILITY
FW 435	*WILDLIFE IN AGRICULTURAL ECOSYSTEMS
FW 456	FRESHWATER ECOLOGY AND CONSERVATION
FW 462	ECOSYSTEM SERVICES
FW 479	WETLANDS AND RIPARIAN ECOLOGY
GEO 202	*EARTH SYSTEMS SCIENCE
GEO 322	SURFACE PROCESSES
GEO 432	APPLIED GEOMORPHOLOGY
GEO 481	GLACIAL GEOLOGY
GEO 487	HYDROGEOLOGY
GEOG 201	*FOUNDATIONS OF GEOSPATIAL SCIENCE AND GIS
GEOG 370	CARTOGRAPHY
GEOG 423	SNOW HYDROLOGY
GEOG 480	REMOTE SENSING I: PRINCIPLES AND APPLICATIONS
HORT 285	PERMACULTURE DESIGN AND THEORY: CERTIFICATE COURSE
HORT 300/CROP 300	CROP PRODUCTION IN PACIFIC NORTHWEST AGROECOSYSTEMS
HORT 318	*APPLIED ECOLOGY OF MANAGED ECOSYSTEMS
HORT 360	IRRIGATION AND DRAINAGE
HORT 414/CROP 414	PRECISION AGRICULTURE
MB 302	GENERAL MICROBIOLOGY
MB 303	GENERAL MICROBIOLOGY LABORATORY
MTH 351	INTRODUCTION TO NUMERICAL ANALYSIS
MTH 452	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS
MTH 481	APPLIED ORDINARY DIFFERENTIAL EQUATIONS
MTH 482	APPLIED PARTIAL DIFFERENTIAL EQUATIONS
OC 434/FW 434	ESTUARINE ECOLOGY
RNG 341	RANGELAND ECOLOGY AND MANAGEMENT
RNG 351	RANGE ECOLOGY I-GRASSLANDS
RNG 352	RANGE ECOLOGY II-SHRUBLANDS
RNG 355	DESERT WATERSHED MANAGEMENT
RNG 421	WILDLAND RESTORATION AND ECOLOGY
RNG 455	RIPARIAN ECOHYDROLOGY AND MANAGEMENT
SOIL 455	BIOLOGY OF SOIL ECOSYSTEMS
ST 421	INTRODUCTION TO MATHEMATICAL STATISTICS
& ST 422	and INTRODUCTION TO MATHEMATICAL STATISTICS
SUS 304	*SUSTAINABILITY ASSESSMENT
SUS 350	*SUSTAINABLE COMMUNITIES
TOX 430	CHEMICAL BEHAVIOR IN THE ENVIRONMENT
WSE 455	INDUSTRIAL MARKETING IN THE FOREST SECTOR
Z 349	*BIODIVERSITY: CAUSES, CONSEQUENCES, AND CONSERVATION
Total credits required for graduation is 180	

Total Credits 93-94

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Baccalaureate Core Course (BCC)

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Writing Intensive Course (WIC)

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For major transfers only, B grade or better, must have completed CH 12X sequence prior to transfer

Major Code: 450

First Year		
Fall		Credits
BEE 101	ECOLOGICAL ENGINEERING I	3
MTH 251	*DIFFERENTIAL CALCULUS	4
CH 231 & CH 261	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 231	5
WR 121	*ENGLISH COMPOSITION	3
Credits		15
Winter		
BEE 102	ECOLOGICAL ENGINEERING II	3
MTH 252	INTEGRAL CALCULUS	4
CH 232 & CH 262	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 232	5
COMM 111 or COMM 114	*PUBLIC SPEAKING or *ARGUMENT AND CRITICAL DISCOURSE	3
Credits		15
Spring		
BEE 103	ECOLOGICAL ENGINEERING III	3
CH 233 & CH 263	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 233	5
MTH 254	VECTOR CALCULUS I	4
PH 211	*GENERAL PHYSICS WITH CALCULUS	4
Credits		16
Second Year		
Fall		
BEE 270	ECOLOGY FOR ENGINEERS	3
PH 212	*GENERAL PHYSICS WITH CALCULUS	4
ENGR 211	STATICS	3
MTH 256	APPLIED DIFFERENTIAL EQUATIONS	4
Credits		14
Winter		
BEE 221	FUNDAMENTALS OF ECOLOGICAL ENGINEERING	3
PH 213	*GENERAL PHYSICS WITH CALCULUS	4
ST 314	INTRODUCTION TO STATISTICS FOR ENGINEERS (Economics Cluster)	3
HHS 231	*LIFETIME FITNESS FOR HEALTH	2
HHS 241	*LIFETIME FITNESS	1
Social Processes and Institutions/Economics Cluster		3
Credits		16
Spring		
BEE 222	ECOLOGICAL ENGINEERING COMPUTATION	2
MTH 264	INTRODUCTION TO MATRIX ALGEBRA	2
MTH 265	INTRODUCTION TO SERIES	2
ENGR 213	STRENGTH OF MATERIALS	3
WR 327	*TECHNICAL WRITING	3
Perspectives/Synthesis Elective/Ethics Cluster		3
Credits		15
Third Year		
Fall		
BEE 311	ECOLOGICAL FLUID MECHANICS	4
BEE 320	BIOSYSTEMS ANALYSIS AND MODELING	4
DPD Elective		3
Science Elective		3
Credits		14
Winter		
BEE 312	ECOHYDRAULICS	4
BEE 322	ECOLOGICAL ENGINEERING THERMODYNAMICS AND TRANSFER PROCESS	4
FE 257	GIS AND FOREST ENGINEERING APPLICATIONS	3
SOIL 205	SOIL SCIENCE	3

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SOIL 206	*SOIL SCIENCE LABORATORY FOR SOIL 205	1
Credits		15
Spring		
BEE 313	ECOHYDROLOGY	4
BEE 361	ECOLOGICAL ENGINEERING LABORATORY	3
BEE 362	ECOLOGICAL ENGINEERING MICROBIAL PROCESSES	3
Engineering Elective		4
Credits		14
Fourth Year		
Fall		
BEE 415	PROFESSIONAL DEVELOPMENT	1
BEE 481	^ECOLOGICAL ENGINEERING DESIGN I	4
FE 208	FOREST SURVEYING	4
Engineering Elective		3
Science Elective		3
Credits		15
Winter		
BEE 482	ECOLOGICAL ENGINEERING DESIGN II	3
BEE 468	BIOREMEDIATION ENGINEERING	4
Engineering Elective		3
Synthesis		3
Perspectives		3
Credits		16
Spring		
BEE 483	ECOLOGICAL ENGINEERING DESIGN III	2
Engineering Elective		4
Science Elective		3
Perspectives		3
Synthesis/Perspectives		3
Credits		15
Total Credits		180

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Baccalaureate Core Course (BCC)

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Writing Intensive Course (WIC)