

ECOLOGICAL ENGINEERING UNDERGRADUATE MAJOR (BS, HBS)

Ecological engineering is the design of sustainable systems consistent with ecological principles that integrate human activities into the natural environment to the benefit of both. This approach 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 ABET Inc. Accredited Bachelor of Science degree in Ecological Engineering (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. The upper-division engineering and science electives are presented as options. 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. Specific activities undertaken might include riparian restoration, optimizing sensor arrays for ecological monitoring, improving agricultural water quality, mitigating toxic materials migration from landfills, developing sustainable industrial systems (agricultural and otherwise), developing closed systems for space travel, or dealing with issues associated with global climate change. 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.

For further information, please contact:

John P. Bolte
116 Gilmore Hall
Oregon State University
Corvallis, OR 97331-3906
541-737-2041
Email: info-bee@engr.orst.edu
Website: <http://bee.oregonstate.edu/>

Code	Title	Hours
Pre-Professional Core		
BEE 102	ECOLOGICAL ENGINEERING II ¹	3
Select one of the following:		3-5
CH 231 & CH 261	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 231 ¹	
CH 121	GENERAL CHEMISTRY ^{1,2}	
CH 201	CHEMISTRY FOR ENGINEERING MAJORS (For major transfers only, with CH 202 and CH 205 only) ¹	
Select one of the following:		3
COMM 111	*PUBLIC SPEAKING ¹	
or COMM 11 *ARGUMENT AND CRITICAL DISCOURSE		
COMM 218	*INTERPERSONAL COMMUNICATION ¹	
ENGR 211	STATICS ¹	3
ENGR 213	STRENGTH OF MATERIALS ¹	3
MTH 251	*DIFFERENTIAL CALCULUS ¹	4
MTH 252	INTEGRAL CALCULUS ¹	4
MTH 254	VECTOR CALCULUS I ¹	4
MTH 256	APPLIED DIFFERENTIAL EQUATIONS ¹	4
Select one of the following:		4-7
MTH 306	MATRIX AND POWER SERIES METHODS ¹	
MTH 253 & MTH 341	INFINITE SERIES AND SEQUENCES and LINEAR ALGEBRA I ¹	
PH 211 & PH 212 & PH 213	*GENERAL PHYSICS WITH CALCULUS and *GENERAL PHYSICS WITH CALCULUS and *GENERAL PHYSICS WITH CALCULUS ¹	12
WR 121	*ENGLISH COMPOSITION	3
Additional Pre-Professional Courses		
BEE 101	ECOLOGICAL ENGINEERING I	3
BEE 221	FUNDAMENTALS OF ECOLOGICAL ENGINEERING	3
BEE 222	ECOLOGICAL ENGINEERING COMPUTATION	3
BI 211 & BI 212 & BI 213	*PRINCIPLES OF BIOLOGY and *PRINCIPLES OF BIOLOGY and *PRINCIPLES OF BIOLOGY	12
Select one of the following:		5
CH 232 & CH 262	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 232	
CH 122	*GENERAL CHEMISTRY ²	
Select one of the following:		5
CH 233 & CH 263	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 233	
CH 123	*GENERAL CHEMISTRY ²	
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 Hours		94-100

Code	Title	Hours		
Baccalaureate Core				
Select 51 credits				
Professional Core Courses				
BEE 311	ECOLOGICAL FLUID MECHANICS	4	ENVE 421	DRINKING WATER TREATMENT PROCESSES
BEE 312	ECOHYDRAULICS	4	ENVE 422	WASTEWATER TREATMENT PROCESSES
BEE 313	ECOHYDROLOGY	4	ENVE 425	AIR POLLUTION CONTROL
BEE 320	BIOSYSTEMS ANALYSIS AND MODELING	4	ENVE 431	FATE AND TRANSPORT OF CHEMICALS IN ENVIRONMENTAL SYSTEMS
BEE 322	ECOLOGICAL ENGINEERING THERMODYNAMICS AND TRANSFER PROCESS	4	ENVE 456	SUSTAINABLE WATER RESOURCES DEVELOPMENT
BEE 361	ECOLOGICAL ENGINEERING LABORATORY	3	FE 209	FOREST PHOTOGRAMMETRY AND REMOTE SENSING
BEE 458	NONPOINT SOURCE POLLUTION ASSESSMENT AND CONTROL	3	FE 310	FOREST ROUTE SURVEYING
BEE 468	BIOREMEDIATION ENGINEERING	4	FE 315	SOIL ENGINEERING
BEE 469	*ECOLOGICAL ENGINEERING DESIGN I	4	FE 316	SOIL MECHANICS
BEE 470	ECOLOGICAL ENGINEERING DESIGN II	4	FE 371	HARVESTING PROCESS ENGINEERING
BI 370	ECOLOGY	3	FE 423	UNMANNED AIRCRAFT SYSTEM REMOTE SENSING
Upper-Division Science and Engineering Electives			FE 430	WATERSHED PROCESSES
<i>Professional Skills Courses</i>			FE 434	FOREST WATERSHED MANAGEMENT
BEE 415	PROFESSIONAL DEVELOPMENT	1	FE 457	TECHNIQUES FOR FOREST RESOURCE ANALYSIS or FOR 457 TECHNIQUES FOR FOREST RESOURCE ANALYSIS
ENGR 391	ENGINEERING ECONOMICS AND PROJECT MANAGEMENT	3	FE 479	SLOPE AND EMBANKMENT DESIGN or CE 479 SLOPE AND EMBANKMENT DESIGN
FE 208	FOREST SURVEYING	4	<i>Science and Public Policy Electives</i>	
FE 257	GIS AND FOREST ENGINEERING APPLICATIONS	3	Select at least 9 non-blanket credits of the following: 9	
<i>Science and Public Policy Course</i>			AEC 351	*NATURAL RESOURCE ECONOMICS AND POLICY
AEC 250	*INTRODUCTION TO ENVIRONMENTAL ECONOMICS AND POLICY	3-4	AEC 432	ENVIRONMENTAL LAW
or ECON 201	*INTRODUCTION TO MICROECONOMICS		ANS 121	*INTRODUCTION TO ANIMAL SCIENCES
<i>Ethics Course</i>			ANS 251	PRINCIPLES OF ANIMAL FOODS TECHNOLOGY
IE 380	*THE RESPONSIBLE ENGINEER	3-4	ANS 315	*CONTENTIOUS SOCIAL ISSUES IN ANIMAL AGRICULTURE
or PHL 205	*ETHICS		ANS 351	ADVANCED PRINCIPLES OF ANIMAL FOODS TECHNOLOGY
<i>Additional Perspectives and Synthesis Courses</i>			BA 362	SOCIAL ENTREPRENEURSHIP AND SOCIAL INITIATIVES
*Cultural Diversity		3	BB 350	ELEMENTARY BIOCHEMISTRY
*Difference, Power, and Discrimination		3	BI 301	*HUMAN IMPACTS ON ECOSYSTEMS
*Literature and the Arts		3	BI 348	*HUMAN ECOLOGY
*Western Culture		3	BI 420	*VIRUSES IN MODERN SOCIETY
*Social Policies and Institutions		3	BOT 313	PLANT STRUCTURE
*Synthesis—Science, Technology, and Society		3	BOT 331	PLANT PHYSIOLOGY
*Synthesis—Contemporary Global Issues		3	BOT 341	PLANT ECOLOGY
Upper-Division Science and Engineering Electives			BOT 442	PLANT POPULATION ECOLOGY
<i>Engineering Electives</i>			CH 324	QUANTITATIVE ANALYSIS
Select at least 10 non-blanket credits of the following: 10			CH 331 & CH 332	ORGANIC CHEMISTRY and ORGANIC CHEMISTRY
BEE 401	RESEARCH		CH 337	ORGANIC CHEMISTRY LABORATORY
BEE 410	ECOLOGICAL ENGINEERING INTERNSHIP		COMM 440	THEORIES OF CONFLICT AND CONFLICT MANAGEMENT
BEE 433	IRRIGATION SYSTEM DESIGN		COMM 442	BARGAINING AND NEGOTIATION PROCESSES
BEE 446	RIVER ENGINEERING		COMM 444	THIRD PARTIES IN DISPUTE RESOLUTION: MEDIATION AND ARBITRATION
CE 411	OCEAN ENGINEERING		FE 460	*FOREST OPERATIONS REGULATIONS AND POLICY ISSUES
CE 413	GIS IN WATER RESOURCES		FES 435	*GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK
CE 415	COASTAL INFRASTRUCTURE			
CE 417	HYDRAULIC ENGINEERING DESIGN			
CE 465	OREGON LAND SURVEY LAW			
CE 469	PROPERTY SURVEYS			
ENGR 248	ENGINEERING GRAPHICS AND 3-D MODELING			

or TOX 435	*GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK
FES 445	ECOLOGICAL RESTORATION
or FW 445	ECOLOGICAL RESTORATION
FES 485	*CONSENSUS AND NATURAL RESOURCES
FOR 330	FOREST RESOURCE ECONOMICS I
FOR 441	SILVICULTURE PRINCIPLES
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	BREWING SCIENCE
FST 461	BREWING ANALYSIS
FST 466	WINE PRODUCTION PRINCIPLES
FST 479	FERMENTATION MICROBIOLOGY
or 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	GEOVISUALIZATION: CARTOGRAPHY
GEOG 423	SNOW HYDROLOGY
GEOG 480	REMOTE SENSING I: PRINCIPLES AND APPLICATIONS
HORT 285	PERMACULTURE DESIGN AND THEORY: CERTIFICATE COURSE
HORT 300	CROP PRODUCTION IN PACIFIC NORTHWEST AGROECOSYSTEMS
or CROP 300	CROP PRODUCTION IN PACIFIC NORTHWEST AGROECOSYSTEMS
HORT 318	^APPLIED ECOLOGY OF MANAGED ECOSYSTEMS
HORT 360	IRRIGATION AND DRAINAGE
HORT 414	PRECISION AGRICULTURE
or 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	ESTUARINE ECOLOGY
or 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 & ST 422	INTRODUCTION TO MATHEMATICAL STATISTICS 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 192

- * Baccalaureate Core Course (BCC)
- ^ Writing Intensive Course (WIC)
- 1 Required for entry into Professional School
- 2 For major transfers only, B grade or better, must have completed CH 12X sequence prior to transfer

Major Code: 450

Pre-Ecological Engineering Major Code: 654

Course	Title	Hours
First Year		
Fall		
BEE 101	ECOLOGICAL ENGINEERING I	3
CH 231 & CH 261	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 231 ¹	5
MTH 251	*DIFFERENTIAL CALCULUS 1	4
WR 121	*ENGLISH COMPOSITION	3
	Hours	15
Winter		
CH 232 & CH 262	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 232	5

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COMM 111 or COMM 114	*PUBLIC SPEAKING 1 or *ARGUMENT AND CRITICAL DISCOURSE	3	ENGR 211	STATICS ¹	3
HHS 231 & HHS 241	*LIFETIME FITNESS FOR HEALTH and *LIFETIME FITNESS (or any PAC course)	3	PH 213	*GENERAL PHYSICS WITH CALCULUS 1	4
MTH 252	INTEGRAL CALCULUS 1	4	ST 314	INTRODUCTION TO STATISTICS FOR ENGINEERS	3
Hours		15	Hours		17
Spring					
BEE 102	ECOLOGICAL ENGINEERING II	3	BEE 222	ECOLOGICAL ENGINEERING COMPUTATION	3
CH 233 & CH 263	GENERAL CHEMISTRY and *LABORATO FOR CHEMISTRY 233	5	BI 213	*PRINCIPLE: OF BIOLOGY	4
MTH 254	VECTOR CALCULUS I ¹	4	ENGR 213	STRENGTH OF MATERIALS	3
PH 211	*GENERAL PHYSICS WITH CALCULUS 1	4	MTH 306	MATRIX AND POWER SERIES METHODS 1	4
Hours		16	WR 327	*TECHNICAL WRITING	3
Hours		16	Hours		17
Second Year					
Fall					
BI 211	*PRINCIPLE: OF BIOLOGY	4	AEC 250	*INTRODUCTION TO ENVIRONMENTAL ECONOMICS AND POLICY	3
MTH 256	APPLIED DIFFERENTIAL EQUATIONS 1	4	BEE 311	ECOLOGICAL FLUID MECHANICS	4
PH 212	*GENERAL PHYSICS WITH CALCULUS 1	4	BEE 320	BIOSYSTEMS ANALYSIS AND MODELING	4
SOIL 205 & SOIL 206	SOIL SCIENCE and *SOIL SCIENCE LABORATORY FOR SOIL 205	4	BI 370	ECOLOGY	3
Hours		16	Hours		14
Winter					
BEE 221	FUNDAMENTALS OF ECOLOGICAL ENGINEERING	3	BEE 312	ECOHYDRAL	4
BI 212	*PRINCIPLE: OF BIOLOGY	4	BEE 322	ECOLOGICAL ENGINEERING THERMODYNAMICS AND TRANSFER PROCESS	4
Hours		16	FE 257	GIS AND FOREST ENGINEERING APPLICATIO	3
Hours		16	IE 380	*THE RESPONSIBLE ENGINEER	3
Hours		16	Engineering Elective I		3-4
Hours		16	Hours		17-18
Spring					
Hours		16	BEE 313	ECOHYDRAL	4

BEE 361	ECOLOGICAL ENGINEERING LABORATORY	3
ENGR 391	ENGINEERIN ECONOMICS AND PROJECT MANAGEME	3
*Difference, Power and Discrimination Bacc Core Elective		3
Engineering Elective II		4
Hours		17
Fourth Year		
Fall		
BEE 415	PROFESSIOI DEVELOPME	1
BEE 469	*ECOLOGICAL ENGINEERING DESIGN I	4
Engineering Elective III		4
Science Elective I		3-5
*Synthesis—Contemporary Global Issues Bacc Core Elective		3
Hours		15-17
Winter		
BEE 468	BIOREMEDI/ ENGINEERIN	4
BEE 470	ECOLOGICAL ENGINEERING DESIGN II	4
*Cultural Diversity Bacc Core Elective		3
Engineering Elective IV		3-4
*Literature and the Arts Bacc Core Elective		3
Hours		17-18
Spring		
Engineering Elective V		4
Science Elective		3-5
Science Elective		3-5
*Western Culture Bacc Core Elective		3
Hours		13-17
Total Hours		189-197

¹ Required for entry into Professional School

* Baccalaureate Core Course (BCC)

^ Writing Intensive Course (WIC)