

# Ecological Engineering

## Undergraduate Advising Guide

2017-2018





## PREFACE

This guide supplements the "Academic Regulations and Procedures" found in the *Registration Handbook 2016-2017* and the *Oregon State University Bulletin: General Catalog 2016-2017* (<http://catalog.oregonstate.edu/>). It is intended to aid students in planning and completing programs leading to a baccalaureate degree in Ecological Engineering as administered by Department of Biological and Ecological Engineering (BEE).

**It is the student's responsibility to be familiar with important dates, deadlines, regulations and rules given in this guide, in the *Registration Handbook*, and in the *Oregon State University General Catalog*.** Please carefully review the College of Engineering and the BEE Department policies for admission, student performance, and academic requirements on pages 11-13 of this guide.

## THE UNIVERSITY AND COLLEGES

The University's mission statement is as follows: Oregon State University, a land grant institution, promotes economic, social, cultural and environmental progress for people across Oregon, the nation and the world through our graduates, research, scholarship, outreach, and engagement. This statement is published on the Oregon State University (OSU) website and is also published in the OSU General Catalog and Schedule of Classes.

The College of Agricultural Sciences (CAS) mission statement is: The College of Agricultural Sciences at Oregon State University is Oregon's principal source of knowledge relating to agricultural and food systems, and a major source of knowledge regarding environmental quality, natural resources, life sciences, and rural economies and communities worldwide. The College provides undergraduate and graduate education leading to baccalaureate and graduate degrees, and extended education programs throughout Oregon and beyond. Its research programs create knowledge to solve problems and to build a knowledge base for the future. It is a source of information and expertise in integrating and applying knowledge with benefits that are felt in domestic and international settings. This statement is published on the CAS website along with an articulation of CAS' values. The CAS reflects the following values:

- Responsiveness to the needs of those it serves;
- Partnership and cooperation with individuals, organizations, businesses, and agencies outside the University;
- Teamwork and coordination among its units and with other units in the University;
- Credibility as a source of reliable, research-based information and education.

The College of Engineering (COE) mission statement is: Driven by our passion, OSU Engineering is fully committed to creating extraordinary engineers and research solutions to the world's most pressing problems,

<p><i>Ecological Engineering Defined</i></p>	<p>while fueling prosperity through innovation for Oregon and beyond. This statement is published on the COE website and also included in the COE Annual Report and in the OSU General Catalog and Schedule of Classes.</p> <p><b>THE DEPARTMENT AND PROGRAM</b></p> <p>Ecological Engineering is defined as engineering that incorporates ecological principles into the design of both natural and human-dominated systems. Ecology as used as its fundamental design paradigm, emphasizing resiliency, adaptation and systems approaches to develop engineered solutions that are sustainable, intrinsically incorporate a broad range of biological systems as components, and emphasize mutual improvement of both human and natural environments. This focus on incorporation of ecological principles in engineering design to promote development of robust, sustainable systems sets it apart from other engineering disciplines.</p>
<p><i>Potential Employers</i></p>	<p>The Ecological Engineering BS program graduates students capable of analyzing problems that occur at the interface between humankind and the environment and synthesizing solutions to the benefit of both. These students are capable of addressing crucial environmental issues including habitat loss, fisheries, and pollution at the system level. Many of these issues are not amenable to simple solutions. The systems perspective often suggests solutions that are not intuitively obvious to observers focused on specific aspects of the system under consideration.</p>
<p><i>Engineering Accreditation</i></p>	<p>The Department of Biological &amp; Ecological Engineering (BEE) mission statement is: Our mission is to achieve national and international recognition as a center of excellence for integrated research and education in the programs broadly defined as Ecological Engineering, Biological Engineering, and Water Resources Engineering while maintaining strong outreach links to the agricultural and natural resources communities. Our stakeholders will include environmental and ecological consulting firms, ecotechnology providers, entrepreneurial enterprises building new 21<sup>st</sup>-century biology- and ecology-based industries, public resource management agencies, and stakeholders in the state with interests in these focus areas.</p>
<p><i>Disciplinary Basis</i></p>	<p>Our educational mission is to balance innovative undergraduate and graduate programs taking advantage of our unique strengths, and a relevant outreach program that takes advantage of emerging technology to deliver information to a broad clientele on adoption and use of sustainable engineering technology. Our department will produce ecological engineering graduates that are work-ready and entrepreneurial systems thinkers capable of contributing to the future prosperity and sustainable future of the State of Oregon and the global community.</p> <p><b>PROGRAM EDUCATIONAL OBJECTIVES (PEOs)</b></p> <p>Our educational objectives were developed to link the Department’s mission to the learning outcomes. The outcomes are then supported by the specific course learning objectives.</p> <p>Three PEOs for Ecological Engineering graduates:</p>

<p><i>Capabilities of our Graduates</i></p>	<p>1) <b>Our graduates will be employed as practicing engineers, engaged in advanced studies, or applying engineering problem-solving skills within non-traditional career paths.</b></p> <p>2) <b>Our graduates will bring creative and innovative ecologically-derived systems-level approaches to solving global problems.</b></p> <p>3) <b>Our graduates will provide leadership and management skills within their organizations.</b></p> <p><b>STUDENT OUTCOMES (SOs)</b></p> <p>The OSU Biological &amp; Ecological Engineering department prepares its Ecological Engineering Graduates to achieve Program Educational Objectives several years into their careers. This is achieved in the short-term by having students able to perform the following on graduation, while preparing them for immediate and long-term service in the field.</p> <ul style="list-style-type: none"> <li>• Ability to apply knowledge of mathematics, science, and engineering</li> <li>• Ability to design and conduct experiments as well as analyze and interpret data</li> <li>• Ability to design a system, component, or process to meet desired needs</li> <li>• Ability to function on a multidisciplinary team</li> <li>• Ability to identify, formulate, and solve engineering problems</li> <li>• Understanding of professional and ethical responsibility</li> <li>• Ability to communicate effectively</li> <li>• Broad education necessary to understand impact of engineering solutions in global, economic, environmental and societal context</li> <li>• Recognition of the need for and ability to engage in life-long learning;</li> <li>• Knowledge of contemporary issues</li> <li>• Ability to use techniques, skills, and modern engineering tools necessary for engineering practice</li> <li>• Ability to apply knowledge in a specialized area related to ecological engineering</li> <li>• Ability to model and design ecological systems</li> <li>• Awareness of the forces that impact design and decision making, such as resource limitations, system constraints, and the identified goals for improvement.</li> </ul>
<p><i>Program Objectives</i></p>	
<p><i>192 Credits Required to Graduate</i></p>	<p><b>THE CURRICULUM – OVERVIEW</b></p> <p>The Bachelor of Science (BS) in Ecological Engineering degree program offered through the Colleges of Agricultural Science and Engineering is a new degree program that is the first of its kind nationally at the undergraduate level. The undergraduate Ecological Engineering degree program requires 192 credit hours and leads to a BS in Ecological</p>

<p><i>Ecological Engineering Core</i></p>	<p>Engineering. This program is accredited by the Accreditation Board for Engineering and Technology (ABET).</p> <p>The curriculum is divided into an Ecological Engineering Core and Upper division Science &amp; Engineering Electives. The Ecological Engineering Core contains the introductory and upper division course work that provides the common engineering and scientific basis or language for our students. The core consists of: (1) Pre-Professional Courses; (2) Baccalaureate Core requirements; (3) Professional Core Upper Division Engineering Courses; (4) Science and Public Policy Courses; (5) Professional Skills requirements; and (6) Ethics requirement.</p> <p>Students choose 1 course from each elective cluster to fulfill upper division science and engineering elective credit requirements. A maximum of two 200-level engineering electives and one 200-level science elective may be taken. Table 1 shows the basic program and science and engineering elective clusters for the Ecological Engineering BS degree. Table 2 shows a sample 4-year program for the Ecological Engineering BS degree.</p> <p><b>This program is ABET accredited.</b> The curriculum fulfills the stated requirements of ABET, the College of Engineering, the Ecological Engineering Department, and Oregon State University for a BS degree. The curriculum contains the following components:</p> <ol style="list-style-type: none"> <li>1. Basic ABET requirements in mathematics, science, liberal arts, engineering science and engineering design;</li> <li>2. Basic University Requirements covered under the Baccalaureate Core;</li> <li>3. Basic university and departmental requirements in communications skills;</li> <li>4. Elective courses in science, engineering science and other technical courses to meet the requirements of ABET and the Ecological Engineering program.</li> </ol>
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**Table 1 – Ecological Engineering, B.S. – 192 Credits**

**Core Requirements**

<b>Pre-Professional Core*</b>	<b>Cr</b>	<b>OSU Baccalaureate Core Courses</b>	<b>Cr</b>
*CH 231/261 – General Chemistry	5	Lifetime Fitness (HHS 231, 241/251 Series or PAC class)	3
*COMM 111 – Pub Speak, <b>OR</b> COMM 114 – Arg & Crit Discourse	3	Mathematics (met by MTH 251)	
*MTH 251 and *MTH 252 – Differential and Integral Calculus	8	Writing I (met by WR 121)	
*MTH 254 – Vector Calculus	4	Writing II (met by WR 327)	
*MTH 256 – Applied Differential Equations	4	Writing III (met by COMM 111/114)	
*MTH 306 – Matrix & Power Series	4	Biological Science (met by BI 211)	
*PH 211, *PH 212, *PH 213 – Gen Physics with Calc	12	Cultural Diversity <sup>a</sup>	3
*WR 121 – English Composition	3	Literature and the Arts	3
*ENGR 211 – Statics	3	Physical Science (met by CH 231/232)	
*ENGR 213 – Strength of Materials	3	Social Processes and Institutions (met by AEC 250)	
*BEE 102 – Ecological Engineering II - Applications	3	Western Culture (met by PHL 205) <sup>b</sup>	3
		Difference, Power, and Discrimination <sup>c</sup>	3
		Contemporary Global Issues	3
<b>Additional Pre-Professional Core</b>			
BEE 101 – Ecological Engineering I – Principles	3	Science, Technology, and Society (met by IE 380)	3
BEE 221 – Ecological Engineering Fundamentals	3		
BEE 222 – Ecological Engineering Computation (Recommended)	3	<b>Non-Pro Core Science and Public Policy Courses</b>	
WR 327 – Technical Writing	3	SOIL 205 – Soil Science	4
ST 314 – Statistics for Engineers (or ST 421***)	3	ATS 320 – The Changing Climate or ATS 210 – Intro Atmos Sci	3
BI 211, BI 212, BI 213 – Principles of Biology	12	BI 370 – Ecology	3
CH 232/262, CH 233/263 – General Chemistry	10	AEC 250 – Intro. To Environ. Econ. And Policy (Recommended)	3
<b>Professional Core</b>		<b>Professional Skills</b>	
BEE 311 – Ecological Fluid Mechanics	4	BEE 415 Professional Devel (May be repeated once for credit)	1
BEE 312 – Ecohydraulics (Proposed)	4	ENGR 391 – Engineering Economics & Project Management	3
BEE 313 – Ecohydrology (Proposed)	4	FE 257 – GIS and Forest Engineering Applications	3
BEE 320 – Biosystems Analysis and Modeling	4		
BEE 322 – Thermodynamics and Transfer Processes	4	<b>Ethics (Pick one)</b>	
BEE 361 – Ecological Engineering Laboratory	3	IE 380 – The Responsible Engineer	3
BEE 468 – Bioremediation (Proposed credit change)	4	PHL 205 – Ethics	4
BEE 469 – Ecological Engineering Design I (WIC)	4		
BEE 470 – Ecological Engineering Design II (WIC)	4		
Upper Division Engineering Elective (UDEE)*	18(21)		
Upper Division Science Electives (UDSE)	9		
* Number of credits assumes BEE 222 is completed C or better.			

## Upper Division Science and Engineering Elective Clusters

### *Ecological Engineering Upper Division Structure – must take 1 course from each group*

<b>Engineering Electives (at least 21 Cr.)</b>		<b>Sci., Pub. Policy, Econ. &amp; Comm. Electives (at least 9 Cr.)</b>	
<b>Engineering I Elective</b>		<b>Science I Elective</b>	
BEE 458 – Nonpoint Source Poll Assess & Abatement	3	CH 331 – Organic Chemistry	4
BEE 433 – Irrigation Systems Management	4	BOT 313-Plant Structure	4
BEE 446 – River Engineering	4	BOT 331 – Plant Physiology	4
		BOT 341 – Plant Ecology	4
<b>Engineering II Elective</b>		RNG 341 – Rangeland Ecology and Management	3
FE 208 – Forest Surveying	4	RNG 355 – Desert Watershed Management	3
ENVE 422 – Environmental Engineering Design	4	GEO 202 – Earth Systems Science	4
FE 315 – Soil Engineering	4	FOR 445 – Ecological Restoration	4
Selection in consultation with Advisor	4	RNG 421 – Wildland Restoration and Ecology	4
		MTH 351 – Introduction to Numerical Analysis	3
<b>Engineering III Elective</b>		GEO 444 – Remote Sensing of the Environment	4
CE 463 – Control Surveying	4	ST 422 – Intro to Mathematical Statistics (Requires ST 421)	4
FE 422 – Forest Geomatics	4	FW 456 – Limnology (Requires: Senior standing)	5
ENVE 421 – Water and Wastewater Characterization	4		
FE 316 – Soil Mechanics	4	<b>Science II Elective</b>	
BEE 446 – River Engineering	4	TOX 430 Chemical Behavior in the Environment	3
Selection in consultation with Advisor	4	CH 332 – Organic Chemistry (Requires CH 331)	4
		BOT 442 – Plant Population Ecology (Requires BOT 341)	3
<b>Engineering IV Elective</b>		RNG 455 – Riparian Ecology & Management (Requires RNG 355)	3
CE 465 – Oregon Land Survey Law	4	GEO 322 – Surface Processes (Requires GEO 202)	4
ENVE 431– Fate & Transport of Chem. in Environ. Sys.	4	FW 479 Wetlands and Riparian Ecology	3
BEE 433 – Irrigation Systems Management	4	Z 477 – Aquatic Entomology	4
Selection in consultation with Advisor	4	FOR 441 – Silviculture Principles	4
		MTH 481 – Math Meth Engineers & Scientists	3
<b>Engineering V Elective</b>		GEO 481 – Glacial Geology (Requires GEO 202)	4
BEE 480 – Bioproduct Engineering	3	GEO 483 – Snow Hydrology (Requires GEO 202)	3
ENVE 456 – Sustainable Water Res Dev	3	GEO 301 – Map and Image Interpretation	4
BEE 475 – Bioenergy Systems	3		
FE 209 – Forest Photogrammetry	3 (4)	<b>Sci. III or Public Policy, Economics, Comm.</b>	
Selection in consultation with Advisor	3	RNG 351 – Range Ecology I (Requires BOT 313 and RNG 341)	3
		RNG 352 – Range Ecology II (Requires BOT 313 and RNG 341)	3
<b>Engineering VI Elective</b>		GEO 432 – App Geomorphology (Requires GEO 322 & GEO 202)	3
ENVE 425 – Air Pollution Control	3	MTH 482 – Math Meth Engineers & Scientists (Requires MTH 481)	3
CE 469 – Property Surveys	3	GEO 360 – Cartography	4
CE 461 – Photogrammetry	3	BEE 478 – Biofuels Feedstocks and Production	3
BEE 401 – Research (Requires: MTH 351)	3	SOIL 455 – Biology of Soil Ecosystems	4
BEE 458 – Nonpoint Source Poll Assess & Abatement	3	CH 337 – Organic Chemistry Laboratory (Requires CH 261/262/263)	4
		BEE 410 – Ecological Engineering Internship	3-6
		CH 324 – Analytical Chemistry (Requires CH 261/262/263)	4
		AREC 351 – Nat Res Economics & Policy (Requires AREC 250)	4
		AREC 432 – Environmental Law	4
		SOIL 335 – Introduction to Water Science and Policy	3



**Upper Division Science and Engineering Elective Clusters**

***Ecological Engineering Upper Division Structure – must take 1 course from each group***

	<b>Sci. III or Public Policy, Economics, Comm. Continued</b>	
	FOR 330 – Forest Conservation Economics	4
	ECON 201 – Introduction to MicroEconomics	4
	BA 362 – Social Entrepreneurship & Social Initiatives	4
	WSE 455 Marketing and Innovation in Renewable Materials	4
	COMM 444 – Third Parties Dispute Resolution: Med & Arbitration	3
	COMM 442 – Bargaining and Negotiation Processes	3
	COMM 440 – Theories of Conflict and Conflict Management	3

\*Required by the College of Engineering for entrance into the Professional Program;

\*\*ST 421 may substitute for ST 314 but 422 must be taken for Science Elective credit. All statistics course are offered in the summer sessions.

<sup>a</sup> Suggested options: **ANTH 210**, Comparative Cultures; **ES 101**, Introduction to Ethnic Studies; **GEO 105**, Geography of the Nonwestern World; **PHL 160**, Quests for Meaning: World Religions; **WS 280**, Global Women

<sup>b</sup> Suggested options: **AREC 253**, Evolution of U.S. Environmental and Natural Resources Law; **PHL 201**, Introduction to Philosophy; **PHL 205**, Ethics; **PHL 207**, Political Philosophy; **PHL 251**, Knowers, Knowing, and the Known; **PS 206**; Introduction to Political Thought

<sup>c</sup> Suggested options: **AG 301**, Ecosystem Science of Pacific NW Indians; **FW 340**, Multicultural Perspectives in Natural Resources; **GEO 309**, Environmental Justice; **PHL 280**, Ethics of Diversity; **SOC 206**, Social Problems and Issues; **SOC 360**, Population Trends and Policy; **SOC 426**, Social Inequality; **WS 223**, Women: Self, and Society; **WS 224**, Women: Personal and Social Change.

**Table 3 B. S. in Ecological Engineering - 4 Year Example Program**

Freshman Year			Sophomore Year		
Fall	Winter	Spring	Fall	Winter	Spring
Differential Calculus MTH 251* 4	Integral Calculus MTH 252* 4	Vector Calculus MTH 254* 4	Applied Diff. Eqns. MTH 256* 4	EcoE Fundamentals I BEE 221 3	EcoE Computation BEE 222 3
English Composition WR 121* 3	Speech Communications COMM 111 or 114* 3	General Physics/Calc PH 211* 4	General Physics/Calc PH 212* 4	General Physics/Calc PH 213* 4	Matrix and Power Series MTH 306* 4
General Chemistry CH 231(4 cr) + CH 261 (1 cr)* 5	General Chemistry CH 232 (4 cr) + 262 (1 cr) 5	General Chemistry CH 233 (4 cr) + 263 (1 cr) 5	Principles of Biology BI 211 4	Principles of Biology BI 212 4	Principles of Biology BI 213 4
Ecological Engineering I BEE 101 3	Lifetime Fitness HHS 231 2	Ecological Engineering II BEE 102* 3	Soil Science SOIL 205/206 4	Statics ENGR 211* 3	Strength of Materials ENGR 213* 3
	Lifetime Fitness HHS 241/251 or PAC course 1			Engineering Statistics ST 314 3	Technical Writing WR 327 3
15	15	16	16	18	17

Junior Year			Senior Year		
Fall	Winter	Spring	Fall	Winter	Spring
Systems Analysis and Modeling BEE 320 4	EcoE Thermo Transfer Processes BEE 322 4	Ecological Engineering Laboratory BEE 361 3	EcoE Design I (WIC) BEE 469 4	EcoE Design II (WIC) BEE 470 4	Science Elective 3 (5)
Ecological Fluid Mechanics BE 311 4	Ecohydraulics BEE 312 4	Ecohydrology BEE 313 4	Engineering Elective III 4	BEE 468 Bioremediation 4	Engineering Elective IV 4
Ecology BI 370 3	GIS & Forest Engineering App FE 257 3	Engineering Econ & Proj Mgmt ENGR 391 3	Science Elective 3 (5)	Engineering Elective V 3 (4)	Science Elective 3 (5)
The Changing Climate ATS 320	Engineering Elective I 3 (4)	Engineering Elective II 4	Synthesis-Contemporary Global Issues Bacc Core Elective 3	Perspectives-Literature and the Arts Bacc Core Elective 3	Western Culture Bacc Core elective (if take PHL 205 as ethics course, take STS Bacc Core instead) 3
Intro to Environ Law & Policy AEC 250 3	The Responsible Engineer IE 380 3	Difference, Power, and Discrimination (DPD) Bacc Core Elective 3	Professional Development Seminar BEE 415 1	Perspectives-Cultural Diversity Bacc Core Elective 3	
17 (19)	17 (18)	17	15 (17)	17 (18)	13 (17)

\*Required by the College of Engineering for entrance into the Professional Program

<p><i>Student Responsibilities for Advising</i></p>	<p><b>ADVISING AND ASSISTANCE</b></p> <p>Academic advising and assistance in program planning is provided by an advisor assigned to each student. The student and his/her academic advisor share responsibilities for planning a program that will satisfy program requirements and career objectives. The student's advisor is responsible to assist the student in understanding the requirements stated in this document. <b>It is formally the responsibility of the student, rather than of the advisor, to continuously audit his/her program for successful completion of requirements.</b> At the quarterly advising, the advisor will make available to the student a numerical audit of the student's progress in meeting the various requirements.</p>
<p><i>Advisor Contact Information</i></p>	<p>The Ecological Engineering business office is located in Room 116 Gilmore Hall. Dr. Frank Chaplen serves as Head Advisor. Please contact Dr. Chaplen at 541-737-1015 or <a href="mailto:Frank.Chaplen@oregonstate.edu">Frank.Chaplen@oregonstate.edu</a> for advising questions that cannot be answered by your assigned faculty advisor.</p>
<p><i>Advisor List</i></p>	<p><b>Ecological Engineering Faculty Advisor List</b></p> <p><b><u>Head Advisor</u></b>  Chaplen, Frank      203 Gilmore    737-1015    <a href="mailto:Frank.Chaplen@oregonstate.edu">Frank.Chaplen@oregonstate.edu</a></p> <p>Ely, Roger            201 Gilmore    737-9409    <a href="mailto:ely@engr.orst.edu">ely@engr.orst.edu</a>  Higgins, Chad        202 Gilmore    737-2286    <a href="mailto:higginch@onid.orst.edu">higginch@onid.orst.edu</a>  Liu, Hong              228 Gilmore    737-6309    <a href="mailto:liuh@engr.orst.edu">liuh@engr.orst.edu</a>  Murthy, Ganti         122 Gilmore    737-6291    <a href="mailto:murthy@engr.orst.edu">murthy@engr.orst.edu</a>  Selker, John          210 Gilmore    737-6304    <a href="mailto:selkerj@engr.orst.edu">selkerj@engr.orst.edu</a>  Tullos, Desirée      233 Gilmore    737-2038    <a href="mailto:tullosd@engr.orst.edu">tullosd@engr.orst.edu</a>  Good, Stephen        200 Gilmore    737-2118    <a href="mailto:Stephen.Good@oregonstate.edu">Stephen.Good@oregonstate.edu</a></p>
<p><i>Spring advising requires you to complete the one-year advising form</i></p>	<p><b>Advising Policy and Schedule (Student and Advisor Meetings):</b></p> <p><b>Advising for Fall term (during Spring term)</b>  All students must see their academic advisor during Spring term advising to go over the one-year curriculum plan. The student should have the one-year curriculum plan filled out in MyDegrees. Make appointment to see advisor, prepare program plan in MyDegrees, see advisor, go over form, get PIN from your advisor, and register on your scheduled day (see <i>Registration Handbook</i> for assigned registration date or go online to <a href="http://catalog.oregonstate.edu/">http://catalog.oregonstate.edu/</a> ).</p> <p><b>Advising for Winter and Spring terms (during Fall and Winter terms):</b>  All students must make an advising appointment with their advisor to receive their registration PIN for the next quarter. Prior to meeting your advisor, you should have reviewed your current progress, identified possible</p>

*You must meet your advisor each quarter to receive your registration PIN.*

courses, and determined potential schedule conflicts, and updated program in MyDegrees.

**Procedures:**

Spring term – Make appointment to see advisor, prepare one year program in MyDegrees, see advisor, go over program, get PIN from your advisor, and register on your scheduled day (see *Registration Handbook* for assigned registration date or go online to <http://catalog.oregonstate.edu/ChapterDetail.aspx?key=374#Section3487> ).

Fall and Winter terms – Make appointment to see advisor, update your program in MyDegrees, go to advising appointment with the updated curriculum planning form, go over curriculum form with advisor and get their signature on the form, receive PIN, and register on your scheduled day.

Times when students may meet with their advisor for the purpose of program planning will be during the week prior to the start of registration. Consult the *Registration Handbook* for the start of registration. The general dates for program planning and study list preparation with an advisor are shown on the front cover of this document. Students must sign up for an advising appointment on the posted appointment sheets at their advisor's office.

The student-advisor relationship can be as rewarding as the student desires. Advisors have resources and experience that can be helpful in planning many aspects of a college education. Students are encouraged to make full use of their advisors for program planning and counseling.

**Important Dates and Deadlines:**

The *Registration Handbook* lists dates for University pre-registration, registration, fee payment, beginning of classes and drop dates, as well as other important dates. **It is the student's responsibility to be familiar with this listing.** This information is also available at: <http://catalog.oregonstate.edu/ChapterDetail.aspx?key=374#Section3487>.

*The Program Core provides flexibility across other Engineering programs*

**DETAILED PROGRAM DESCRIPTION**

**Program Core**

The core curriculum in Ecological Engineering is similar to that required by other programs in the College of Engineering. It is planned and coordinated so that transfer between engineering programs during the first 2 years (Pre-Engineering) can be made with a minimum loss of time or credits. The core

<p><i>Basic Science is required of all EcoE students</i></p> <p><i>Math through Applied Differential Equations is required</i></p>	<p>provides a background in communication skills, sciences, mathematics, engineering sciences, and liberal arts (humanities and social sciences).</p> <p>A detailed listing of all courses required by the Department is shown in Table 1. All courses required by the College of Engineering for admission to the professional program are labeled with an “*”; additional prerequisite courses that should be completed before entry into the Professional Program are labeled with **. <b>Any deviation from these requirements must be requested by petition and approved by the department’s Head Advisor or by the Department Head.</b> To aid in program planning, a four-year program format for completion of the Ecological Engineering curriculum is shown in Table 2.</p> <p><b>Using Satisfactory/Unsatisfactory Grading System</b>  The maximum number of non-graded (i.e., S/U) course credits allowed to satisfy baccalaureate degree requirements cannot exceed 3 times the number of terms enrolled at OSU as a full-time student, or a maximum of 36 credits. Courses in the following categories may be taken S/U: perspectives/synthesis, fitness, and free electives.</p> <p><b>Pass/No Pass Grading</b>  Certain courses are only offered with P/N (pass/no pass grading). Examples include Physics recitations (PH 221, 222, and 223). The maximum number of P/N- graded course credits allowed to satisfy baccalaureate degree requirements is 5.</p> <p><b>Basic and Advanced Sciences (all courses must be graded; "C" or better required)</b>  ABET requires a total of 45 credit hours of mathematics and science. Basic science requirements include General Physics with calculus (PH 211, 212, 213), General Chemistry (CH 231+261, 232+262, 233+263), and Principles of Biology (BI 211, 212, 213). Advanced Science includes SOIL 205/206 Soil Science, ATS 320 The Changing Climate, BI 370 Ecology and 3 Upper Division Science electives totaling at least 9 credits as detailed above. A maximum of one 200-level science elective may be taken. The Ecological Engineering degree program automatically meets the biological science requirement. <b>Students who complete the Chemistry for Engineers sequence, including recitations (CH 201, 202, 205, 211, and 212) will have to take an additional 6 credits of 200-level or above chemistry.</b> Students petition to take chemistry courses to bring their total 200-level and above chemistry course credits to 15. Completion of the above science requirements will satisfy the science requirements for OSU's Baccalaureate Core. Transfer and change of major students (only) who have completed CH 121,122,123 each with a grade of B or better may, with the completion of CH 324 Analytical Chemistry Lab, waive the 200-level chemistry requirement.</p>
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<p><i>Statistics coursework must include ST 314 or ST 421</i></p>	<p><b>Mathematics (all courses must be graded; "C" or better required)</b>          ABET requires a total of 45 credit hours of mathematics and science. All students must attain a proficiency level in mathematics. This includes Differential Calculus (MTH 251), Integral Calculus (MTH 252), Vector Calculus I (MTH 254), Matrix and Power Series Methods (MTH 306), and Applied Differential Equations (MTH 256). At the Community College students may take Infinite Series and Sequences (MTH 253) and Linear Algebra (MTH 2XX) to substitute for Matrix and Power Series Methods (MTH 306). Some Oregon community colleges teach a MTH 253 that is equivalent to OSU MTH 306. Check with your advisor to determine whether that is the case when transferring MTH 253.</p> <p>Students with a strong high school program in science and mathematics typically begin at the level of Differential Calculus (MTH 251). Students with exceptionally strong mathematics backgrounds or with advanced placement credits may start at more advanced levels. Conversely, students having a limited mathematical background should first take preparatory courses below MTH 251 such as MTH 111 (College Algebra) or MTH 112 (Elementary Functions). Credit earned in these preparatory courses cannot be used to fulfill the ABET mathematics credit requirements. Completion of the above mathematics requirements will satisfy the mathematics requirements for OSU's Baccalaureate Core.</p>
<p><i>Perspectives and Synthesis courses provide breadth to a student's educational experience</i></p>	<p><b>Statistics (course must be graded; "C" or better required)</b>          The Ecological Engineering BS degree program requires ST 314 Statistics for Engineers in recognition of the importance that statistical analysis plays in systems modeling. ST 421 Introduction to Mathematical Statistics is a recommended substitute for ST 314 but ST 422 must be taken additionally as an Upper Division Science Elective course. The lower level statistics does not fulfill this requirement. Students changing majors to Ecological Engineering who have completed ST 351 with a grade of B or better may substitute ST 351 for the ST 314 requirement.</p> <p><b>Communication Skills (all courses must be graded; "C" or better required)</b>          A minimum of 9 credits of communication skill coursework is required for a baccalaureate degree in Ecological Engineering. Specified courses include: English Composition (WR 121); Technical Writing (WR 327); and Speech Communication (COMM 111 or 114 or 218). Completion of these courses will fulfill both the ABET requirement and OSU's Baccalaureate Core requirements. WR 121 is alpha-sectioned by term. Additional communication skills are provided through the inclusion of the Senior Design sequence WIC courses.</p>

<p><i>EcoE students are well grounded in engineering design and technical coursework</i></p>	<p><b>Perspectives and Synthesis (courses may be non-graded (S/U); passing grade required)</b>  The intent of the perspectives/synthesis requirement in the Baccalaureate Core is to encourage students to develop non-technical interests. The ABET requirement for liberal arts is a balance of breadth and depth among humanities and social sciences. The ABET requirements are fulfilled through the OSU perspectives and synthesis courses. The Baccalaureate Core requirements for liberal arts include 15 hours of "perspectives" courses and 6 hours of "synthesis" courses. Within the 15 credit hours of perspectives coursework, students are required to complete 3 hours in "Literature and Arts," 3 hours in "Cultural Diversity," 3 hours in "Western Culture," 3 hours in "Difference, Power, and Discrimination," and "Social Processes and Institutions."  <b>No more than two courses from any one department may be used by a student to satisfy the <i>Perspectives</i> category of the core.</b> Within the 6 credit hours of synthesis coursework, students are required to complete 3 hours each in "Science, Technology, and Society" and "Contemporary Global Issues." <b>The two courses used to fulfill the <i>Synthesis</i> requirement may not be in the same department.</b></p> <p>The specific requirements and listing of acceptable courses for the Baccalaureate Core are given in detail in the front of the <i>Oregon State University Bulletin: General Catalog 2016 – 2017</i> (<a href="http://catalog.oregonstate.edu/">http://catalog.oregonstate.edu/</a>). Courses that are recommended (but not required) listed as footnotes in Table 1.</p> <p><b>Fitness (course may be non-graded; passing grade required)</b>  The Baccalaureate Core requires completion of either the 2-credit course HHS 231 "Lifetime Fitness for Health" or NFM 232 "Nutrition and Lifetime Fitness" and one of the following 1-credit lab/activity courses: HHS 241, HHS 242, HHS 243, HHS 244, HHS 245, HHS 246, HHS 247, HHS 248, or HHS 251. The lecture and lab courses can be taken concurrently or in separate terms.</p> <p><b>Engineering Science, Engineering Design and other Technical courses (all courses must be graded; "C" or better required)</b>  ABET requires that Ecological Engineering students be exposed to a wide breadth of technical subject matter. This is accomplished in the Ecological Engineering curriculum with a requirement of a total of 75 credit hours of engineering science, engineering design, and other technical course credits. The required courses automatically provide 53 credit hours of technical credits included in engineering science and design. Six engineering electives totaling at least 21 credits provide the balance of the student experience. These are shown in Table 1. Note a new course, BEE 222 EcoE Computation will be offered Spring 2017. A maximum of two 200-level engineering electives may be taken.</p>
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<p><i>Writing skills are emphasized through design reports</i></p> <p><i>At most, six “blanket hour” credits are typically allowed in your program</i></p>	<p>Engineering science provides the “bridge” between the basic sciences and engineering design. ABET requires 75 credit hours of engineering science, engineering design and other technical course subjects. The Ecological Engineering curriculum includes several design experiences that build upon one another. Many of these experiences are within required courses; others are integral parts of elective courses. The design experience includes a required capstone design project that exposes students to problems and issues similar to those encountered in the practices of civil and environmental engineering. This course incorporates economic and institutional constraints, team activities, and oral and written presentations.</p> <p><b>Writing-Intensive Courses</b></p> <p>The OSU Baccalaureate Core requires that an upper division course, the credits for which are included in the major, be writing-intensive. The course must include general writing activities. The Ecological Engineering major uses BEE 469 Ecological Engineering Design I and BEE 470 Ecological Engineering Design II as its writing-intensive courses.</p> <p><b>“Blanket Hour” Credits (BEE 401, 405, 407, 410 or equivalent from other departments)</b></p> <p>The maximum number of “blanket hour” course credits allowed to satisfy baccalaureate degree requirements is six unless identified as a specific course by title or as approved by the Head Advisor. To receive blanket-hour credits (except BEE 407 Seminars) students must complete the following steps:</p> <ol style="list-style-type: none"> <li><b>1. In advance of the work</b>, consult with a faculty member and work supervisor (for BEE 410 or blanket numbered courses outside the department) and ascertain whether the faculty member and work supervisor (for BEE 410 or blanket numbered courses outside the department) will agree to supervise the student’s work. The work supervisor (for BEE 410 or blanket numbered courses outside the department) will sign-off on the final report. The faculty member will sign-off on and assign a letter grade for the final report.</li> <li>If the faculty member and work supervisor (for BEE 410 or blanket numbered courses outside the department) agree, complete a <a href="#">Blanket Hour Credits Request Form</a> (available on BEE website) in consultation with the faculty member and work supervisor (for BEE 410 or blanket numbered courses outside the department).</li> <li>Reach agreement with the faculty member and work supervisor (for BEE 410 or blanket numbered courses outside the department) on credits to be received (normally 1 – 3), commensurate with requirements in regular courses. Regular course credits are based on 30 hours of academic effort for each credit hour granted (based on 10 weeks X 3 hours/week/credit = 30 hours/credit).</li> </ol>
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<p><i>Any OSU student can enter the EcoE Undergraduate Program</i></p>	<p>4. Provide a final copy of the Blanket Hour Credits Request Form, signed by the responsible faculty member and work supervisor (for BEE 410 or blanket numbered courses outside the department), to the Head Advisor (Dr. Frank Chaplen) for inclusion in the student's Ecological Engineering file as part of the Department's permanent record.</p> <p>5. Register for the Blanket Hour credits.</p> <p>6. Produce a substantial report for the completed work, graded by the responsible faculty member and work supervisor (for BEE 410 or blanket numbered courses outside the department, as tangible evidence and documentation of the work performed and of its technical merit.</p> <p>7. Submit a <a href="#">Program Petition Form</a> to the Head Advisor requesting where blanket hour credits should be applied in the student's program as either Science or Engineering Elective Credits. The Undergraduate Program Committee will approve or deny the request based on how well the student achieved the objectives of the work per feedback from the work supervisor or faculty member and on the grade given by the faculty member.</p>
<p><i>Admission to the EcoE Professional Program is dependent on satisfying the requirements as well as demonstrated performance</i></p>	<p><b>Program Changes</b></p> <p>Changes are made periodically in the curricula of the Department, College and University. These result from new opportunities to address changing technology and societal needs, as well as from accreditation considerations. If program changes occur during the period while a student is pursuing a BS Ecological Engineering degree, the Department will establish policy for meeting old or new requirements. It is the student's responsibility to become familiar with these requirements through conversations with their advisor.</p> <p>The basic advising policy applied to students entering the Professional Program is that they should meet pre-engineering course requirements effective during the most recent two-year period prior to entering the junior year Professional Program (e.g., 2004 - 2005 and 2005 - 2006 pre-engineering requirements for those entering the Professional Program in Fall 2006). <b>Similarly, graduating seniors should satisfy all requirements in effect during the final two years of their professional program.</b> Thus, students who spend more than two years to complete either the pre-professional program or the professional program may need to meet new requirements rather than old requirements should program changes be made during their studies.</p>
<p><i>Attendance in 3xx and 4xx EcoE classes generally requires admission into the professional program.</i></p>	<p><b>ADMISSION POLICY</b></p> <p>The undergraduate Ecological Engineering program consists of a Pre-Engineering program (Major Code: 654) and Professional Engineering program (Major Code: 450). Admission to the Pre-Engineering program (freshman and sophomore years of a 4 year program) is open to any student admitted to the University. Admission to the Professional Engineering Program (beginning at the junior year) is competitive, being restricted to</p>

those students who have demonstrated an ability to achieve the high standards required for professional engineering studies as ranked by their pre-engineering core GPA (see below).

For admission to the Professional Engineering program, students must have been previously admitted to the University and must apply to the College of Engineering. **The application for fall entry is open online for the month of April (Spring) and the month of July (Summer); the application for winter entry is open online for the month of October**

**<http://engineering.oregonstate.edu/apply-engineering-professional-program-summer15-later>**). To be eligible to apply, students must have completed at least 80 credit hours of college coursework; completed 52 credit hours of required pre-engineering core courses (See Table 1) with grades of C or better and a GPA on these courses (Pre-Engineering Core GPA) of 2.5 or greater for the Academic Year 2016-2017. Admission to the Ecological Engineering professional program is based on student ranking determined on the grade point calculated using Pre-Engineering Core courses. In addition, students should complete the courses identified by \*\* in Table 1, so that all prerequisites for junior courses are met. Repeated courses to remove grades below "C" are included in the calculation per University Guideline's for grade replacement. For students with more than two repeats, the second posted grade is used for GPA calculation purposes per University Guidelines. However, the student must continue repeating the course until the C minimum is obtained and the deficiency is cleared.

Students are not allowed into junior-level professional engineering courses until they are admitted into the professional program except by department petition under limited circumstances. Students who are deficient in required pre-engineering core courses or who miss the application deadline for professional school may petition to enroll in BEE 320 and BEE 311 in the fall quarter to allow timely graduation since our Junior sequence is only taught once a year.

Considerations include student Pre-Engineering Core GPA, which must meet or exceed the GPA minimum for professional school entry that academic year, the number of missing Pre-Engineering Core courses, completion of prerequisites, space available in BEE 311 and BEE 320 after enrollment of students who have completed their Pre-Engineering Core, and other considerations as necessary. In addition, there is mandatory fall co-enrollment in all missing Pre-Engineering Core courses and application for the winter pro-school application cycle assuming all Pre-Engineering Core requirements are successfully met. If courses are unavailable, then student will not be able to petition to take BEE 311 and BEE 320. In the event of space limitations in BEE 320 and BEE 311, students petitioning will be ranked based on completed Pre-Engineering Core course GPA and number of courses remaining to complete. Pre-Engineering Core GPA calculations will assume a C for Pre-Engineering Core courses not completed unless there is a posted grade.

<p><i>Ethical standards are enforced</i></p>	<p>More generally, enrollment in any upper division engineering course in the College of Engineering requires that: (a) students have been admitted to a professional engineering program of the College of Engineering and that the course is required in their program of study, or (b) students are enrolled in any major program at OSU whose curriculum, as printed in the <i>OSU General Catalog</i>, stipulates the course by name and number, or (c) students admitted with the approval of the College and the Department offering the course by a petition process.</p> <p><b>TRANSFER CREDITS</b></p> <p>Policies regarding transfer students, transfer credits and advanced placement credits are discussed at <a href="http://oregonstate.edu/admissions/transfer.html">http://oregonstate.edu/admissions/transfer.html</a>. Transfer students with upper transfer courses that have no OSU equivalent as determined by the Registrar's office will be required to bring copies of transfer course materials including syllabus to their initial advising appointment for credit determination. This process might include contacting OSU instructors for courses that might be equivalent to determine equivalency. The entire process is described at the URL listed above.</p>
<p><i>Academic honesty is expected for all students; dishonesty will result in expulsion from the program.</i></p>	<p><b>STUDENT PERFORMANCE POLICIES</b></p> <p>The professional character of engineering instruction involves many considerations other than those reflected by Oregon State University minimum grade standards. The College of Engineering has adopted certain policies and procedures that are described below.</p> <p><b>Code of Ethics</b></p> <p>Each student is expected to comply with those aspects of the code of ethics of the profession that are applicable to students. Ethical conduct constitutes an important element of professional competence. Evasion of full personal responsibility is considered unethical by the profession, by the College of Engineering, and by the Biological &amp; Ecological Engineering Department.</p>
<p><i>Standards of good behavior are expected of all students</i></p>	<p><b>Academic Honesty</b></p> <p>Academic dishonesty is defined as an intentional act of deception in which a student seeks to claim credit for the work or effort of another person or uses unauthorized materials or fabricated information in any academic work. It includes "cheating" (intentional use or attempted use of unauthorized materials, information, or study aid), "fabrication" (intentional falsification or invention of any information), "assisting in dishonesty" (intentionally or knowingly helping or attempting to help another commit an act of dishonesty), "tampering" (altering or interfering with evaluation instruments and documents), and "plagiarism" (intentionally or knowingly representing the words or ideas of another person as one's own). Academic honesty is expected and required of all students; infringement of this standard can result in termination from the program.</p> <p><b>Student Demeanor</b></p>

The dignity of the classroom setting has an important influence on learning. To enhance and preserve this dignity, Ecological Engineering students are expected to be seated, prepared to work when the period begins, and remain until dismissed by the instructor at the end of the period. Students are required to demonstrate considerate behavior while in the classroom setting. Disruptive activities in class, such as open conversations during lectures and general lack of attentiveness, are discourteous and will not be condoned by instructors. Cell phone usage is prohibited, including text messaging unless by prior arrangement with the instructor.

### **COLLEGE OF ENGINEERING ACADEMIC REQUIREMENTS**

To assure that all College of Engineering graduates have the strongest possible educational preparation for a professional career in engineering with no deficiencies in any required area of study, the College has adopted rules for Academic Warning, Probation and Suspension, which can be found at <http://engineering.oregonstate.edu/undergraduate-policy-manual>.

### **DEPARTMENTAL ACADEMIC REQUIREMENTS**

1. Students must demonstrate that adequate background has been gained in all coursework used to satisfy program requirements. Therefore, all coursework must be passed with a grade of "C" or better.
2. When proceeding in sequence courses or in courses with prerequisites, a student receiving a grade below "C" in a prerequisite course must see the Head Advisor before proceeding in the sequence.

### **RESOURCES FOR UNDERGRADUATES**

#### ***Resources available to only Engineering students:***

- **The HUB**: Offers a variety of resources including study tables, academic coaching, and information on study abroad.
- **College of Engineering Academic Coaching**: Meet with academic coaches to discuss and to explore the future direction of your educational goals while helping you improve your grades, manage your time, prepare for exams, etc. To schedule an appointment, please email [engrcoaching@oregonstate.edu](mailto:engrcoaching@oregonstate.edu)

#### ***OSU Academic Support:***

- **Collaborative Learning Center (CLC)**: Offering peer-tutors and GTAs to help with math, sciences and writing. Located on the main floor of the Valley Library.
- **Chemistry Tutoring (Mole Hole)**: General chemistry tutoring offered in the Valley Library Collaborative Learning Center, located on the main floor.

- **Math Tutoring (Math Learning Center)**: The Math Learning Center provides free drop-in tutoring, printed resources, calculators, help using MATLAB and other math software, study areas, and a computer classroom. Private tutoring for a fee is also available. Located in Kidder Hall 108.
- **Physics Tutoring (Worm Hole)**: General physics tutoring offered in Weniger Hall 145 (M-F) and the Valley Library Collaborative Learning Center (Su-Th).
- **Writing Center**: The Writing Center's mission is to provide writing support that enable students at all levels to function effectively, efficiently, and confidently in an academic environment. Writing assistants can help with all aspects of the writing process from brainstorming and organization to questions of grammar and usage.