

**Plan of Study for the Environmental Science & Engineering AB Concentration**  
Effective for Students Declaring the Concentration after August 1, 2019

NAME: \_\_\_\_\_

CLASS: \_\_\_\_\_

EMAIL: \_\_\_\_\_

DATE: \_\_\_\_\_

This Plan of Study Form is for a (*Circle One*):

DECLARATION

REVISION

<b>REQUIRED COURSES</b> (Circle or fill-in for courses planned in each category.)	<b>Semester</b> (FA/SP Year)
<p><b>Mathematics</b> (2-5 courses)</p> <p><i>Begin according to placement:</i></p> <p>Math 1a – Introduction to Calculus I (or Math Ma &amp; Mb)</p> <p>Math 1b – Calculus, Series, and Differential Equations</p> <p>Math 21a – Multivariable Calculus (or Math 22a or 23b, or Applied Math 21a or 22b)</p> <p>Math 21b – Linear Algebra and Differential Equations (or Math 22b or 23a, or Applied Math 21b or 22a)</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p><b>Physics</b> (2 courses)</p> <p>AP 50a – Physics as a Foundation for Sci. &amp; Eng. Part I (or PS 12a or Physics 15a or 16)</p> <p>AP 50b – Physics as a Foundation for Sci. &amp; Eng. Part II (or PS 12b or Physics 15b)</p>	<p>_____</p> <p>_____</p>
<p><b>Chemistry</b> (2 courses)</p> <p><i>Select two:</i></p> <p><i>Recommended:</i> Physical Sciences 11 – Foundations and Frontiers of Modern Chemistry: A Molecular and Global Perspective (or Physical Sciences 1 – Chemical Bonding, Energy, and Reactivity)</p> <p>Life Sciences 1a – An Integrated Introduction to the Life Sciences (or Life &amp; Physical Sciences A – Foundational Chemistry and Biology)</p> <p>Physical Sciences 10 – Quantum and Statistical Foundations of Chemistry</p> <p>Chemistry 17 – Principles of Organic Chemistry (or Chemistry 20 – Organic Chemistry)</p> <p>Chemistry 60 – Foundations of Physical Chemistry</p>	<p>_____</p> <p>_____</p>
<p><b>Environmental Science &amp; Engineering Introductory Course</b> (1 course)</p> <p>ESE 6 – Intro to Environmental Science &amp; Engineering (may substitute GENED 1085, 1094, or 1137, or other appropriate course by petition)</p>	<p>_____</p>
<p><b>Sophomore Forum</b></p> <p><i>Required, non-credit.</i></p>	<p>_____</p>

<b>REQUIRED COURSES</b> (Circle or fill-in for courses planned in each category.)	<b>Semester</b> (FA/SP Year)
<p><b>Breadth in Environmental Science &amp; Engineering</b> (2 courses)  <i>Strongly recommended to select one course on environmental physics and one course on environmental chemistry. With permission of the Director of Undergraduate Studies, students may substitute alternative ESE courses.</i></p> <p><i>One course on environmental physics:</i> ESE 131, 132, 162</p> <p><i>One course on environmental chemistry:</i> ESE 133, 163</p>	<p>_____</p> <p>_____</p>
<p><b>Approved Electives</b> (5 courses)  <i>Select five from the options below (course titles are listed on page 3). With permission of the Director of Undergraduate Studies, up to two courses may be substituted with a relevant upper-level course from other areas of the natural sciences and engineering. Courses marked with an * are approved for the required design experience (see below).</i></p> <ul style="list-style-type: none"> <li>• ESE 109, 129, 130*, 131, 132, 133, 136, 138, 160*, 161, 162, 163*, 166*, 169*</li> <li>• ES 91r (one term), 96*, 112, 115*, 123, 181, 183</li> <li>• EPS 53, 134, 187</li> <li>• OEB 55, 120, 157</li> </ul>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p><b>Design Experience</b>  <i>All students must take an approved course (see courses marked with an * above) with significant design experience as one of their ESE Breadth or Approved Electives. This requirement may also be satisfied with a design component within a senior thesis or independent research project (ES 91r).</i></p>	

**Required Signatures:**

\_\_\_\_\_  
Student

\_\_\_\_\_  
Date

\_\_\_\_\_  
Associate Director of Undergraduate Studies

\_\_\_\_\_  
Date

ADUS indicate if a petition is needed: Yes \_\_\_\_\_

No \_\_\_\_\_

\_\_\_\_\_  
Director of Undergraduate Studies

\_\_\_\_\_  
Date

## **COURSE TITLES FOR APPROVED ELECTIVES:**

ESE 109 – Earth Resources and the Environment  
ESE 129 -- Climate and Atmospheric Physics Lab  
ESE 130 – Biogeochemistry of Carbon Dioxide and Methane  
ESE 131 – Introduction to Physical Oceanography and Climate  
ESE 132 – Introduction to Meteorology and Climate  
ESE 133 – Atmospheric Chemistry  
ESE 136 – Climate and Climate Engineering  
ESE 138 – Mysteries of Climate Dynamics  
ESE 160 – Space Science and Engineering: Theory and Applications  
ESE 161 – Applied Environmental Toxicology  
ESE 162 – Hydrology  
ESE 163 – Pollution Control in Aquatic Ecosystems  
ESE 166 – State-of-the-art Instrumentation in Environmental Sciences  
ESE 169 – Seminar on Global Pollution Issues

ES 91r – Supervised Reading and Research  
ES 96 – Engineering Problem Solving and Design Project  
ES 112 – Thermodynamics by Case Study  
ES 115 – Mathematical Modeling  
ES 123 – Intro to Fluid Mechanics & Transport Processes  
ES 181 – Engineering Thermodynamics  
ES 183 – Introduction to Heat Transfer

EPS 53 – Marine Geochemistry  
EPS 134 – Global Warming Debates: The Reading Course  
EPS 187 – Low Temperature Geochemistry II: Modern and Ancient Biogeochemical Processes

OEB 55 – Ecology: Populations, Communities, and Ecosystems  
OEB 120 – Plants and Climate  
OEB 157 – Global Change Biology

**Prerequisite Planning Table for the Environmental Science & Engineering AB**

	Typically Offered	Math	Chemistry	Physics	Other
<i>Required Courses</i>					
ESE 6	Spring				
<i>Selected Electives</i>					
ESE 109	Spring (odd)				<b>ESE 6</b>
ES 112	Spring				
ES 123	Spring	<b>21a,b</b>		<b>A</b>	
ESE 129	Fall	<i>21a</i>		<i>A</i>	
ESE 130	Bracketed		<b>PS 11</b>		<b>ESE 6</b>
ESE 131	Spring (even)	<b>21a,b</b>		<b>A</b>	
ESE 132	Fall (even)	<b>21a,b</b>		<b>A</b>	
ESE 133	Spring	<b>1b</b>	<b>PS 11</b>		
ESE 136	Spring	<b>1a</b>	<b>PS 11</b>	<b>A</b>	
ESE 138	Fall (odd)	<i>21a,b</i>		<i>A</i>	
ESE 160	Spring (even)	<b>21a,b</b>		<b>A,B</b>	
ESE 161	Fall (odd)	<b>1b</b>	<b>PS 11</b>		
ESE 162	Fall (even)	<b>21a,b</b>		<b>A</b>	
ESE 163	Fall (odd)	<b>21a</b>			<b>ESE 6</b>
ESE 166	Spring	<b>1b</b>	<b>PS 11</b>	<b>A,B</b>	
ESE 169	Fall (even)	<b>1b</b>	<b>PS 11</b>		

<sup>1</sup>Courses listed as Recommended Preparation, and not an enforced prerequisite, are shown in italics

<sup>2</sup>Equivalent courses are accepted for prerequisites (e.g., Phys 15a, PS 12a, or AP50a all count for Physics A)