Plan of Study for the Environmental Science & Engineering Track
of the Engineering Sciences SB Concentration
Effective for Students Declaring the Concentration after August 1, 2020

NAME: _____ CLASS: _____

EMAIL: _____ DATE: _____

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

The S.B. Program in Engineering Sciences must contain at least 20 courses: 4 courses in mathematics, 4 courses in basic sciences, and 12 courses in engineering topics. This Plan of Study is not final until this form has been signed, ensuring that the proposed plan meets the ABET distribution requirements.

REQUIRED COURSES (Circle or fill-in for courses planned in each category.)	**Math**	**Science**	**Engr.** **Topics**	**Semester** (FA/SP Year)

Mathematics (2-5 courses)
 	
Begin according to placement:
Math 1a – Introduction to Calculus I (or Math Ma & Mb)
Math 1b – Calculus, Series, and Differential Equations
Math 21a – Multivariable Calculus
    (or Math 22a or 23b, or Applied Math 21a or 22b)
Math 21b – Linear Algebra and Differential Equations
    (or Math 22b or 23a, or Applied Math 21b or 22a)
	1.0
	1.0
	1.0
	
	1.0
				_____
				_____
				_____
				
				_____

Probability & Statistics (1 course, if starting in Math 1b or higher) *Select one*: AM 101 – Statistical Inference for Scientists & Engineers ES 150 – Intro to Probability with Engineering Applications Statistics 110 – Introduction to Probability	(1.0)			_____
Applied Mathematics (1course, if starting in Math 21a or equivalent) *Select one:* AM 104 – Series Expansions & Complex Analysis AM 105 – Ordinary & Partial Differential Equations AM 106 – Applied Algebra AM 107 – Graph Theory & Combinatorics	(1.0)			_____

Physics (2 courses)
 	
AP 50a – Physics as a Foundation for Sci. & Eng. Part I
    (or PS 12a or Physics 15a or 16)
AP 50b – Physics as a Foundation for Sci. & Eng. Part II
    (or PS 12b or Physics 15b)
		1.0
		
		1.0
				_____
				
				_____

Chemistry/Life Sciences (2 courses)
 	
Select two (PS 11 strongly recommended):
LS 1a – Intro to the Life Sciences
    (or LPS A – Foundational Chemistry & Biology)
PS 10 – Chemistry: A Microscopic Perspective
PS 11 – Foundations & Frontiers in Modern Chemistry
    (or PS 1 – Chemical Bonding, Energy, & Reactivity)
Chemistry 17 – Principles of Organic Chemistry
    (or Chemistry 20 – Organic Chemistry)
		1.0
		
		1.0
				———
				
				———

REQUIRED COURSES (Circle or fill-in for courses planned in each category.)	Math	Science	Engr. Topics	Semester (FA/SP Year)
Sophomore Forum *Required, non-credit.*				———
Computer Science (1 course) *Select one:* CS 50 – Introduction to Computer Science I CS 51 – Introduction to Computer Science II CS 61 – Systems Programming & Machine Organization			1.0	———
Environmental Science & Engineering Core (5 courses) Environmental Science and Engineering 6 *Select four courses from (course titles shown on p. 4):* Environmental Science and Engineering 109, 130, 131, 132, 133, 136, 160, 161, 162, 163, 164, 166, 169, Engineering Sciences 112, 123			1.0 1.0 1.0 1.0 1.0	——— ——— ——— ——— ———

Engineering Breadth (3 courses)
 	
 Select one upper-level course (>100) from each area, see lists on pp. 4-5. (Note: ES54 may be used for the Electrical area.)
 	
 Area: Mechanics & Materials
 	
   Course:
 	
 Area: Engineering Physics & Chemistry
 	
   Course:
 	
 Area: Electrical
 	
   Course:
			1.0
			
			 1.0
			
			 1.0
				———
				
				 ———
				
				 ———

Approved Engineering Elective (1 course) *Select at least 1additional course on engineering topics** 1.			1.0	———
Engineering Design (2 courses) Engineering Sciences 96 Engineering Sciences 100hf			1.0 1.0	——— ———
TOTALS	**/4**	**/4**	**/12**	

* Environmental Science and Engineering 6, Engineering Sciences 50, 51, and 53: No more than two of these courses may count towards concentration credit. Engineering Sciences 50 and 53 can only count as an Engineering Elective when taken during the freshman or sophomore year.

  ES 91r may be included as an Engineering Elective in a Revised Plan of Study following the approval of a written petition and a signed certification that the project meets the ABET definition of an engineering topic.

For courses co-listed in another department, students must enroll in the Engineering Sciences offering.

Required Signatures:

_____   _____
Student   Date

_____   _____
Associate/Director of Undergraduate Studies   Date

This plan *does* / *does not* meet the ABET distribution requirements.

_____   _____
Assistant Dean for Education   Date

Pre-approved Courses for the SB in Engineering Sciences

Engineering Courses
Sorted by Depth Area and fulfills requirement for ABET engineering topics. For courses co-listed in another department, students must enroll in the Engineering Sciences offering.

Environmental
ESE 6 – Introduction to Environmental Science & Engineering
ESE 109 – Earth Resources and the Environment
ES 112 – Thermodynamics by Case Study
ES 123 – Intro to Fluid Mechanics & Transport Processes
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 160 – Space Science: Theory and Applications
ESE 161 – Applied Environmental Toxicology
ESE 162 – Hydrology
ESE 163 – Pollution Control in Aquatic Ecosystems
ESE 164 – Environmental Chemistry
ESE 166 – State-of-the-art Instrumentation in Environmental Sciences
ESE 169 – Seminar on Global Pollution Issues

Mechanics and Materials
ES 51 – Computer Aided Machine Design
ES 120 – Intro to the Mechanics of Solids
ES 123 – Intro to Fluid Mechanics & Transport Processes
ES 125 – Mechanical Systems
ES 128 – Computational Solid & Structural Mechanics
ES 181 – Engineering Thermodynamics
ES 183 – Introduction to Heat Transfer
ES 190 – Intro to Materials Science & Engineering

Engineering Physics and Chemistry
ES 112 – Thermodynamics by Case Study
ES 170 – Engineering Quantum Mechanics
ES 173 – Introduction to Electronic and Photonic Devices
ES 181 – Engineering Thermodynamics
ES 190 – Intro to Materials Science & Engineering

Electrical
ES 50 – Intro to Electrical Engineering
ES 54 – Electronics for Engineers
ES 151 – Applied Electromagnetism
ES 152 – Circuits, Devices, and Transduction
ES 153 – Laboratory Electronics
ES 154 – Electronic Devices & Circuits
ES 155 – Systems and Control
ES 156 – Signals and Communications
ES 157 – Biological Signal Processing
ES 158 – Feedback Systems: Analysis and Design
ES 159 – Intro to Robotics
ES 170 – Engineering Quantum Mechanics
ES 173 – Introduction to Electronic and Photonic Devices
ES 175 – Photovoltaic Devices
ES 177– Microfabrication Laboratory
CS 141 – Computing Hardware
CS 146 – Computer Architecture
CS 148 – Design of VLSI Circuits & Systems

Biological and Biomedical
ES 53 – Quantitative Physiology as a Basis for Bioengineering
BE 110 – Physiological Systems Analysis
BE 121 – Cellular Engineering
BE 125 – Tissue Engineering
BE 128 – Introduction to Biomedical Imaging and Systems
BE 129 – Introduction to Bioelectronics
BE 130 – Neural Control of Movement
BE 191 – Intro to Biomaterials
ES 211 – Microphysiological Systems
ES 221 – Drug Delivery
ES 227 – Medical Device Design
ES 228 – Biologically-Inspired Matreials

General Engineering Electives (Cannot be used for Depth or Breadth Areas)
ES 111 – Intro to Scientific Computing
ES 115 – Mathematical Modeling
ES 121 – Intro to Optimization: Models & Methods

Prerequisite Planning Table for the ES SB - Environmental Science & Engineering Track

	Typically Offered	Math	Chemistry	Physics	Other
Required Courses					
ESE 6	Spring				
ES 96	Fall & Spring				**Junior year**
ES 100HF	Fall-Spring				**ES 96**
Selected Electives					
ESE 109	Spring (odd)				**ESE 6**
ES 112	Spring				
ES 123	Spring	**21a,b**		**A**	
ESE 130	Bracketed		**PS 11**		**ESE 6**
ESE 131	Spring (even)	**21a,b**		**A**	
ESE 132	Fall (even)	**21a,b**		**A**	
ESE 133	Spring	**1b**	**PS 11**		
ESE 136	Spring	**1a**	**PS 11**	**A**	
ESE 160	Spring (even)	**21a,b**		**A,B**	
ESE 161	Fall (odd)	**1b**	**PS 11**		
ESE 162	Fall (even)	**21a,b**		**A**	
ESE 163	Fall (odd)	**21a**			**ESE 6**
ESE 164	Fall		*PS 11*		
ESE 166	Spring	**1b**	**PS 11**	**A,B**	
ESE 169	Spring (odd)	**1b**	**PS 11**		

[1]Courses listed as Recommended Preparation, and not an enforced prerequisite, are shown in italics

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