Plan of Study for the Environmental Science & Engineering Track

of the Engineering Sciences SB Concentration

Effective for Students Declaring the Concentration after August 1, 2024

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.

In a few sentences, describe your main interest area within Environmental Science and Engineering:

Please list your selected concentration courses in the schedule below:

1st Fall	1st Spring	2nd Fall	2nd Spring	3rd Fall	3rd Spring	4th Fall	4th Spring

REQUIRED COURSES	**Selected Courses**
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 22b, 25a) Math 21b – Linear Algebra and Differential Equations (or Math 22a, 25b)	
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 STAT 110 – Introduction to Probability ESE 102 – Data Analysis and Stat. Inference in the Earth and Env. Sci.	
Applied Mathematics (1 course, if starting in Math 21a or equivalent) *Select one:* AM 105 – Ordinary & Partial Differential Equations AM 115 – Mathematical Modeling AM 120 – Applied Linear Algebra and Big Data	

REQUIRED COURSES	Selected Courses
Physics (2 courses) PS 12a – Electromagnetism and Quantum Physics (or AP 50a or Physics 15a or 16) PS 12b– Mechanics and Statistical Physics (or AP 50b or Physics 15b)	
Chemistry / Basic Sciences (2 courses) PS 11– Foundations and Frontiers of Modern Chemistry ***(Required)*** *Take one from the following or petition for more advanced courses:* LPS A – Foundational Chemistry and Biology (or LS 1a) CHEM 10 – Quantum and Statistical Foundations of Chemistry CHEM 17 – Principles of Organic Chemistry (or CHEM 20)	
Computer Science (1 course) *Select one:* AM 10 – Computing with Python for Scientists and Engineers (***Recommended)*** CS 32 – Computational Thinking and Problem Solving CS 50 – Introduction to Computer Science	
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, 115, 131, 133, 160, 161, 162, 163, 164, 166, 168, 169 Engineering Sciences 112, 123, 231, 248	
Engineering Breadth (2 courses) *Select one upper-level course (>100) from each area, see lists on pp. 4-5. (Note: ES50 may be used for the Electrical area.)* *Area*: Mechanics & Materials Course: *Area*: Electrical Course:	
Approved Engineering Elective (2 courses) *Select at least 2 additional Engineering courses. See lists on pp. 4-5** 1. 2.	
Engineering Design (2 courses) Engineering Sciences 96 Engineering Sciences 100hf	

* Environmental Science and Engineering 6, ES 50, 51, and 53: No more than three of these courses may count towards concentration credit. ES 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
Assistant/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 requirements 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
ESE 115 – Ecosystem Patterns and Processes: Parallels in Natural and Built Environments
ESE 131 – Introduction to Physical Oceanography 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 168 – Human Environmental Data Science: Agriculture, Conflict and Health
ESE 169 – Field and Lab-based Seminar on Local Pollution Issues
ES 112 – Thermodynamics
ES 123 – Intro to Fluid Mechanics & Transport Processes
ES 231 – Energy Technology
ES 248 – Electrochemistry

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
ES 192 – Material Selection and Design

Electrical
ES 50 – Intro to Electrical Engineering
ES 151 – Applied Electromagnetism
ES 152 – Circuits, Devices, and Transduction
ES 155 – Systems and Control
ES 173 – Introduction to Electronic and Photonic Devices
ES 177– Microfabrication Laboratory
CS 141 – Computing Hardware
PHY 113 – Electronics for Physicists

General Engineering Electives (Cannot be used for Depth or Breadth Areas)
ES 111 – Intro to Scientific Computing
ES 105hfr – Humanitarian Design Projects (4 credits)
ES 115 – Mathematical Modeling
ES 121 – Intro to Optimization: Models & Methods
CS 109a – Data Science 1: Introduction to Data Science
CS 120 – Introduction to Algorithms and their limitations
PHY 129 – Energy Science
SCI 6121/6122 – Environmental Systems (must take both)

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

	Typically Offered	Math	Chemistry	Physics	Other	Prog. Lang.
Required Courses						
ESE 6	Fall					R/Python
ES 96	Fall & Spring				**Junior year**	
ES 100HF	Fall-Spring				**ES 96**	
Selected Core and Breadth Course						
ESE 109	Spring (odd)				(ESE 6 or EPS 10)	MATLAB
ESE 115	Spring	1b	(PS 11)		(ESE 6)	R / Python
ESE 131	Spring (even)	21a,b		A	`	Python / MATLAB
ESE 132	Fall (even)	21a,b		A		
ESE 133	Spring	1b	PS 11			
ESE 160	Fall (odd)	21a,b		A,B		Python / MATLAB
ESE 161	Spring	1a or 1b	PS 11			
ESE 162	Fall (even)	21a,b		A		
ESE 163	Fall (even)	21a			*(ESE 6)*	
ESE 164	Fall		PS 11			
ESE 166	Spring	1b	PS 11	A,B		
ESE 168	Fall	(1b)	(PS 11)	(A)		Python / MATLAB
ESE 169	Fall	1a or 1b	PS 11			Python
ES 112	Spring					
ES 120	Spring	21a, b		A		
ES 123	Spring	21a		A		Python
ES 150	Spring	21a (Co-req 21b)				Any language
ES 173	Fall	1b		A, B		
ES 181	Fall			A		
ES 183	Spring	21a,b		A		MATLAB
ES 190	Spring	(21a,b)				
ES 192	Fall	(21a,b)				
AM 101	Spring	21a				MATLAB
AM 105	Spring	21a,b				MATLAB
AM 115	Fall/Spring	21a,b			*(AM 104,105,108; STAT 110)*	MATLAB
AM 120	Spring	21a,b			CS 32, 50; AM 10; SCI 5	Python / MATLAB

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

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

[3] Programming language indicates the default language used for instruction (not prerequisites).

[4] Please check out https://info.seas.harvard.edu/courses/four-year-plan each semester.