Plan of Study for the Environmental Science & Engineering Track  
of the Engineering Sciences AB Concentration  
Effective for Students Declaring the Concentration after August 1, 2015

NAME: ___________________________ CLASS: ___________________________

EMAIL: ___________________________ DATE: ___________________________

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

<table>
<thead>
<tr>
<th>REQUIRED COURSES</th>
<th>Semester (FA/SP Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Mathematics (2-4 half-courses)</strong></td>
<td></td>
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<tr>
<td><em>Begin according to placement</em></td>
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<tr>
<td>Math 1a – Introduction to Calculus I</td>
<td></td>
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<tr>
<td>Math 1b – Calculus, Series, and Differential Equations</td>
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<tr>
<td>Applied Mathematics 21a – Mathematical Methods in the Sciences I</td>
<td></td>
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<tr>
<td>(or Mathematics 21a or 23a)</td>
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<tr>
<td>Applied Mathematics 21b – Mathematical Methods in the Sciences II</td>
<td></td>
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<tr>
<td>(or Mathematics 21b or 23b)</td>
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<tr>
<td><strong>Required Physics (2 half-courses)</strong></td>
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<tr>
<td>Applied Physics 50a – Physics as a Foundation for Sci. &amp; Eng. I</td>
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<tr>
<td>(or Physical Sciences 12a or Physics 15a or Physics 16)</td>
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<tr>
<td>Applied Physics 50b – Physics as a Foundation for Sci. &amp; Eng. II</td>
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<tr>
<td>(or Physical Sciences 12b or Physics 15b)</td>
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<tr>
<td><strong>Required Chemistry (Choose 2 half-courses)</strong></td>
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<tr>
<td>Physical Sciences 10 – Quantum and Statistical Foundations of Chemistry</td>
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<tr>
<td>Physical Sciences 11 – Foundations and Frontiers of Modern Chemistry</td>
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<tr>
<td>(or Physical Sciences 1 – Chemical Bonding, Energy, and Reactivity)</td>
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<tr>
<td>Life Sciences 1a – An Integrated Introduction to the Life Sciences</td>
<td></td>
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<tr>
<td>(or Life &amp; Physical Sciences A – Foundationalal Chemistry and Biology)</td>
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<tr>
<td><strong>Required Computer Science (Choose 1 half-course)</strong></td>
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<tr>
<td>CS 50 – Introduction to Computer Science I</td>
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<tr>
<td>CS 51 – Introduction to Computer Science II</td>
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<tr>
<td>CS 60 – System Programming &amp; Machine Organization</td>
<td></td>
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<tr>
<td><strong>Sophomore Forum</strong></td>
<td></td>
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<tr>
<td>Required, non-credit.</td>
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</tbody>
</table>
### Environmental Science & Engineering Core (4-half courses)

Select Engineering Sciences 6 plus three courses from the options below.

- **ES 6** – Environmental Science & Technology
- **ES 109** – Earth Resources and the Environment
- **ES 112** – Thermodynamics by Case Study
- **ES 131** – Introduction to Physical Oceanography and Climate
- **ES 132** – Introduction to Meteorology and Climate
- **ES 133** – Atmospheric Chemistry
- **ES 135** – Physics & Chemistry: In the Context of Energy & Climate
- **ES 160** – Space Science: Theory and Applications
- **ES 161** – Applied Environmental Toxicology
- **ES 162** – Hydrology & Environmental Geomechanics
- **ES 163** – Pollution Control in Aquatic Ecosystems
- **ES 164** – Environmental Chemistry
- **ES 165** – Water Engineering

### Approved Electives (3 half-courses)

Select three courses from the options below (course titles are listed on Page 4)

- Earth & Planetary Sciences 134, 136, 186, 187, 208, 236
- No more than one from*: Engineering Sciences 50, 51, 53, or Earth & Planetary Sciences 22
- No more than one from: Engineering Sciences 52, 153, or 154
- No more than one from: Engineering Sciences 111, 115, 121, 150, Statistics 110, Applied Math 101, 104, 105, or 147

* ES 50, 53, or EPS 22 may only be counted as an Approved Elective if taken during the Freshman or Sophomore year.

### Required Signatures:

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Student

Date

Assistant Director for Undergraduate Studies

Date

ADUS indicate if a petition is needed: Yes______ No______

Director for Undergraduate Studies

Date
Plan of Study for the Environmental Science & Engineering Track
of the Engineering Sciences AB Concentration

INSTRUCTIONS:

The Engineering Sciences AB program is an interdisciplinary concentration that allows students to pursue coursework around one or two central themes related to engineering practice or current topics in engineering research. The degree requirements are sufficiently flexible to accommodate student interests that span the traditional engineering fields. As such, students who wish to concentrate in Engineering Sciences must present an intellectually coherent plan of study and describe how the selected courses will form this program. Students should work in close consultation with an Assistant Director for Undergraduate Studies (ADUS) or the Director for Undergraduate Studies (DUS) to construct a degree program and must include the required written justification as a part of their Plan of Study.

Students intending to focus their degree program around the Environmental Science & Engineering (ESE) depth area follow a set of pre-approved guidelines that form an ESE Track within the structure of the Engineering Sciences AB requirements. These intellectually coherent guidelines have been vetted by the faculty to allow students to structure a rigorous engineering science program with a strong emphasis in ESE.

Students declaring the Engineering Sciences AB concentration must file an approved Plan of Study with the Office of Student Affairs at the time of declaration. Students must keep their Plan of Study up-to-date by filing an approved Revised Plan of Study during any semester that changes to the course program will be made. Students should discuss their proposed revisions with an ADUS or the DUS. Course substitutions are a change in the Plan of Study and WILL NOT BE APPROVED without preapproval and a revision to the Plan of Study Form.

For an initial declaration of the Engineering Sciences AB concentration, students may not include any courses that would require a petition in their Plan of Study. This includes ES 91r, ES 95r, and courses offered at MIT. However, following discussion with faculty advisors and an ADUS, other relevant and/or advanced courses may be included in a Revised Plan of Study through an approved petition. This petition must present a coherent and persuasive written argument for the intellectual merit of the proposed substitution.

To complete a Plan of Study form, fill-in your name, date, class year, email address, and circle if this form is for an initial Declaration of Concentration or for a Revision to an existing plan. Review the requirements for each section, and circle or fill-in the course number for the appropriate number of required courses that you have taken or are planning to take and note the semester for each course.
COURSE TITLES FOR APPROVED ELECTIVES:
For courses co-listed in another department, students must enroll in the Engineering Sciences offering.

ES 91r – Supervised Reading and Research
ES 103 – Spatial Analysis of Environmental & Social Systems
ES 109 – Earth Resources and the Environment
ES 112 – Thermodynamics by Case Study
ES 123 – Intro to Fluid Mechanics & Transport Processes
ES 131 – Introduction to Physical Oceanography and Climate
ES 132 – Introduction to Meteorology and Climate
ES 133 – Atmospheric Chemistry
ES 135 – Phys & Chem: In the Context of Energy & Climate at the Global & Molecular Level
ES 137 – Energy within Environmental Constraints
ES 160 – Space Science: Theory and Applications
ES 161 – Applied Environmental Toxicology
ES 162 – Hydrology & Environmental Geomechanics
ES 163 – Pollution Control in Aquatic Ecosystems
ES 164 – Environmental Chemistry
ES 165 – Water Engineering
ES 169 – Seminar on Global Pollution Issues
ES 181 – Engineering Thermodynamics
ES 220 – Fluid Dynamics
ES 265 – Advanced Water Treatment
ES 267 – Aerosol Science and Technology
ES 268 – Chemical Kinetics
ES 269 – Environmental Nanotechnology
EPS 134 – Global Warming Debates: The Reading Course
EPS 136 – Introduction to Ocean Circulation Physics
EPS 186 – Low Temperature Geochemistry I: Introduction to Biogeochemical Cycles
EPS 187 – Low Temperature Geochemistry II: Modern and Ancient Biogeochemical Processes
EPS 208 – Physics of Climate
EPS 236 – Environmental Modeling

No more than one from:
ES 50 – Introduction to Electrical Engineering
ES 51 – Computer-Aided Machine Design
ES 53 – Quantitative Physiology as a Basis for Bioengineering
EPS 22 – The Fluid Earth: Oceans, Atmosphere, Climate, and Environment

No more than one from:
ES 52 – The Joy of Electronics - Part 1
ES 153 - Laboratory Electronics
ES 154 – Electronic Devices and Circuits

No more than one from:
AM 101 – Statistical Inference for Scientists and Engineers
AM 104 – Series Expansions & Complex Analysis
AM 105 – Ordinary & Partial Differential Equations
AM 147 – Nonlinear Dynamical Systems
ES 111 – Introduction to Scientific Computing
ES 115 – Mathematical Modeling
ES 121 – Introduction to Optimization: Models & Methods
ES 150 – Introduction to Probability with Engineering Applications
Statistics 110 – Introduction to Probability