Plan of Study for the Engineering Sciences SB Concentration  
*Cross-Disciplinary Engineering Track*  
Effective for Students Declaring the Concentration after July 1, 2014

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 half courses: 4 half-courses in mathematics, 4 half-courses in basic sciences, and 12 half-courses in engineering topics. Plans of Study will not be considered final until this form has been signed. The signature of this form ensures that the proposed plan meets the ABET distribution requirements.

<table>
<thead>
<tr>
<th>REQUIRED COURSES</th>
<th>Math</th>
<th>Science</th>
<th>Engr. Topics</th>
<th>Semester (FA/SP Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics Required (2-4 half-courses)</strong></td>
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<tr>
<td>Math 1a – Intro to Calculus 1</td>
<td>1.0</td>
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<tr>
<td>Math 1b – Intro to Calculus 2</td>
<td>1.0</td>
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<tr>
<td>AM 21a – Mathematical Methods in the Sciences 1 (or Math 21a or 23a)</td>
<td>1.0</td>
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<tr>
<td>AM 21b – Mathematical Methods in the Sciences 2 (or Math 21b or 23b)</td>
<td>1.0</td>
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<tr>
<td><strong>Probability &amp; Statistics (1 half-course if you started in Math 1b or later) CIRCLE ONE</strong></td>
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<tr>
<td>AM 101 - Statistical Inference for Scientists &amp; Engineers</td>
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<tr>
<td>ES 150 – Intro Probability w/ Engineering Applications Statistics 110 - Intro to Probability</td>
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<tr>
<td><strong>Applied Mathematics (1 half-course if you started in AM/Math 21a)</strong></td>
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<td>See list on page 6.</td>
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<td>1.</td>
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<tr>
<td><strong>Physics (2 half-courses) CIRCLE TWO</strong></td>
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<tr>
<td>AP 50a – Physics as a Foundation for Sci &amp; Eng 1 (or Physical Sciences 12a or Physics 15a or 16)</td>
<td>1.0</td>
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<tr>
<td>AP 50b – Physics as a Foundation for Sci &amp; Eng 2 (or Physical Sciences 12b or Physics 15b)</td>
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<tr>
<td><strong>Chemistry/Life Science (2 half-courses)</strong></td>
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<td>See list on page 6.</td>
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<td>1.</td>
<td>1.0</td>
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<td>2.</td>
<td>1.0</td>
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<td><strong>Sophomore Forum</strong></td>
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<tr>
<td>Required, non-credit.</td>
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</tbody>
</table>
### REQUIRED COURSES
(Circle or fill-in information for each course you plan to take in each category.)

<table>
<thead>
<tr>
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<th>Engr. Topics</th>
<th>Semester (FA/SP Year)</th>
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</thead>
</table>

**Computer Science (1 half-course) CIRCLE ONE**
- CS 50 – Intro to Computer Science 1
- CS 51 – Intro to Computer Science 2
- CS 61 – System Programming & Machine Organization

**Engineering Depth (3 half-courses)**
*Identify and select three half-courses from one depth area, see list on Pages 6-7.*

**Depth Area:**
1. 1.0
2. 1.0
3. 1.0

**Engineering Breadth (3 half-courses)**
*Identify and select one half-course from three other depth areas, see list on Pages 6-7.*

**First Area:**
- Course: 1.0

**Second Area:**
- Course: 1.0

**Third Area:**
- Course: 1.0

**Approved Engineering Electives (3 half-courses)**
*Select three half-courses with engineering topics (any depth area), see list on Pages 6-7.*

1. 1.0
2. 1.0
3. 1.0

**Engineering Design (2 half-courses)**
- Engineering Sciences 96
- Engineering Sciences 100hf

**TOTALS**
/4 /4 /12

Note: Depth, breadth, and elective courses in general should all be pre-approved 100- or 200-level AM, ES, or CS courses. One of ES 1, 6, 50, 51, or 53 may count as an engineering elective if taken during the Freshman or Sophomore year. ES 6, 50, 51, or 53 may be included as depth or breadth courses if they are justified in terms of the coherence of the overall plan of study. ES 91r and ES 95r 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.
Please provide a few paragraphs describing how the proposed Plan of Study and the courses selected provide an intellectually coherent program centered around 1 or 2 central themes.
Required Signatures:

________________________________________________________________________  
Student Signature  

________________________________________________________________________  
Assistant Director for Undergraduate Studies  

________________________________________________________________________  
Director for Undergraduate Studies  

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

________________________________________________________________________  
Assistant Dean for Education  


Plan of Study for the Engineering Sciences SB Concentration
Effective for Students Declaring the Concentration after July 1, 2014

INSTRUCTIONS:

A concentration in Engineering Sciences (SB) 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 such as: robotics, renewable energy, nanotechnology, etc. 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. This statement is part of the Plan of Study form.

Students declaring the Engineering Sciences SB concentration must file an approved Plan of Study with the Office of Student Affairs at the time of declaration. This form must be signed by the Director for Undergraduate Studies (DUS) and an Assistant Director for Undergraduate Studies (ADUS) who is closest to the area(s) of your proposed plan in biomedical engineering, environmental science and engineering, or mechanical/electrical engineering.

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 considered a change to the Plan of Study and WILL NOT BE APPROVED without preapproval and submission of a revised Plan of Study Form.

For an initial declaration of the Engineering Sciences (SB) concentration, students may not include any courses that would require a petition in their initial Plan of Study. This includes MIT courses, ES 91r, and ES 95r. However, following discussion with faculty advisers 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 or to submit 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. Once all of the proposed courses are included on the form, sum the total number of half-courses for each column to ensure that the proposed degree program meets the requirements of 4 half-courses on Mathematics, 4 half-courses on the Basic Sciences, and 12 half-courses on Engineering Topics. Additionally, provide a statement that describes how each of the selected courses in Engineering Topics create an intellectually coherent plan of study centered around one or two central themes.
Pre-approved Courses for Engineering Sciences SB

Applied Mathematics
- AM 104 – Series Expansions & Complex Analysis
- AM 105 – Ordinary & Partial Differential Equations
- AM 106 – Applied Algebra
- AM 107 – Graph Theory & Combinatorics
- AM 120 – Applicable Linear Algebra
- AM 147 – Nonlinear Dynamical Systems

Chemistry/Life Sciences
- LS 1a – Intro to the Life Sciences: Chemistry, Molecular Biology, & Cell Biology
  o or LPS A – Foundational Chemistry & Biology
- LS 1b – Intro to the Life Sciences: Genetics, Genomics, and Evolution
- PS 10 – Chemistry: A Microscopic Perspective on Molecules, Materials, & Life
- PS 11 – Foundations & Frontiers of Modern Chem: A Molecular & Global Perspective
  o or PS 1 – Chemical Bonding, Energy, & Reactivity: An Intro to the Physical Sciences

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

Bio/Biomedical
- ES 53 – Quantitative Physiology as a Basis for Bioengineering
- BE 110 – Physiological Systems Analysis
- BE 121 – Cellular Engineering
- BE 125 – Tissue Engineering
- BE 130 – Neural Control of Movement
- BE 160 – Chemical Kinetics
- BE 191 – Intro to Biomaterials
- ES 227 – Medical Device Design

Computer
- CS 51 – Intro to Computer Science 2
- CS 61 – System Programming & Machine Organization
- CS 141 – Computing Hardware
- CS 143 – Computer Networks
- CS 146 – Computer Architecture
- CS 148 – Design of VLSI Circuits & Systems
- CS 175 – Computer Graphics

Electrical
- ES 50 – Intro to Electrical Engineering
- ES 52 – The Joy of Electronics – Part 1
- ES 151 – Applied Electromagnetism
- ES 153 – Laboratory Electronics
- ES 154 – Electronic Devices & Circuits
- ES 155 – Biological Signal Processing
- ES 156 – Signals & Systems
- ES 159 – Intro to Robotics
- ES 173 – 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
Engineering Physics and Chemistry
- ES 135 – Phys & Chem: In the Context of Energy & Climate
- ES 173 – Introduction to Electronic and Photonic Devices
- ES 181 – Engineering Thermodynamics
- ES 190 – Intro to Materials Science & Engineering

Environmental
- ES 6 – Environmental Science & Technology
- ES 103 – Spatial Analysis of Environmental & Social Systems
- 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
- ES 162 – Hydrology & Environmental Geomechanics
- ES 163 – Pollution Control in Aquatic Ecosystems
- ES 164 – Soil & Environmental Chemistry
- ES 165 – Water Engineering
- ES 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

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