Plan of Study for the Cross-Disciplinary 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 AM 108 – Nonlinear Dynamical Systems AM 120 – Applied Linear Algebra and Big Data	 (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: LS 1a – Intro to the Life Sciences (or LPS A – Foundational Chemistry & Biology) LS 1b – Genetics, Genomics, and Evolution PS 10 – Chemistry: A Microscopic Perspective PS 11 – Foundations & Frontiers in Modern Chemistry (or PS 1 – Chemical Bonding, Energy, & Reactivity)		 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	_____
Engineering Depth* (3 courses) *Select three courses from one depth area, list on pp. 5-6.* Depth Area: 1. 2. 3.			 1.0 1.0 1.0	 _____ _____ _____
Engineering Breadth* (3 courses) *Select one course from three separate areas, list on pp. 5-6.* First Area: Course: Second Area: Course: Third Area: Course:			 1.0 1.0 1.0	 _____ _____ _____
Approved Engineering Electives* (3 courses) *Select three courses on engineering topics (any area), list on pp. 5-6.* 1. 2. 3.			 1.0 1.0 1.0	 _____ _____ _____
Engineering Design (2 courses) Engineering Sciences 96 Engineering Sciences 100hf			 1.0 1.0	 _____ _____
TOTALS	**/4**	**/4**	**/12**	

* Depth, breadth, and elective courses, in general, should be pre-approved 100- or 200-level ES or CS courses.

ESE 6, ES 50, ES 51, and ES 53 may be included as depth or breadth courses if they are justified in the coherence of the overall plan of study, however no more than two of these courses may count towards concentration credit. ESE 6, ES 50, and ES 53 can only count as an engineering elective when taken during the freshman or sophomore year.

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

Please provide a few paragraphs describing how the courses selected for your proposed Plan of Study create an intellectually coherent program around 1 or 2 central themes.

Required Signatures:

Student Signature	Date
Assistant Director for Undergraduate Studies	Date
Director for Undergraduate Studies	Date

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

Assistant Dean for Education	Date

Pre-approved Courses for the Engineering Sciences SB

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 128 – Intro to Biomedical Imaging and Systems
- BE 129 – Intro to Bioelectronics
- BE 130 – Neural Control of Movement
- BE 131 – Neuroengineerng
- BE 191 – Intro to Biomaterials
- ES 211 – Microphysiological Systems
- ES 221 – Drug Delivery
- ES 227 – Medical Device Design
- ES 228 – Biologically-Inspired Materials

Computer

- CS 51 – Intro to Computer Science 2
- CS 61 – System Programming & Machine Organization
- CS 124 – Data Structures and Algorithms
- CS 141 – Computing Hardware
- CS 143 – Computer Networks
- CS 144r – Networks Design Projects
- CS 146 – Computer Architecture
- CS 148 – Design of VLSI Circuits & Systems
- CS 175 – Computer Graphics
- CS 179 – Design of Useful and usable Interactive Systems
- CS 181 – Machine Learning
- CS 182 – Artificial Intelligence
- CS 183 – Foundations of Machine Learning
- CS 187 – Computational Linguistics
- CS 189 – Autonomous Robot Systems

Electrical

- ES 50 – Intro to Electrical Engineering
- ES 54 – Electronics for Engineers
- ES 143 – Computer Vision
- 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 & 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 – Electronic and Photonic Devices
- ES 175 – Photovoltaic Devices
- ES 176 – Intro to MicroElectroMechanical Systems
- ES 177– Microfabrication Laboratory
- AP 171 – Introduction to Quantum Materials and Devices
- CS 141 – Computing Hardware
- CS 143 – Computer Networks
- CS 144r – Networks Design Projects
- CS 146 – Computer Architecture
- CS 148 – Design of VLSI Circuits & Systems
- CS 189 – Autonomous Robot Systems

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

Environmental

- ESE 6 – Intro 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 and Engineering: 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
- ES 192 – Materials Selection and Design

General Engineering Electives - Cannot be used for Depth or Breadth Areas

- AM 10 – Computing for Science and Engineering
- ES 111 – Intro to Scientific Computing
- ES 115 – Mathematical Modeling
- ES 121 – Intro to Optimization: Models & Methods