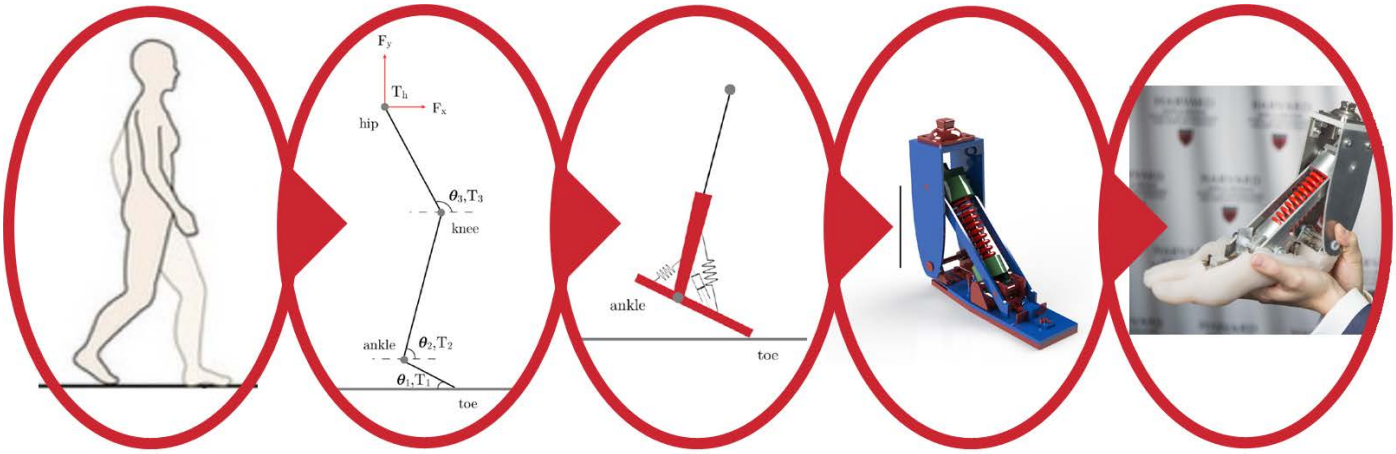
Engineering @ SEAS

Engineers **solve** real-world problems by applying math and science for **analysis** and **design**.

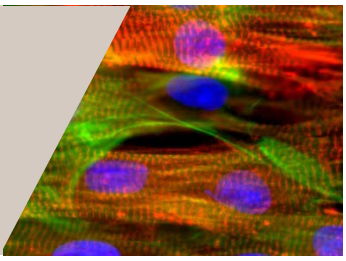


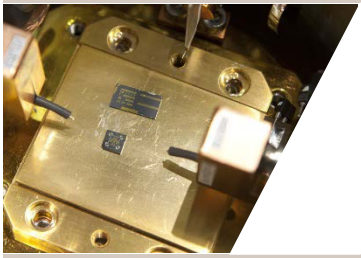
Images courtesy of Alex Yang, BE SB '17

Bioengineering

At the intersection of life and physical sciences biomedical engineers apply principles of engineering to understand and model living systems and design novel therapies to improve human health.

Degrees offered: Engineering Sciences SB *(Bioengineering track)*; Biomedical Engineering AB





Electrical Engineering

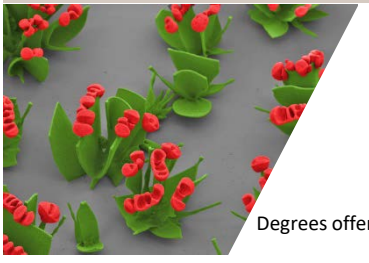
Covers a range of research areas from devices to systems, offering ample research opportunities, both theoretical and experimental, at the forefront of the field and its interdisciplinary applications.

Degrees offered: Electrical Engineering SB; Engineering Sciences AB *(Electrical and Computer Engineering Track)*

Environmental Science and Engineering

To understand, predict, and respond to natural and human-induced environmental change, environmental scientists and engineers provide technical solutions and advance innovations in environmental measurements, modeling, and control.

Degrees offered: Engineering Sciences SB *(Environmental Science and Engineering track);* Environmental Science and Engineering AB



Mechanical Engineering

Mechanical engineering uses the principles of physics and materials science for the analysis and design of mechanical and thermal systems.

Degrees offered: Mechanical Engineering SB; Engineering Sciences AB *(Mechanical and Materials Science and Engineering Track)*

*What problem do **you** want to **solve**?*

Senior theses in the Class of 2018:

- Prototyped a mug to keep tea the perfect drinking temperature using a novel wax substrate for thermal control (ME SB)
- Built a power conversation circuit to drive a >500 V load for in -flight system using a small form factor lithium ion battery (EE SB)
- Conducted design, synthesis, assay optimization, and biological evaluation of compounds that can produce double strand breaks in DNA (BME AB, Joint with Chemistry)
- Built a model to estimate carbon storage in tidal marshes over the next 50 years under different restoration scenarios (ESE SB)
- Created soft wearable sensors to measure stresses in prosthetic sockets (BE SB)

Frequently asked questions

- **What's the difference between Bachelor of Arts (A.B.) and Bachelor of Science (S.B.)?**
  - AB: 14-16 courses, more flexible requirements, can do research thesis, can do joint concentration
  - SB: 20 courses, engineering design courses, including individual capstone design project in ES100 (this is a required thesis), ABET-accredited (for professional licensure)
- **How can I get involved in research?**
  - Term-time: SEAS labs welcome undergraduates to work on research projects during the term
    - Can do research for credit with an ES 91r
  - During summer: Students regularly join SEAS labs with funding through PRISE, HCRP, HUCE
    - Many students participate in research at other universities through NSF REU programs
- **What kinds of internships can I do?**
  - Research internships are available through SEAS and national labs. See above.
  - Industry internships are available and can be found by attending SEAS career fairs or talking to the SEAS Experiential Learning Director, Keith Karasek (kkarasek@seas.harvard.edu)
- **Where do I start?**
  - Start taking math (according to placement) and science in your first year
  - Talk to a concentration advisor (ADUS) in any of our fields to chat about your options
  - Take one of our introductory courses (see below)
  - Joint a SEAS club (HCES, EWB, HURC, etc…)

Full FAQ @ www.seas.harvard.edu/programs/engineering/engineering-faqs

Gateway Courses

Designed for freshmen and sophomores

Electrical*
ES 155 (Fall), CS 141(Spr)

Mechanical
ES 51 (Fall,Spr)

*ES 155 pre-req: Math 1a and 1b
*CS 141 pre-req: CS 50 or programming experience

Environmental
ESE 6 (Spr)

Bio/biomedical
ES 53 (Fall)

Common course sequences for the first two years

General Guidelines	Fall	Spring
Freshman	Foundational Math Science or Gateway Engineering	Foundational Math Science or Gateway Engineering
Sophomore	Foundational Math (if needed) Science Engineering	Foundational Math (if needed) Science Engineering

Tips for all students:

- ***Freshman year:*** At least two courses toward the concentration should be taken each term
- ***Sophomore year:*** Generally, three courses toward the concentration should be taken each term
- Foundational math, physics, science, and gateway courses generally count toward any of the engineering concentrations
    - Students have the flexibility to switch between programs freshman and sophomore year
- **Foundational Math**: Students should start math freshman fall according to their placement (i.e., start at Math Ma, 1a, 1b, or Math/AM 21a) and continue each semester until completion of the 21a/b series, which is required of all students. SB students starting in Math 1b and beyond will need to take additional advanced math courses beyond foundational math.
- **Physics**: Students should complete the physics series by spring of sophomore year. Typical sequences are:
    - Spring freshman year (PS 12a or Physics 15a) then fall sophomore year (PS 12b or Physics 15b)
    - Fall sophomore year (Physics 15a or AP 50a) then spring sophomore year (Physics 15b or AP 50b)
- **Life Science/Chemistry/other Science**: Students should take the appropriate course relevant to their discipline (see chart below).

Bio/biomedical engineering

	Fall	Spring
Freshman	Foundational Math LS 1a/LPS A	Foundational Math Physics (LS 1b)
Sophomore	ES 53 Found. Math (if needed) Physics	Found. Math (if needed) Physics (if needed) Engineering course

Tips for Bio/BME students:

- Most Bio/BME students take ES 53 in sophomore fall, though some take the course in freshman fall
- While not strictly required for the SB program, many premed SB students take LS 1b (beyond concentration requirements)

Electrical engineering

	Fall	Spring
Freshman	Foundational Math CS 50	Foundational Math Physics *Consider:* CS 141
Sophomore	Found. Math (if needed) Physics ES 155 or ES 152	Found. Math (if needed) CS 141 (if needed) ES 156

Tips for EE students:

- Freshmen who place out of Math 1b can take ES 155 in freshman fall
- Freshmen who take CS50 in fall or have programming experience can take CS141 in spring
- Strongly recommended to start physics in freshman year to be able to take ES152 (co-req Physics b) in sophomore year

Environmental science and engineering

	Fall	Spring
Freshman	Foundational Math LS 1a/LPS A	Foundational Math ESE 6 *Consider:* PS 11
Sophomore	Found. Math (if needed) Physics LS 1a/LPS A (if needed)	Found. Math (if needed) Physics PS 11 or Engineering course

Tips for ESE students:

- Most ESE students take ESE 6 in freshman spring
- Students are highly encouraged to consider PS11 in freshman spring

Mechanical engineering

	Fall	Spring
Freshman	Foundational Math ES 51 or CS 50	Foundational Math ES 51 (if needed) or ES 54 Physics
Sophomore	Found. Math (if needed) Physics CS 50 (if needed)	Found. Math (if needed) Physics (if needed) ES 54 (if needed) ES 120

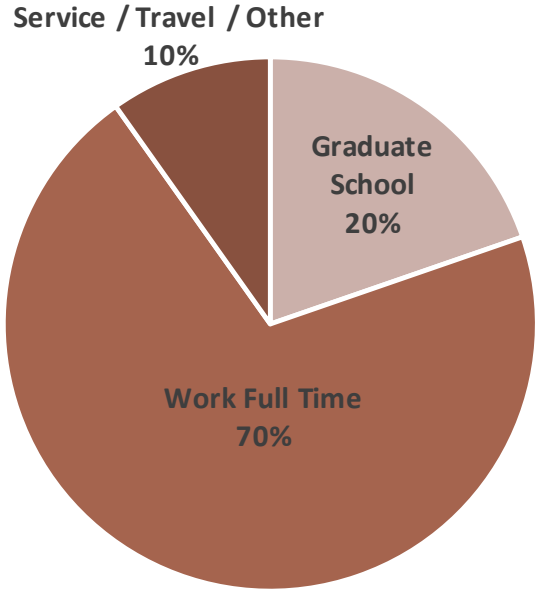
Tips for MechE students:

- MechE students should complete ES 51 by sophomore fall
- Almost all MechE students take ES 120 in sophomore spring

Undergraduate Engineering Stats — *Spring 2018*

	BE/BME	EE	ESE	ME
# Concentrators	104	49	27	77
% SB (vs. AB)	57%	82%	63%	94%
Women to Men Ratio	52/52	12/37	17/10	26/51
Median Class Size	18	13	15	32

Where have our 2017 graduates gone?



A few examples of where recent alumni are currently:

Raytheon, Medtronic, amazon, United States Environmental Protection Agency, Chevron, BOEING, MERCK, INTUITIVE SURGICAL

You're invited to learn more!

Talk to our engineering advisors:

For freshmen with last name starting with A-G, contact:

Chris Lombardo
lombardo@seas.harvard.edu
Pierce 207B

For freshmen with last name starting with H-M, contact:

Linsey Moyer
lmoyer@seas.harvard.edu
Pierce 206C

For freshmen with last name starting with N-Z, contact:

Patrick Ulrich
pulrich@seas.harvard.edu
Pierce 117

Learn more on the web: www.seas.harvard.edu/engineering