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## ***Dartmouth Class of 2023 — Pre-Engineering Advising***

### **Basic facts about the major**

- The engineering sciences major has seven to nine prerequisites: three courses in math (3, 8, 13 or 11), two in physics (13, 14), one in chemistry (5), and one or two in computer science (ENGS 20 OR COSC 1 and 10). The major itself consists of three core courses (ENGS 21, 22, 23), five ENGS courses chosen from a subset of our course offerings and one engineering or science elective, plus the culminating experience.
- We also offer modified majors with biology, chemistry, computer science, earth sciences, economics, environmental science, public policy, studio art, and neuroscience. Along with our Engineering Sciences major we also offer a major in engineering physics and a major in biomedical engineering along with minors in engineering science, human centered design, and in materials. For details, consult the ORC.
- The Bachelor of Engineering program, which requires nine or ten courses beyond the basic major, usually requires one to three terms beyond graduation. The B.E. is strongly recommended for students who intend to enter the engineering profession. Financial aid is available from the Thayer School for the B.E. program. Engineering sciences majors also go on to graduate programs in medicine, business and law, as well as engineering.
- Students or advisors with questions about the engineering major are urged to contact Jenna Wheeler, Undergraduate Programs Administrator.

### **Completing the prerequisites and entering the major**

Traditionally, students majoring in engineering (in most schools, including Dartmouth) have concentrated on completing prerequisites—math, physics, chemistry, computer science—in the first year, and even into the sophomore year. However, there are other paths which may be better suited to students who are unsure of their interests or who, may have difficulty adjusting to Dartmouth’s rigorous academic pace. It is *not* mandatory, although it is recommended, that prospective engineering majors take five math, science, and engineering courses in the first year. *As long as the prerequisites are completed by the end of the sophomore year, the major can be completed on schedule; normally a student will also take ENGS 21 and at least one other engineering course in the sophomore year.*

- A student who is committed to majoring in engineering sciences will likely complete the traditional sequence of MATH 3-8-13, PHYS 13-14, and possibly ENGS 20 in the first year.
- A student with one advanced placement credit in mathematics (“Calculus AB”) may enroll in MATH 8 in the fall. A student with two advanced placement credits in mathematics (“Calculus BC”) may take MATH 11 in the fall term.
- Students with advanced placement may also be invited to take honors sections of math (9, 14), physics (15-16), and/or chemistry (10). They should be careful, however, not to overcommit themselves in the fall term. *The engineering sciences department has no preference for honors math and physics over the standard courses.*

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- A student who is curious about engineering but unsure about the major at this time should take MATH 3 & 8 and CHEM 5 (or 10) or PHYS 13 & 14 in the first year, and an introductory engineering course to explore the field. ENGS 1-19 are technology courses, which do not count toward the major. ENGS 20, 21 and 31 are accessible to first-year students in the spring term and carry major credit, but require a greater time investment. As long as the prerequisites are completed by the end of the sophomore year, the major can be completed on schedule. *It is best, however, to take ENGS 21 and at least one other engineering course prior to the sophomore summer.*
  - A student who has been placed into MATH 1-2 should take these courses in fall-winter, and continue with MATH 8 in the spring. PHYS 13-14 will be taken in the sophomore year.
  - Sometimes a student wishes to combine the engineering sciences major with preparation for medical school. In this case, the student should take the two general chemistry courses (CHEM 5-6) in the first year and postpone physics to the sophomore year. This is also advisable for students who wish to double major in chemistry and engineering science, and may be advisable for students interested in modifying engineering with chemistry as preparation for further study in chemical engineering.

### **Planning for Language Study Abroad**

Engineering students are encouraged to participate in LSA. However, because many LSAs occur in the sophomore year, students should be careful that the LSA does not interfere with completing the prerequisites for the major. A Foreign Study Program (FSP) in engineering is also feasible and more information is available in the Student and Academic Affairs Office (MacLean 103)

### **Distributive credits**

The prerequisites for engineering science help fulfill distributive requirements as follows: math—quantitative and deductive science; physics and chemistry—natural science and laboratory; computer science and engineering science—technology or applied science. Therefore, even if a student ultimately decides not to major in engineering, the time spent taking prerequisites is well spent. Many engineering pre-requisites are also pre-requisites for other majors in the sciences.

### **Sample First-Year Programs**

Various first year programs are possible, depending upon high school preparation in physics and mathematics. Several of these are listed below. In some cases, suggested schedules beyond the first year are included to show how prerequisites are completed (for example, students placed in MATH 1-2 will complete physics in the sophomore year). Remember it is possible for course offerings to change.

## 1. TRADITIONAL PROGRAM FOR STUDENTS WITH NO ADVANCED PLACEMENT

First year		
Fall	Winter	Spring
MATH 3	MATH 8	ENGS 20
Elective	PHYS 13	PHYS 14
WRIT 5	First year Seminar	Elective

One example of a sophomore year:			
Fall	Winter	Spring	Summer
MATH 13	Elective	Electives	ENGS 22*
ENGS 21*	CHEM 5	or	ENGS 25, 31, or 33
Elective	Elective	LSA	Elective

\* core courses in the major.

## 2. STUDENTS CURIOUS ABOUT ENGINEERING BUT UNSURE ABOUT MAJORING IN IT.

Suitable exploratory electives include ENGS courses below 20 (no major credit). ENGS 20, 21, and 31, which count toward the engineering sciences major, are also available to first-year students, but require more time.

First year		
Fall	Winter	Spring
MATH 3	MATH 8	Elective
Elective	PHYS 13 or CHEM 5	PHYS 14 or ENGS 20
WRIT 5	First year Seminar	Elective

A student interested in pursuing engineering beyond the first year would then take the remainder of the prerequisites to the major in the sophomore year, *e.g.*,

Sophomore year			
Fall	Winter	Spring	Summer
MATH 13	Elective	ENGS 20	ENGS 22*
ENGS 21*	PHYS 13 or CHEM 5	PHYS 14 or Elective	ENGS 25, 31, or 33
Elective	Elective	Elective	Elective

\* core courses in the major.

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### 3. STUDENTS WITH ONE TERM OF ADVANCED PLACEMENT IN MATHEMATICS

Fall	Winter	Spring
MATH 8	MATH 13	ENGS 20
PHYS 13	PHYS 14	Elective
WRIT 5	First year Seminar	Elective

### 4. STUDENTS WITH TWO TERMS OF ADVANCED PLACEMENT IN MATHEMATICS

Fall	Winter	Spring
MATH 11	Elective	ENGS 20
PHYS 13	PHYS 14	Elective
WRIT 5	First year Seminar	Elective

### 5. STUDENTS BEGINNING WITH MATH 1

First year		
Fall	Winter	Spring
MATH 1	MATH 2	MATH 8
Elective	Elective	Elective
WRIT 5	First year Seminar	Elective

An exploratory course, such as ENGS 1-19, could be taken in this schedule, so the student can check out engineering before committing to the heavier load in the sophomore year.

Sophomore year (note that chemistry is postponed to the junior year)			
Fall	Winter	Spring	Summer
MATH 13	Elective	ENGS 20	ENGS 22
ENGS 21	PHYS 13	PHYS 14	ENGS 25, 31, or 33
Elective	Elective	Elective	Elective

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6. STUDENTS INTERESTED IN ENGINEERING AND PRE-MED — If the student is planning to enter medical school immediately following graduation from Dartmouth, then the required pre-med courses must be completed by winter of the junior year, in order to take the MCAT exams in the spring. This can lead to a rather hectic schedule for the first two years, as shown below. On the other hand, if the student intends to complete the Bachelor of Engineering before medical school or postpone applying to medical school until senior year or later, then the pre-med requirements need not be completed until the winter term of the *senior* year. This allows more flexibility in scheduling, but can be a difficult decision to make in one's first year.

The essential difference in first-year planning is that CHEM 5-6 are taken in the first year, and PHYS 13-14 in the sophomore year. Mathematics, biology, and organic chemistry fill out the complement of science courses in the first two years.

First year			
Fall	Winter	Spring	
MATH 3	MATH 8	ENGS 20	
BIOL 11	CHEM 5	CHEM 6	
WRIT 5	First year seminar	Elective	

  

Sophomore year			
Fall	Winter	Spring	Summer
ENGS 21	PHYS 13	PHYS 14	ENGS 22
MATH 13	BIOL 12 or 13	CHEM 51	CHEM 52
Language 1	Language 2	Language 3	Elective