**Engineering**

Engineers make decisions, by collecting and analyzing data; using scientific principles to formulate analytical models of a process; and predicting the outcome of candidate solutions to a problem. They use their creativity to identify innovative solutions to challenging problems. These skills are valuable not only in technical careers, but also in fields such as public service, environmental policy, architecture, teaching, technology management, finance, entrepreneurship or patent law. A foundation in engineering will help prepare you for the future, regardless of your aspirations. The School of Engineering offers the Engineering A.B. degree ([https://engineering.brown.edu/undergraduate/concentrations/bachelor-arts/](https://engineering.brown.edu/undergraduate/concentrations/bachelor-arts/)) to enable students to combine a rigorous and interdisciplinary foundation in engineering with the diverse opportunities provided by Brown's liberal arts curriculum. With only 11 required courses, it has the greatest flexibility of all of the School's undergraduate degree programs. Please note that all students concentrating in Engineering need to file a concentration declaration using the University's ASK advising system. This declaration must be first reviewed by the relevant Concentration Advisor and then approved by the Director of Undergraduate Studies after assuring compliance with all relevant program and accreditation requirements.

**Mathematics Requirements**

As mathematics is a cornerstone of all engineering programs, significant attention is given to early preparation in mathematics in engineering concentrations. It is recognized that students entering Brown will have different levels of mathematics preparation, and the following is offered as general guidance, though the actual choices of courses should be made in consultation with an exploratory advisor. MATH 0190 (or MATH 0100), followed by MATH 0200 (or MATH 0180) is the preferred sequence of courses to be taken in the freshman year. MATH 0100 and MATH 0180 offer content like that in MATH 0190 and MATH 0200, respectively, but the latter courses are highly recommended for future engineering students because they offer a more rigorous and intensive foundation in the field. Students who would prefer, or require, a more introductory level calculus course may start the sequence with MATH 0090. They may then take MATH 0200 (or MATH 0180) in the subsequent semester and in that case, would receive engineering concentration credit equivalent to that which they would have received having taken MATH 0190 and MATH 0200. However, students who find that the step up from MATH 0090 to MATH 0200 is too challenging, have a choice to take MATH 0190 (or MATH 0100) upon completion of MATH 0090, but in this case, MATH 0090 would not carry engineering concentration credit and the student would then need to take MATH 0200 (or MATH 0180) in the sophomore year.

Students who have taken Advanced Placement (AP) calculus courses in high school and/or have shown proficiency through AP examinations may start the calculus sequence at a higher level than that suggested above. If a student has AP credit and accepts to use it, it then allows the student to place out of MATH 0190 (or MATH 0100). These students should enroll in the appropriate higher-level math course, e.g., MATH 0200 (or MATH 0180) or possibly MATH 0350 (a more theoretical course that covers similar material). Although it is impossible to place out of MATH 0200 or MATH 0350 with AP credit, we recognize that some students enter with an even higher level of preparation. Those students are advised to enroll in MATH 0520 (Linear Algebra), or MATH 0540 (Honors Linear Algebra), and take their second freshman mathematics course at a higher level, for example, MATH 1260 (Complex Analysis), MATH 1610 (Probability), or MATH 1620 (Mathematical Statistics). Alternatively, for some engineering concentrations, this second MATH credit requirement may be satisfied by taking a course from the Applied Mathematics Department, such as APMA 0350 (Applied Ordinary Differential Equations), APMA 0360 (Applied Partial Differential Equations), APMA 1650 (Statistical Inference) or APMA 1210 (Operations Research: Deterministic Models) if one of those courses listed is not taken for two APMA concentration credits. Details regarding the mathematics requirement for each concentration are listed in the corresponding programs.

**Advanced Placement**

Courses that have been taken at the secondary school level are typically only used for placement into the appropriate course level at Brown. The examples of how this can be done in mathematics are given above, and there are other instances (such as in selection of the appropriate introductory chemistry course) where AP credit is considered. It should be noted, however, that advanced placement credits cannot be used to substitute for any Engineering concentration requirements; they are instead used to ensure that students are placed into the correct level of courses.

**Transfer Credits**

Some students will also complete courses at other universities during the time they are Brown students (sometimes during summers while they are not in residence at Brown; sometimes during a junior semester abroad). Students who have successfully completed college courses elsewhere may apply to the University for transfer credit. (See the “Study Elsewhere” section of the University Bulletin for procedures). In addition to the general rules governing such transfers, there are specific rules governing courses that will be offered as satisfying Engineering concentration requirements.

If the course proposed for transfer credit is offered by another department at Brown (i.e., that it carries a course number that does not start with ENGN), then the equivalent of the course must be established by that other department. This is done by submitting a formal request through the ASK system ([https://ask.brown.edu/transfer_credits/information/index](https://ask.brown.edu/transfer_credits/information/index)). Once this approval has been received from the other department, the student’s internal transcript will show the equivalent and the course in question can be shown in the Engineering concentration declaration as having been completed elsewhere. If the equivalence to a Brown course is not approved, then there may still be “unassigned credit” given for the course. In this case, the situation relative to how it does or does not count for concentration credit needs to be discussed with the Concentration Advisor. In rare cases, students may petition the Engineering Concentration Committee to use courses that do not have an equivalent offered at Brown in order to meet a concentration requirement. Substitutions of this nature can only be approved if the student’s overall program meets published educational outcomes for the concentration and has sufficient basic science, mathematics, and engineering topics courses to meet relevant accreditation requirements. Students should consult their Concentration Advisor for assistance with drafting a petition. The decision whether to award concentration credit is made by majority vote of the Engineering Concentration Committee.

If the student wishes to transfer a course taken outside of Brown that would normally carry an Engineering course number, the sequence is a bit different. First, the student needs to fill out an Engineering Transfer Credit Approval Request (see [https://engineering.brown.edu/undergraduate/concentrations/concentration-options/study-abroad](https://engineering.brown.edu/undergraduate/concentrations/concentration-options/study-abroad)). This routes the request to the relevant Brown Engineering faculty member for approval. Once this has been obtained, then transfer approval is requested through the ASK system, as described above. This process ensures that the transcript will capture the equivalence of the externally completed course.

**Substitutions for Required Courses**

Students may petition the Engineering Concentration Committee to substitute a course in place of a defined concentration requirement. Such substitutions can only be approved if the student’s modified program continues to meet the published educational outcomes for the concentration and has sufficient basic science, mathematics, and engineering topics courses needed to meet accreditation requirements. If the substitution involves taking an equal or higher level course in a substantially the same area, whether at Brown or elsewhere, it can be approved by the Concentration Advisor without requiring a formal petition to the Concentration Committee. (For courses taken elsewhere, the credit must be officially transferred as described above.) Students wishing to make substitutions of a broader nature should consult their Concentration Advisor for assistance in drafting their petition to the
Let’s talk about your work experience addressing the following prompts:
The student must write and upload to ASK a reflective essay about the fulfillment of this requirement.
The end of the fall and the start of the spring semesters cannot be used to complete the requirement.
Internships that take place between the fall and spring semesters cannot be used to fulfill this requirement.

Supervision of a faculty member. Internships that take place between the fall and spring semesters cannot be used to fulfill this requirement.

Students choose to do more than one internship experience. Such work is normally done at a company, but may also be at a university under the supervision of a faculty member. Internships that take place between the fall and spring semesters cannot be used to fulfill this requirement.

The reflection essays are subject to the approval of the student's Concentration Advisor.

Entry to the Professional Track requires a simple application form to be completed by the student and approved by the Concentration Advisor at the time of the concentration declaration. If the student has not yet declared a concentration, the form may be approved by the Chair of the Concentration Committee. The Concentration Advisor will certify that all Professional Track students have completed the necessary internships and will grant approval for the associated reflective essays. All other requirements remain identical to those in the standard tracks in the concentrations.

Degrees with Honors in Engineering
Honors are granted by the University to students whose work in a field of concentration has demonstrated superior quality and culminated in an "Honors Thesis of Distinction." Honors recipients in the School of Engineering must meet the following criteria: (1) Demonstrate a strong academic record (60% A's or "S with Distinction" in their concentration through the seventh semester); (2) Propose and execute an independent research project under the guidance of a faculty member; (3) Complete a written thesis to the satisfaction of the Honors Program Committee; (4) Give a scientific/technical presentation at the Undergraduate Research Symposium in the spring semester; and (5) Fulfill all deadlines for applying for or completing honors to the satisfaction of his/her research advisor and the Honors Program Committee.

Engineering Concentration Committee. Such petitions may be approved by a majority vote of the Committee.

Standard Program for the A.B. Degree
Please note that the A.B. degree program is not accredited by ABET. Candidates for the Bachelor of Arts (A.B.) degree in concentration in Engineering must complete at least eight approved Engineering courses. The eight courses must include at least two 1000-level Engineering courses. Of these two 1000-level courses, one must be a design course (ideally capstone or any design course in accredited Sc.B. programs) or be an independent study course that incorporates elements of student project design (must meet Brown course hour requirements), and the other course would be any 1000-level advanced (with pre-requisites) engineering in-classroom experience course. The set of Engineering courses must be chosen with careful attention to the prerequisites of the 1000-level courses.

Not all engineering courses may be used to satisfy the Engineering course requirement for the A.B. degree. For example, the following courses cannot be used to satisfy the Engineering course requirement for the A.B. degree: ENGN 0020, ENGN 0090, ENGN 0260, ENGN 0900, ENGN 0930A, ENGN 0930C, ENGN 0130, ENGN 0610, ENGN 0620, ENGN 1010, ENGN 1800, ENGN 1931J, ENGN 1931Q, ENGN 1931W, ENGN 1932M, ENGN 2110, ENGN 2120, ENGN 2130, ENGN 2140, ENGN 2150, ENGN 2160, ENGN 2180. Therefore, the program of study must be developed through consultation with the Concentration Advisor.

The A.B. program also requires preparation in Mathematics equivalent to MATH 0200 and APMA 0350, as well as at least one college-level science course from the general areas of chemistry (except CHEM 0100), biology, physics, or geological sciences. A programming course is also recommended, but not required. The entire program is subject to approval by an Engineering Concentration Advisor and the Director of Undergraduate Programs in Engineering. Note: Students who completed APMA 0330 prior to academic year 2021-22 may count that course as satisfying the APMA 0350 requirement.

* course will be reevaluated in the 2024-25 academic year

Professional Tracks
While we do not give course credit for internships, we officially recognize their importance via the optional Professional Tracks. The requirements for the professional tracks include all those of the standard tracks, as well as the following: Students must complete full-time professional experiences (or part-time experiences of equivalent total effort) doing work that is related to their concentration programs, totaling 2-6 months, whereby each internship must be at least one month in duration in cases where students choose to do more than one internship experience. Such work is normally done at a company, but may also be at a university under the supervision of a faculty member. Internships that take place between the end of the fall and the start of the spring semesters cannot be used to fulfill this requirement. On completion of each professional experience, the student must write and upload to ASK a reflective essay about the experience addressing the following prompts:

- Describe the organization you worked in and the nature of your responsibilities.
- Which courses were put to use in your work?
- Which topics, in particular, were important?
- In retrospect, which courses should you have taken before embarking on your work experience?
- What are the topics from these courses that would have helped you if you had been more familiar with them?
- What topics would have been helpful in preparation for this work experience that you did not learn at Brown?
- What did you learn from the experience that probably could not have been picked up from course work?
- Is the sort of work you did something you would like to continue doing once you graduate? Explain.
- Would you recommend your work experience to other Brown students? Explain.

Courses cannot be used to satisfy the Engineering course requirement for the A.B. degree. For example, the following courses cannot be used to satisfy the Engineering course requirement for the A.B. degree. Therefore, the program of study must be developed through consultation with the Concentration Advisor.