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 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 more examples of relevance to 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 (Linear Algebra with Theory), 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 0355 (Applied Ordinary Differential Equations), APMA 0360 (Applied Partial Differential Equations I), APMA 0365 (Applied Partial Differential Equations I with Theory), APMA 1650 (Introduction to Probability and Statistics with Calculus), APMA 1655 (Introduction to Probability and Statistics with Theory) 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). Once this approval has been received from the other department, the student's internal transcript will show the equivalence 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). 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 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

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 with a 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, in the table below, cannot be used to satisfy the Engineering course requirement for the A.B.** Therefore, the program of study must be developed through consultation with the Concentration Advisor.

ENGN 0020	Transforming Society-Technology and Choices for the Future
ENGN 0090	Management of Industrial and Nonprofit Organizations
ENGN 0130	The Engineer's Burden: Why Changing the World is Difficult
ENGN 0260	Mechanical Technology
ENGN 0350	Art Fluid Engineering
ENGN 0610	Systems Thinking
ENGN 0620	Design Brief
ENGN 0900	Managerial Decision Making
ENGN 0930A	Appropriate Technology
ENGN 0930C	DesignStudio
ENGN 1010	The Entrepreneurial Process
ENGN 1800	Social Impact of Emerging Technologies: The Role of Scientists and Engineers
ENGN 1820	Future of Work
ENGN 1931Q	Entrepreneurial Management in Adversity
ENGN 1931W	Selling & Sales Leadership in the Entrepreneurial Environment
ENGN 1932M	Foundations of Internet Communication Systems
ENGN 1932R	Leadership in Organizations
ENGN 2110	Business Engineering Fundamentals I
ENGN 2120	Business Engineering Fundamentals II
ENGN 2130	Innovation and Technology Management
ENGN 2140	Innovation and Technology Management II
ENGN 2150	Technology Entrepreneurship and Commercialization I
ENGN 2180	Globalization Immersion Experience and Entrepreneurship Laboratory
ENGN 2160	Technology Entrepreneurship and Commercialization II

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.

Professional Track

The requirements for all undergraduate professional tracks within concentrations are standardized and additional information can be found here:

https://bulletin.brown.edu/undergradproftrack/

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.