CURRICULA OVERVIEW (EG)

Curricula in the College of Engineering lead to the degrees of bachelor of science in the disciplines of biomedical, chemical, civil, computer, electrical, environmental and mechanical engineering, as well as the Bachelor of Science in Computer Science & Engineering. Integrated five-year liberal arts/engineering programs, leading to bachelor of science and bachelor of arts degrees or a Bachelor of Science and Bachelor of Management for Engineers degree, are also offered. In addition, students may choose to integrate their studies by concentrating their electives to pursue interests in a particular area such as biomedical or environmental engineering. The cross-disciplinary nature of these studies allows students from several disciplines to participate in available courses.

Each of the engineering programs emphasizes the fundamentals of mathematics, natural sciences and engineering science combined with specialized study in a particular discipline and broadening studies in the humanities and social sciences. Students interested in pursuing computer science as a major may do so as an option under the Bachelor of Science in Computer Science & Engineering curriculum or under the bachelor of science degree program or the bachelor of arts degree program.

Programs in Engineering

The programs leading to the degrees of bachelor of science in biomedical, computer science & engineering, chemical, civil, computer, electrical, environmental and mechanical engineering are accredited by the Engineering Accreditation Commission of ABET (ABET.org (http://www.abet.org/)). The Bachelor of Science in Computer Science & Engineering degree program is also accredited by the Computing Accreditation Commission of ABET (ABET.org (http://www.abet.org/)). All of the programs are designed to develop in students a broad understanding of engineering disciplines, an appreciation of the engineer's individual and professional role in society, and a capacity for lifelong learning.

The undergraduate engineering programs cover four years, but in five years a student can complete a joint degree in liberal arts & engineering with a major in each college. First-year engineering students may select a specific engineering major when they enroll or remain undecided during the first semester. Engineering students may apply to change from one engineering program to another at the end of one or two semesters; later changes are more difficult but may be possible. Changes from one major program to another may be limited due to enrollment restrictions in the program. Students in the College of Arts & Sciences who apply to transfer to the College of Engineering will be subject to a review of their academic performance at Bucknell for entrance into any engineering program, and subject to enrollment limitations that may be in place in specific degree programs. Specific information may be obtained from the associate dean, College of Engineering. During the fall term, all first-year engineering students take calculus, physics, a foundation seminar (FOUN or RESC), W1 writing course, an introductory engineering course, ENGR 100 Engineering Design Experience (unless they have earned AP or other credit, or have a special educational need), and an engineering seminar course, ENGR 099 Engineering Seminar: Becoming a Bucknell Engineer. In the spring term, they take the first course in their engineering major. The sophomore year continues the emphasis on science and mathematics and introduces courses in the engineering sciences, such as mechanics, thermodynamics, fluids and materials. During the junior and senior years, most of the work is concerned with the principles of the student's major engineering discipline.

Each program contains courses in mathematics and natural sciences, a general education component, courses in engineering sciences, and courses in design, systems and synthesis. The remaining courses, depending upon the specific program, may be in the student's engineering discipline or in electives.

Engineering as a profession strives to benefit society through the application of technology and science. Meaningful contributions from engineering graduates are achieved by balancing technical proficiency with a wider understanding of society. The general education component provides engineering graduates with contextual sensitivity that will enable them to make impactful contributions throughout their careers given complex and global drivers of societal change. Exploring disciplinary perspectives, views, methodologies and ways of knowing beyond the major are not only important aspects of a liberal arts experience, and a hallmark of a Bucknell education as stated in the University learning goals, but also a critical component of being an impactful engineer.

Students should develop a plan in concert with their academic advisers and then carry out that plan to use the courses that fulfill the general education requirement, free electives, and in-major electives to achieve these wider goals. Possible paths include exploring topics directly related to their engineering major, exploring a diverse set of courses, pursuing courses within a specific nontechnical area or pursuing a minor.

General Education Requirement

To fulfill the **general education requirement**, engineering students must complete five courses. One of the five courses must be a social science or management course and one must be an arts & humanities course. Of these two courses, one may be further specified by the student's degree program. The remaining three courses may be fulfilled by any combination of social science, management, arts & humanities, university courses, residential college courses or foundation seminars.

In the course of fulfilling a student's degree program, two additional requirements must also be met. All engineering students must fulfill the University writing requirement and must complete the college global perspectives requirement. The college global perspectives requirement is met through a Global Connections course or a foreign language course. The writing and the global perspectives requirements may be fulfilled by any course so designated in the student's degree program.

In addition, the engineering curricula reflect the increased importance of design in the education of today's students by an integration of design instruction from ENGR 100 Engineering Design Experience through all four years to the senior design courses. The emphasis of all programs is on the development of a broad foundation in engineering and on the initiation of specialized study in a specific engineering discipline.

Whenever appropriate, students may engage in special projects in creative design or in independent study, or they may participate with a faculty member in a research project. Such projects may start in or continue into the summer.

Several engineering departments offer a program of departmental honors in which selected majors may undertake special studies or investigations leading to graduation with honors.

Students are encouraged to work with their faculty advisers and department chairs to take full advantage of the flexibility of the engineering programs that makes possible special plans of study appropriate to their individual career objectives. Furthermore, with the approval of the department chair and the dean of the College of Engineering, degree requirements may be altered slightly to accommodate special needs of students with different academic backgrounds and those who have transferred from other degree programs or other institutions.

All engineering degree programs require the completion of 34 courses (42 in the combined liberal arts-engineering program and the engineering-management program) with a cumulative grade point average (GPA) of at least 2.00 overall and in engineering.

Writing Requirement

To satisfy the **University writing requirement**, a student must successfully complete three writing courses: one course designated W1 (which must be taken during the first semester, unless approved by the associate dean of engineering, and before the W2 courses), and two W2 courses (usually taken after the first year, but, in any case, at least one of which must be taken after the first year). Lists of W1 and W2 courses are available on the Registrar's webpage (bucknell.edu/Registrar (http://www.bucknell.edu/Registrar/)) under Course Information.

Writing courses are designed to enhance the student's understanding of the writing process and to emphasize that writing is a way of learning as well as a communication skill. They may be taken in any department.

Minors

Students in the College of Engineering, through judicious choice of electives, may choose a departmental or interdepartmental minor.

Those students who wish to apply the principles, concepts and methods from their prospective majors to define, understand and solve problems in the life sciences and medical technology have several options.

1. Students may major in one of the eight bachelor of science programs in engineering and use their elective courses to concentrate on biology, chemistry and biomedical engineering. (Biology students may elect to use their unrestricted electives to take engineering courses.)
2. Through a judicious choice of electives, engineering students may complete the **biomedical engineering minor** that combines the study of the basic biological sciences with their technological application.

Faculty advisers in these disciplines will advise students on the appropriateness of the various options in light of their particular career goals. Information on specific faculty advisers may be obtained from the Office of the Dean of Engineering. Students wishing to complete the pre-medical requirement should consult the pre-health professions adviser.

Students can declare a minor (via an online declaration form (https://etcentral.bucknell.edu/#/form/22/?header=false&focus=true)) beginning in their 4th semester and up to March 1 for May degree candidates and Dec. 1 for January degree candidates, assuming they have declared and been approved for a major and earned at least 12 cumulative credits.

Program in Engineering & Liberal Arts

The five-year program in engineering & liberal arts offers students the opportunity to obtain a broader education in the arts or sciences while completing the requirements for a major in engineering. Students may combine any bachelor of science degree program in engineering with any bachelor of arts degree. Students' home college will be the College of Engineering. Upon successful completion of this program, the single degree, bachelor of science in the engineering major, and bachelor of arts degree is awarded.

Students may enter this joint program at any time during the first five semesters of one of the engineering B.S. programs. Students in the College of Arts & Sciences also may apply to enter this program. The timing for this change is critical because of the sequential nature of the courses in the engineering programs. Such students should consult the associate dean of the College of Engineering as early as possible and no later than their third semester of study.

Students in this program must fulfill the distribution requirements and the major requirements for the degrees of bachelor of arts and either the bachelor of science in biomedical, chemical, civil, computer, electrical, environmental or mechanical engineering, or bachelor of science in computer science & engineering. Suggested course sequences for each five-year program are available from the Office of the Dean of Engineering.

Program in Engineering & Management

The five-year program in engineering & management offers students the opportunity to combine the study of engineering in any of the engineering degree programs with a selected sequence of courses in management. Students' home college will be the College of Engineering. Upon successful completion of this program, the joint degree, the Bachelor of Science in Engineering degree (within a specific engineering discipline), and the Bachelor of Management for Engineers degree is awarded. The degree has the same accreditation status as the four-year bachelor of science degree in the engineering program selected. See Bachelor of Management for Engineers (https://coursecatalog.bucknell.edu/collegeofmanagementcurricula/areasofstudy/bme/) for specific course requirements.

Prospective students interested in pursuing this five-year degree program are encouraged to apply for admission directly into the program. Admission to this joint degree program may be limited by enrollment.

Suggested course sequences for the program and detailed information on the degree requirements are available from the Office of the Dean of Engineering and the Freeman College of Management.

Graduate Studies

Bucknell University's graduate program leads to the degrees of master of science in chemical, civil, electrical, environmental or mechanical engineering. Each graduate program is individually tailored to meet the needs, preparation and goals of the student.

Undergraduate students who have completed three years in the chemical, civil, electrical, environmental or mechanical engineering program at Bucknell, earned a cumulative grade point average of at least 3.0, and who show an aptitude for graduate study, may apply for admission to the integrated 3-2 program through the Office of Graduate Studies. This program permits selected students to complete all requirements for both a bachelor of science degree and a master of science degree in five years. Those students who are selected receive a full-tuition scholarship for the fifth year.

Traditional master's degree programs are offered in addition to the special 3-2 program. Assistantships are available. Information can be obtained from the dean of engineering or the dean of graduate studies.

In addition to formal master's degree programs, any undergraduate student who has arranged to complete all undergraduate degree requirements may with prior approval take up to two courses for graduate credit. An application for graduate credit by undergraduate students may be obtained from the Office of Graduate Studies or the Office of the Registrar.