COLLEGE OF ENGINEERING

Our Website (http://www.eng.vt.edu)

Mission, Vision, and Values

Mission: Anchored by our land-grant identity and the university's motto Ut Prosim (That I May Serve), the College of Engineering educates and inspires students to be critical thinkers, innovators, and leaders. We create new knowledge, technologies, and sustainable solutions that address complex social and technical challenges.

Vision: The Virginia Tech College of Engineering will be the college of choice for aspiring engineers because of our innovative, dynamic, and integrated approach to education, research, and service. Our students and alumni will be sought globally for their talent, creativity, and work ethic. The impact of our transdisciplinary research will advance the boundaries of engineering knowledge and practice. Our solutions will make a difference in the Commonwealth and the world.

The Mission and Vision are informed by five Core Values:

- Inclusiveness: Our community supports equity and fosters respect for every individual, enabling collaboration and collegiality to permeate our classrooms, research facilities, and offices, and to extend to the broader university community. We recognize the importance of allowing every voice to be heard in a spirit of mutual respect.
- Excellence: We are committed to excellence through continuous improvement in our teaching, research, service and day-to-day operations.
- Integrity: Ethics, honesty and transparency are the foundation of all that we do. We believe in honor, discipline and a commitment to do the right thing.
- Perseverance: We are tenacious and believe in the value of hard work. Through resilience, teamwork and a supportive community, we become stronger and more agile, enabling us to adapt to future challenges and opportunities.
- Stewardship: As citizens, innovators, and leaders, we serve our communities, both local and global. We seek to be environmental stewards, believing that engineering for sustainability is critical for the future health of our world and its inhabitants.

College of Engineering at-a-Glance

Virginia Tech engineering students are among the best and brightest in the nation. During their time at the college, they engage with world-class faculty and participate in hands-on learning experiences that span course instruction, student design teams, internship opportunities, and study abroad programs. They learn to work across and outside disciplines to solve the world's most complex problems, as part of a collaborative culture that has flourished at Virginia Tech.

The College of Engineering offers accredited programs leading to Bachelor of Science degrees in the following areas:

- **Aerospace Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Aerospace and Similarly Named Engineering Programs.
- **Biological Systems Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Biological and Similarly Named Engineering Programs.
- **Biomedical Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Bioengineering and Biomedical and Similarly Named Engineering Programs.
- **Building Construction** which is accredited by the American Council for Construction Education, ACCE (https://www.acce-hq.org).
- **Chemical Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Chemical, Biochemical, Biomolecular and Similarly Named Engineering Programs.
- **Civil Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Civil and Similarly Named Engineering Programs.
- **Computer Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s) and Similarly Named Engineering Programs.
- **Construction Engineering and Management** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Construction and Similarly Named Engineering Programs and is also accredited by the Applied and Natural Science Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Construction Management and Similarly Named Programs.
- **Computer Science** which is accredited by the Computing Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Computer Science and Similarly Named Engineering Programs.
- **Electrical Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s) and Similarly Named Engineering Programs.
- **Industrial and Systems Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Industrial and Similarly Named Engineering Programs.
- **Materials Science and Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Materials, Metallurgical, Ceramics and Similarly Named Engineering Programs.

- **Mechanical Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Mechanical and Similarly Named Engineering Programs.
- **Mining Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Mining and Similarly Named Engineering Programs.
- **Ocean Engineering** which is accredited by the Engineering Accreditation Commission of ABET (https://catalog.vt.edu/undergraduate/college-engineering/www.abet.org), under the commission's General Criteria and Program Criteria for Naval Architecture, Marine Engineering, Ocean Engineering and Similarly Named Engineering Programs.

Admission to Major

All students admitted to the College of Engineering as First Time in College (FTIC) students with an intent to pursue an engineering or computer science major are placed in the Department of Engineering Education and are designated as General Engineering majors. General Engineering provides an innovative learning environment that embraces a hands-on, minds-on approach, which leverages the latest advances in educational technologies to fully engage students in the learning experience. The first-year course sequence integrates professional and technical skills to give students tools for tackling the grand challenges of the 21st century. The program introduces students to the wide range of engineering majors in the College of Engineering so that students are able to make informed decisions about their educational pathways. Further information on General Engineering can be found in the overview (https://catalog.vt.edu/undergraduate/college-engineering/engineering-education/#text) for the Department of Engineering Education in the undergraduate catalog.

While in the General Engineering program, students will complete the courses required to matriculate to a degree-granting engineering or computer science program. Further information on the process to enter a degree-granting engineering or computer science program is available at: https://eng.vt.edu/academics/undergraduate-students/resources-support/change-of-major/restricted.html.

Students admitted to the College of Engineering as FTIC students with an intent to pursue the Building Construction major are directly admitted to that major.

All students admitted to the College of Engineering as transfer students will be directly admitted to the major indicated on their application. Transfer applications are competitive and prospective transfer students are strongly encouraged to consult the Admissions Transfer Roadmaps posted by the university to prepare themselves for success in their intended major. (https://vt.edu/admissions/transfer/roadmaps.html)

Students wishing to transfer into an engineering major or change majors from another college or degree program within the university must meet current standards set by the college for each engineering program. All major changes are processed by the Director of Enrollment Management in the Academic Affairs office.

The college has a guaranteed admission agreement with the Virginia Community College System. VCCS students who complete the transferable Associate Degree in engineering with a minimum 3.2 overall grade-point-average are guaranteed admission to the College of Engineering. Not all Virginia Community Colleges offer engineering courses. Please review Guaranteed Admission Agreement (posted at https://www.vt.edu/admissions/transfer/vccs.html) for specific information on this agreement.

Engineering Technology credits are not accepted for transfer by the College of Engineering.

Experiential Learning

The Virginia Tech College of Engineering fosters opportunities for hands-on learning, interdisciplinary collaboration, and exploration of emerging and innovative subject areas.

The Ware Lab is one of the first spaces on Virginia Tech's campus dedicated to the development of an undergraduate engineering build space. Prior to the founding of the Ware Lab, the university's design teams meet in multiple spaces spread across campus in various academic buildings. Thanks to the generosity and vision of Ware, multidisciplinary teams can interact in a common space. The lab removes boundaries that often separate engineering professions. In real-world practice, engineers from different disciplines will work together. Students who work in the lab are highly recruited by top-tier companies who frequent the lab looking for the well-rounded, globally minded engineers who have had hands on experiences. Further information can be found: https://eng.vt.edu/academics/warelab.html.

The Advanced Engineering Design Lab (AEDL) provides additional space for engineering teams that focus on aerospace and rocketry projects. Further information can be found: https://eng.vt.edu/academics/aerospace-engineering-design-lab.html.

Students can participate in Undergraduate Research and Independent Research. Undergraduate Research offers students the opportunity to work closely with a faculty member in a research lab environment or performing directed work toward a research goal. Undergraduate Research can serve as valuable preparation for graduate study. Independent Study provides students an opportunity to pursue unique, self-directed study under the supervision of a faculty member. Further information can be found at: https://eng.vt.edu/academics/undergraduate-students/resources-support/undergraduate-research-independent-study.html

The College of Engineering has several options for students to have a global experience. Information on the different opportunities available can be found at: https://eng.vt.edu/academics/international-programs.html.

Approximately 75% of college of engineering students participate in a co-op or internship allowing them to experience professional work prior to completing their degree. One of the primary ways that students find these opportunities is the Engineering EXPO, a career fair organized by the Student Engineering Council (SEC) that is typically held early in the Fall semester each year. Engineering EXPO is one of the largest student-run career fairs in the nation and hosts hundreds of companies offering full-time employment or internship and co-op opportunities. Additional information on Engineering EXPO can be found at: https://www.sec.vt.edu/expo.html.

Many undergraduate engineering programs culminate in a capstone senior design course sequence in which student teams work under the supervision of a faculty advisor to complete a client-driven design project. Such projects replicate aspects of professional problem-

solving experience, providing a transitional learning experience to help students prepare for a professional career. The college also offers an Interdisciplinary Capstone Course (ENGE 4735-4736) that brings together students from different majors to work on design projects that require multiple fields of expertise.

All College of Engineering Programs now require completion of a Career Bridge experience prior to graduation. Career Bridge experiences help prepare students for post-graduation life and develop a professional identity. They offer opportunities to apply specific disciplinary knowledge to contemporary problems and questions. A wide variety of experiences are accepted to fulfil the Career Bridge requirement including internships and undergraduate research among others. The specific expectations for fulfilment of the Career Bridge are determined by the degree program that a student is enrolled in. Students are introduced to the Career Bridge expectations when they take the Foundations of Engineering course (EGE 1215 or ENGE 1414) or Introduction to Building Construction (BS 1114) in their first year. Further information is available once students enter a specific degree-granting program.

Undergraduate Scholarships

Each year, the College of Engineering (COE) provides scholarships to students. Scholarships are available at two levels: departmental and college. The scholarship opportunities are varied. Some require a minimum GPA for eligibility while others require a demonstration of financial need as indicated by the FAFSA. Some others have specific eligibility criteria such as in-state residency or participation in the Corps of Cadets as examples. The College of Engineering uses a single application process for most of these scholarships. More information on how to apply for COE scholarships can be found at https://eng.vt.edu/academics/undergraduate-students/resources-support/scholarships-financial/scholarships-for-current-students.html.

- Aerospace Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/aerospace-ocean-engineering/aerospace-engineering-bs/)
- Applied Electromagnetics Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/electrical-engineering-bs-applied-electromagnetics/)
- Biological Systems Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/biological-systems-engineering/biological-systems-engineering-bs/)
- Biomedical Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/biomedical-engineering-mechanics/biomedical-engineering-bs/)
- Building Construction Major (https://catalog.vt.edu/undergraduate/college-engineering/building-construction/building-construction-bs/)
- Chemical Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/chemical-engineering/chemical-engineering-bs/)
- Chip-Scale Integration Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/computer-engineering-bs-chip-scale-integration/)
- Civil Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/civil-environmental-engineering/civil-engineering-bs/)
- Computer Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/computer-engineering-bs/)
- Computer Science Major (https://catalog.vt.edu/undergraduate/college-engineering/computer-science/computer-science-bs/)
- Construction Engineering and Management Major (https://catalog.vt.edu/undergraduate/college-engineering/construction-engineering-management/construction-engineering-management-bs/)
- Construction Safety Leadership Major (https://catalog.vt.edu/undergraduate/college-engineering/construction-engineering-management/construction-safety-leadership-bs/)
- Controls, Robotics & Autonomy Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/electrical-engineering-bs-controls-robotics-autonomy/)
- Controls, Robotics & Autonomy Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/computer-engineering-bs-controls-robotics-autonomy/)
- Data-Centric Computing Major (https://catalog.vt.edu/undergraduate/college-engineering/computer-science/data-centric-computing-bs/)
- Ecological Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/biological-systems-engineering/ecological-engineering/)
- Electrical Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/electrical-engineering-bs/)
- Energy & Power Electronic Systems Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/electrical-engineering-bachelor-science-energy-power-electronic-systems/)
- Environmental Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/civil-environmental-engineering/environmental-engineering-bs/)
- Industrial and Systems Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/industrial-systems-engineering/industrial-systems-engineering-bs/)
- Machine Learning Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/computer-engineering-bs-machine-learning/)
- Materials Science and Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/materials-science-engineering/materials-science-engineering-bs/)
- Mechanical Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/mechanical-engineering/mechanical-engineering-bs/)
- Micro/Nanosystems Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/electrical-engineering-bs-micro-nanosystems/)
- Mining Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/mining-minerals-engineering/mining-engineering-bs/)
- Networking & Cybersecurity Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/computer-engineering-bs-networking-cybersecurity/)
- Ocean Engineering Major (https://catalog.vt.edu/undergraduate/college-engineering/aerospace-ocean-engineering/ocean-engineering-bs/)
- Robotics and Mechatronics Major (https://catalog.vt.edu/undergraduate/college-engineering/mechanical-engineering/robotics-mechatronics-bs/)
- Secure Computing Major (https://catalog.vt.edu/undergraduate/college-engineering/computer-science/secure-computing-bs/)

- Software Systems Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/computer-engineering-bs-software-systems/)
- Wireless Communications and Signal Processing Major (https://catalog.vt.edu/undergraduate/college-engineering/electrical-computer-engineering/electrical-engineering-bs-wireless-communications-signal-processing/)

Dean: Julia Ross
Associate Dean for Administration and Chief of Staff: Edward L. Nelson
Associate Dean for Academic Affairs: Keith Thompson

Associate Dean for Graduate and Professional Studies: Holly Matusovich

Associate Dean for Research and Innovation: Harpreet Dhillon

Associate Dean for Information Technology: Glenda R. Scales

Associate Dean of Inclusive Excellence (interim): Walter Lee
Assistant Dean of Advancement: Jeremy Weaver

Engineering – Non Major Specific Courses
Overview

The following courses are applicable to study in several departments and do not carry departmental designations. Several of the undergraduate courses listed below were developed specifically for students in both engineering and non-engineering majors with the objective of broadening the base of knowledge in cross-disciplinary areas with some background within a technology driven focus. Some of these courses were created for students living in the College of Engineering's Living Learning Communities of Hypatia and Galileo, and are restricted to those students. Others were created as part of the academic, professional and personal support services provided for engineering students. Most students will use these courses to satisfy free electives in their programs. Engineering students also may find these courses of value in broadening their perspectives regarding their fields of study and may wish to use them as free electives in their programs.

Undergraduate Course Descriptions (ENGR)

ENGR 1014 - Engineering Research Seminar (1 credit)
Discussion of current research topics in the College of Engineering by Virginia Tech Faculty. (1C, 1H)
Instructional Contact Hours: (1 Lec, 1 Crd)

ENGR 1034 - First Year Hypatia Seminar (2 credits)
Success strategies that are designed for first-year female engineering students who are residents of the Hypatia learning community are presented. Students are provided information on study skills; resources and academic support for Virginia Tech students; gender issues in engineering; service learning; leadership; technology; and the College of Engineerings departments/majors.
Instructional Contact Hours: (2 Lec, 2 Crd)

ENGR 1054 - First Year Galileo Seminar (2 credits)
Success strategies that are designed for first-year male engineering students who are residents of the Galileo learning community are presented. Students are provided information on study skills; resources and academic support for Virginia Tech students; gender issues in engineering; service learning; leadership; technology; and the College of Engineerings department/majors. (2H, 2C)
Instructional Contact Hours: (2 Lec, 2 Crd)

ENGR 1984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 2004A - Engineering International Activity (0 credits)
Engineering International Education course reflects academic effort in study abroad settings as defined by the college. No degree applicable credit awarded. Enrollment in this course does not apply toward the definition of full time status. 0 Credits.
Instructional Contact Hours: (0 Crd)

ENGR 2004E - Engineering Experiential Learning (0 credits)
Engineering Experiential course reflects college defined experiential learning experiences for undergraduates. No degree applicable credit is awarded. Enrollment in this course does not apply toward the definition of full time status.
Instructional Contact Hours: (0 Crd)

ENGR 2004R - Engineering Undergraduate Exploratory Activity (0 credits)
Engineering Undergraduate Exploratory Activity course is an undergraduate research experience as defined by the college. No degree applicable credit is awarded. Enrollment in this course will not apply toward the definition of full time status. 0 Credits.
Instructional Contact Hours: (0 Crd)

ENGR 2004S - Engineering Service Learning (0 credits)
Engineering Service Learning course reflects academic effort in service learning settings as defined by the college. No degree applicable credit is awarded. Enrollment in this course will not apply toward the definition of full time status. 0 Credits.
Instructional Contact Hours: (0 Crd)

ENGR 2044 - Second-Year Galileo and Hypatia Seminar (1 credit)
Second-Year Galileo and Hypatia seminar for student leaders. Success strategies designed for second-year engineering students who are participants of the Galileo and Hypatia Living-Learning Community; topics include communication skills, critical thinking skills, diversity, leadership, networking with peers and future employers, and goals associated with academic and professional success.
Prerequisite(s): ENGR 1034 or ENGR 1054
Instructional Contact Hours: (1 Lec, 1 Crd)

ENGR 2164 - Introduction to Scieneering (1 credit)
Seminar-based course providing a survey of current interdisciplinary science and engineering research problems; introduction interdisciplinary thinking and communication; issues related to interdisciplinary research teams.
Instructional Contact Hours: (1 Lec, 1 Crd)
Course Crosslist: COS 2164

ENGR 2464 - Engineering Fundamentals for Scientists (2 credits)
Introduction to the engineering profession and basic engineering skills for students pursuing science majors. Fundamentals of graphing, technical communication, ethics, the design process, project management, and problem solving as applicable to engineering. Partially duplicates ENGE 1024. May not be used for credit towards any degree from the College of Engineering.
Prerequisite(s): ENGR 2164 or COS 2164
Instructional Contact Hours: (2 Lec, 2 Crd)

ENGR 2974 - Independent Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 2984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 2984G - Special Study (1-19 credits)
Pathway Concept Area(s): 7 Identity & Equity in U.S.
Instructional Contact Hours: Variable credit course

ENGR 2994 - Undergraduate Research (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 3044 - Third-Year Galileo and Hypatia Seminar (1 credit)
Success strategies designed for third year engineering students who are participants of the Galileo and Hypatia Living-Learning Community; topics include critical thinking skills, diversity, leadership, networking with peers and future employers, and goals associated with academic and professional success.
Prerequisite(s): ENGR 2044
Instructional Contact Hours: (1 Lec, 1 Crd)

ENGR 3124 - Introduction to Green Engineering (3 credits)
Introduction to green engineering and global environmental issues. Impacts of human and engineering activities on the environment, and techniques that can be utilized to minimize adverse environmental impacts with emphasis on environmentally conscious design and manufacturing.
Instructional Contact Hours: (3 Lec, 3 Crd)

ENGR 3954 - Study Abroad (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 3984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 4064 - Scieneering Capstone (3 credits)
A capstone experience centered around an open-ended, faculty-advised senior project involving the design of a process, material, or technique for solving an interdisciplinary problem. Pre: Enrollment in Interdisciplinary Engineering and Science Minor.
Prerequisite(s): ENGR 2464 or BIOL 2124
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: COS 4064

ENGR 4134 - Environmental Life Cycle Assessment (3 credits)
Quantification of the environmental impacts for products, processes, and systems across all engineering disciplines. A detailed look at life cycle phases and formal and informal Life Cycle Assessment (LCA) methodologies including ISO standards, stream-lined LCA, green building ratings systems, carbon footprints, and other environmental ratings systems.
Prerequisite(s): ENGR 3124
Instructional Contact Hours: (3 Lec, 3 Crd)

ENGR 4974 - Independent Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 4984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 4994 - Undergraduate Research (1-19 credits)
Instructional Contact Hours: Variable credit course

ENGR 4994H - Undergraduate Research (1-19 credits)
Honors
Instructional Contact Hours: Variable credit course