

COLLEGE OF SCIENCE

Our Website (<http://www.science.vt.edu>)

Overview

The College of Science at Virginia Tech provides students with interdisciplinary training in analytical skills, a comprehensive foundation in the tools of science and the scientific method, and rigorous education in any of a wide variety of scientific fields. Outstanding faculty members conduct research and teach courses in fourteen disciplines leading to baccalaureate and advanced degrees. Coursework from the College of Science further provides a foundation of knowledge in a number of fundamental and advanced subjects for students in all Colleges across the campus. The College of Science also offers academic advising and appropriate preparatory coursework for students interested in pre-medicine, pre-dentistry, pre-veterinary medicine, and patent or intellectual property law.

The college supports research centers in areas such as biomedical and public health sciences, applied mathematics, macromolecular science, and many other critical technologies and applied sciences that interface with other Colleges at the University. Allied disciplines emphasize the study of behavioral science as well as economic and strategic decision making. The College is committed to providing research opportunities for interested students at all levels.

General Requirements for Graduation

A student in the College of Science must complete at least 120 hours for an undergraduate degree as well as satisfying the following requirements:

- achieve a minimum overall Grade Point Average (GPA) established for their degree by the major department for all hours attempted
- achieve a minimum in-major GPA established for their major by the department for all hours attempted in all work applied to the major
- complete all other requirements established for their degree by the major department
- complete all college and General Education (Pathways General Education) requirements

No course required for the major/minor may be elected to be taken on a pass/fail (P/F) basis (i.e., pass/fail may be used for free electives only). This excludes courses that are offered P/F only.

College Core Curriculum

A description of the General Education Requirements (Pathways General Education) may be found in the Academics chapter of this catalog or on the Pathways General Education website (www.pathways.prov.vt.edu) (<http://www.pathways.prov.vt.edu>).

Foreign Language

Students must complete the second year (level II) of a single foreign language [including Sign Language (ESL)] in a secondary school. This requirement may also be fulfilled by successful completion of one of the following:

- Satisfactorily complete 1106 for any foreign language offered including any prerequisites

- Satisfactorily complete an accelerated course which combines 1105 and 1106 of a foreign language
- Students who have not completed two (2) units of a single foreign language in high school must satisfactorily complete 1106 or an accelerated course which combines 1105 and 1106 of a foreign language. These hours are in addition to the 120 hours required for graduation, so these hours will not count towards graduation.
- Credit by examination for a foreign or classical language. The credit by examination option is available only to students who have gained knowledge of a foreign language without the benefit of formal training. This option is intended to recognize informal, non-academic learning experience. This option is restricted and does not carry credit towards graduation. Requests must be made through the Foreign Language office. See <https://clep.collegeboard.org> for available tests and procedures.
- Students whose native language is not English may be exempted from the foreign language requirement.

Honors College

The Honors College welcomes highly motivated College of Science students. The mission of the Honors College is to inspire and facilitate an extraordinary education for students of exceptional ability who seek to be active learners and who will apply their knowledge and skills to critical real-world problems.

Currently enrolled Virginia Tech students will receive an invitation to apply to the Honors College at the end of each fall or spring semester, provided they have achieved a 3.40 or better cumulative GPA and have at least four (4) semesters remaining at Virginia Tech before they graduate. More information about honors academic requirements and how to earn an honors diploma is available on the Honors College website: <https://www.honorscollege.vt.edu>.

Integrated Science Curriculum

Designed for students seeking an in-depth understanding of 21st century science, the Integrated Science Curriculum (ISC) provides a novel, integrated scientific foundation for any degree program in the College of Science. It employs a collaborative, active-learning environment emphasizing teamwork, skill acquisition, independent thought, and creativity. Structurally, ISC is a 30-credit two-year course sequence that covers the fundamentals of college-level chemistry, physics, and biology integrated with each other and with calculus and linear algebra. Teamwork, written and oral presentation, and problem-solving are central components throughout the curriculum. See a full description of the ISC at <https://www.ais.science.vt.edu/academics/isc.html>.

Dean's List

An undergraduate student who attempts at least 12 credit hours graded on the A-F option and who earns a 3.4 GPA for either spring or fall semester will be included on the online Dean's List for that term. Please note: Students will not appear on the online Dean's List if they are listed in the system as confidential or if they do not have an active permanent address. Questions about omissions from the online list should be directed to the Office of the University Registrar.

Pre-Professional Advising in the College of Science

Career and Professional Development offers advising to all students who are considering graduate or professional school as part of their career

planning process. Students are welcome to seek advising for decision-making on whether graduate school is the path to their career goal, how to research school and programs, and reviews resumes and personal statements. Students interested in any health profession requiring graduate or professional school are encouraged to participate in health professions advising <https://career.vt.edu/channels/healthcare-health-sciences/>. Health professions advising is particularly helpful in advising students interested in nursing, dentistry, optometry, veterinary medicine, allopathic medicine (MD), osteopathic medicine (OD), physical therapy, becoming a physician's assistant/nurse practitioner, etc. Advising for students interested in patent or intellectual property law careers is available in the college advising center.

Phi Beta Kappa

Phi Beta Kappa is the oldest and most prestigious honor society dedicated to recognizing excellence in the liberal arts and sciences. Students in the College of Science who have exhibited outstanding academic ability in eligible coursework may be eligible for selection to Phi Beta Kappa.

Scholarships

A number of scholarships are available for outstanding students enrolled in the College of Science. Descriptions and deadlines are available on the Scholarships and Financial Aid website.

Undergraduate Research

Research opportunities and experiencing the excitement of discovery can play an important part in undergraduate training in science. College of Science departments offer diverse research opportunities in which students may choose to participate. Individuals interested in undergraduate research should contact a faculty member in the department where they wish to conduct research.

Internships, Co-op Opportunities, and Enrichment Programs

Students are encouraged to participate in internship and co-op opportunities to gain relevant work experience prior to graduation. Career advisors in the college advising center as well as departmental career advisors can help students identify opportunities. In some cases, students can receive credit for qualifying work experience. Enrichment studies include field station opportunities, study abroad and summer laboratory experiences outside of the university.

Career Advising

Career advising is available from a number of sources. The centralized Career and Professional Development, located at the Smith Career Center, offers many services to aid with your career journey. Beginning with career and major exploration early in your time on campus, through the process of assisting you in the job search or graduate and professional school application, Career and Professional Development advisors can be a resource for you along the way. Career advisors have resources to guide your every step in the career journey, as well as assisting in gaining valuable experience through internships and other opportunities in your career field(s) of interest. Specialized Health Professions Advisors are also available for those that are choosing to pursue post-graduate education in a Health Profession. For more information, visit <https://career.vt.edu/>. The departments within the College of Science also host panels and information sessions with employers interested in hiring students with degrees from the college. Every major has departmental

advisors who specialize in guiding students from their field towards career success.

As part of a service to you, Career and Professional Development offers each student a **free** Handshake account. Students who are seeking any type of career-related experience or employment, including internships, co-ops, career-related summer employment, and permanent positions are eligible to use Handshake. You may upload your resume, search for companies interested in Virginia Tech students, apply for positions, review job fairs, and sign up for on-campus interviews listed in Handshake. Additional information about this resource can be found at <https://vt.joinhandshake.com/login> (<https://vt.joinhandshake.com/login/>).

Graduate Programs in Science

College of Science departments offer graduate degrees at both the Master's and Ph.D. levels. Complete information on these programs including descriptions of graduate courses can be found in the Graduate Catalog (https://secure.graduateschool.vt.edu/graduate_catalog/).

Degree Programs

- Biological Sciences Major (<https://catalog.vt.edu/undergraduate/college-science/biological-sciences/biological-sciences-bs/>)
- Biological Sciences Major with Biology Education Option (<https://catalog.vt.edu/undergraduate/college-science/biological-sciences/biological-sciences-bs-biology-education/>)
- Biological Sciences Major with Biomedical Option (<https://catalog.vt.edu/undergraduate/college-science/biological-sciences/biological-sciences-bs-biomedical/>)
- Biological Sciences Major with Ecology, Evolution, and Behavior Option (<https://catalog.vt.edu/undergraduate/college-science/biological-sciences/biological-sciences-bs-ecology-evolution-behavior/>)
- Chemistry Major (B.A.) (<https://catalog.vt.edu/undergraduate/college-science/chemistry/chemistry-ba/>)
- Chemistry Major (B.S.) (<https://catalog.vt.edu/undergraduate/college-science/chemistry/chemistry-bs/>)
- Clinical Neuroscience Major (<https://catalog.vt.edu/undergraduate/college-science/neuroscience/neuroscience-bs-clinical-neuroscience/>)
- Cognitive and Behavioral Neuroscience Major (<https://catalog.vt.edu/undergraduate/college-science/neuroscience/neuroscience-bs-cognitive-behavioral-neuroscience/>)
- Computational and Systems Neuroscience Major (<https://catalog.vt.edu/undergraduate/college-science/neuroscience/neuroscience-bs-computational-systems-neuroscience/>)
- Computational Modeling and Data Analytics Major (<https://catalog.vt.edu/undergraduate/college-science/computational-modeling-data-analytics/computational-modeling-data-analytics-bs/>)
- Computational Modeling and Data Analytics Major with Biological Sciences Option (<https://catalog.vt.edu/undergraduate/college-science/computational-modeling-data-analytics/computational-modeling-data-analytics-bs-biological-sciences/>)
- Computational Modeling and Data Analytics Major with Cryptography and Cybersecurity Option (<https://catalog.vt.edu/undergraduate/college-science/computational-modeling-data-analytics/computational-modeling-data-analytics-bs-cryptography-cybersecurity/>)

- Computational Modeling and Data Analytics Major with Economics Option (<https://catalog.vt.edu/undergraduate/college-science/computational-modeling-data-analytics/computational-modeling-data-analytics-bs-economics/>)
- Computational Modeling and Data Analytics Major with Geosciences Option (<https://catalog.vt.edu/undergraduate/college-science/computational-modeling-data-analytics/computational-modeling-data-analytics-bs-geosciences/>)
- Computational Modeling and Data Analytics Major with Physics Option (<https://catalog.vt.edu/undergraduate/college-science/computational-modeling-data-analytics/computational-modeling-data-analytics-bs-physics/>)
- Economics Major (<https://catalog.vt.edu/undergraduate/college-science/economics/economics-ba/>)
- Economics Major with Business Option (<https://catalog.vt.edu/undergraduate/college-science/economics/economics-ba-business/>)
- Economics Major with Managerial Economics and Data Science Option (<https://catalog.vt.edu/undergraduate/college-science/economics/economics-ba-managerial-economics-data-science/>)
- Economics Major with Policy and Regulation Option (<https://catalog.vt.edu/undergraduate/college-science/economics/economics-ba-policy-regulation/>)
- Geosciences Major with Earth Science Education Option (<https://catalog.vt.edu/undergraduate/college-science/geosciences/geosciences-bs-earth-science-education/>)
- Geosciences Major with Environmental and Engineering Geoscience Option (<https://catalog.vt.edu/undergraduate/college-science/geosciences/geosciences-bs-environmental-engineering-geoscience/>)
- Geosciences Major with Geobiology & Paleobiology Option (<https://catalog.vt.edu/undergraduate/college-science/geosciences/geosciences-bs-geobiology-paleobiology/>)
- Geosciences Major with Geochemistry Option (<https://catalog.vt.edu/undergraduate/college-science/geosciences/geosciences-bs-geochemistry/>)
- Geosciences Major with Geology Option (<https://catalog.vt.edu/undergraduate/college-science/geosciences/geosciences-bs-geology/>)
- Geosciences Major with Geophysics Option (<https://catalog.vt.edu/undergraduate/college-science/geosciences/geosciences-bs-geophysics/>)
- Mathematics Major (<https://catalog.vt.edu/undergraduate/college-science/mathematics/mathematics-bs/>)
- Mathematics Major with Applied Computational Mathematics Option (<https://catalog.vt.edu/undergraduate/college-science/mathematics/mathematics-bs-applied-computational-mathematics/>)
- Mathematics Major with Applied Discrete Mathematics Option (<https://catalog.vt.edu/undergraduate/college-science/mathematics/mathematics-bs-applied-discrete-mathematics/>)
- Mathematics Major with Mathematics Education (Master's Track) Option (<https://catalog.vt.edu/undergraduate/college-science/mathematics/mathematics-bs-mathematics-education-masters-track/>)
- Medicinal Chemistry Major (<https://catalog.vt.edu/undergraduate/college-science/chemistry/medicinal-chemistry-bs/>)
- Microbiology Major (<https://catalog.vt.edu/undergraduate/college-science/biological-sciences/microbiology-bs/>)
- Microbiology Major with Biomedical Option (<https://catalog.vt.edu/undergraduate/college-science/biological-sciences/microbiology-bs-biomedical/>)
- Nanomedicine Major (<https://catalog.vt.edu/undergraduate/college-science/nanoscience/nanomedicine-bs/>)
- Nanoscience Major (<https://catalog.vt.edu/undergraduate/college-science/nanoscience/nanoscience-bs/>)
- Neuroscience Major (<https://catalog.vt.edu/undergraduate/college-science/neuroscience/neuroscience-bs-neuroscience/>)
- Physics Major (<https://catalog.vt.edu/undergraduate/college-science/physics/physics-ba/>)
- Physics Major (<https://catalog.vt.edu/undergraduate/college-science/physics/physics-bs/>)
- Physics Major with Physics Education Option (<https://catalog.vt.edu/undergraduate/college-science/physics/physics-ba-physics-education/>)
- Physics Major with Pre-Health Option (<https://catalog.vt.edu/undergraduate/college-science/physics/physics-ba-pre-health/>)
- Physics Major with Pre-Law Option (<https://catalog.vt.edu/undergraduate/college-science/physics/physics-ba-pre-law/>)
- Polymer Chemistry Major (<https://catalog.vt.edu/undergraduate/college-science/chemistry/polymer-chemistry-bs/>)
- Psychology Major (<https://catalog.vt.edu/undergraduate/college-science/psychology/psychology-bs/>)
- Statistics Majors with Statistical Data Science Option (<https://catalog.vt.edu/undergraduate/college-science/statistics/statistical-data-science/>)
- Statistics Majors with Statistical Methods and Theory Option (<https://catalog.vt.edu/undergraduate/college-science/statistics/statistical-methods-theory/>)

Dean: Kevin Pitts

Associate Dean for Research: John Morris

Associate Dean for Faculty Affairs and Graduate Studies: Patricia Hammer

Associate Dean for Undergraduate Programs: Michel Pleimling

Assistant Dean for Outreach and Student Engagement: Victoria Corbin

Assistant Dean for Research in the National Capital Region: Laura Freeman

Assistant Dean for Inclusion and Diversity: Estrella Johnson

Assistant Dean for Finance: Will Walton

Assistant Dean for Advancement: Michael Walsh

COS 1004 - Explore Science Seminar (2 credits)

Overview of the college and its degrees as well as the various career opportunities available to College of Science graduates. Introduction to University resources that aid in strategic academic and career planning. Intended for first-year Explore Science majors in the College of Science.

Instructional Contact Hours: (2 Lec, 2 Crd)

COS 1015 - Successful Starts in Science: Curie and Da Vinci Living Learning Communities (1 credit)

First year experience course for students living in the Curie or Da Vinci Living Learning Communities at Virginia Tech. Provides resources and fundamental skills to enhance learning experiences and support academic success in the sciences. Engages students with professional and academic development activities both in the classroom and within a science-themed residence hall. Uses a learn by doing approach to blending technical know-how with leadership, ethical, interpersonal and professional skills fundamental to the practice of science. Requires teamwork to envision, design, and implement research projects while using innovative discipline-specific technology. Provides first-year students with support through a weekly peer mentoring program. 1015: Emphasis on scientific inquiry, curriculum planning, career planning in the sciences, skills to promote academic success, awareness of academic and career resources and opportunities. 1016: Emphasis on collaborative problem-solving skills using innovative discipline-specific technology, critical thinking; Integration of ideas and experiences to encourage life-long learning through service work related to their academic/ career interests.

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 1016 - Successful Starts in Science: Curie and Da Vinci Living Learning Communities (1 credit)

First year experience course for students living in the Curie or Da Vinci Living Learning Communities at Virginia Tech. Provides resources and fundamental skills to enhance learning experiences and support academic success in the sciences. Engages students with professional and academic development activities both in the classroom and within a science-themed residence hall. Uses a learn by doing approach to blending technical know-how with leadership, ethical, interpersonal and professional skills fundamental to the practice of science. Requires teamwork to envision, design, and implement research projects while using innovative discipline-specific technology. Provides first-year students with support through a weekly peer mentoring program. 1015: Emphasis on scientific inquiry, curriculum planning, career planning in the sciences, skills to promote academic success, awareness of academic and career resources and opportunities. 1016: Emphasis on collaborative problem-solving skills using innovative discipline-specific technology, critical thinking; Integration of ideas and experiences to encourage life-long learning through service work related to their academic/career interests.

Prerequisite(s): COS 1015

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 1984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 2015 - Professional Leadership in Science: Curie and Da Vinci LLC Leadership Course (1 credit)

Leadership and professional development course for sophomore science majors in the Curie and Da Vinci Living Learning Communities (LLCs). Applied experience in fundamental leadership and project management skills associated with practice of science, gained through service learning within the LLC. 2015: Academic peer mentoring, application and development of leadership and communication skills; application and development of project planning, organizational and collaboration skills; emphasis on written communication skills. 2016: Application of team mentoring and project management skills, including project planning and coordination, leadership strategies, collaboration, communication, conflict resolution, understanding group dynamics and the importance of diversity, and facilitating group discussion on scientific problem solving; emphasis on verbal communication skills.

Prerequisite(s): COS 1016

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 2016 - Professional Leadership in Science: Curie and Da Vinci LLC Leadership Course (1 credit)

Prerequisite(s): COS 2015

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 2164 - Introduction to Scieneering (1 credit)

Seminar-based course providing a survey of current interdisciplinary science and engineering research problems; introduction to interdisciplinary thinking and communication; issues related to interdisciplinary research teams.

Instructional Contact Hours: (1 Lec, 1 Crd)

Course Crosslist: ENGR 2164

COS 2964 - Field Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 2974 - Independent Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 2984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 3015 - Applications of Leadership in the Orion Science Living Learning Community (1 credit)

Applications of science leadership for sophomore through senior students in the Orion Science Living Learning Community (LLC). Students learn leadership skills while mentoring and designing activities to help younger students develop skills needed to succeed in college and future science careers. 3015: Recognize the needs of first- and second-year college students: help students find their own solutions; cooperatively plan and run activities that help first- and second-year college students develop professional skills and meet learning objectives; practice communication and motivation skills; model professional and ethical conduct; assess self as a learner and a leader. 3016: Coach teams and manage projects: help first- and second-year college students to apply their existing knowledge to a new project; identify problem-solving strategies and propose solutions; facilitate teamwork; communicate scientific information to the public in writing and orally; articulate the relationship between service to others and effective leadership.

Prerequisite(s): COS 1016 or COS 2016

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 3016 - Applications of Leadership in the Orion Science Living Learning Community (1 credit)

Applications of science leadership for sophomore through senior students in the Orion Science Living Learning Community (LLC). Students learn leadership skills while mentoring and designing activities to help younger students develop skills needed to succeed in college and future science careers. 3015: Recognize the needs of first- and second-year college students: help students find their own solutions; cooperatively plan and run activities that help first- and second-year college students develop professional skills and meet learning objectives; practice communication and motivation skills; model professional and ethical conduct; assess self as a learner and a leader. 3016: Coach teams and manage projects: help first- and second-year college students to apply their existing knowledge to a new project; identify problem-solving strategies and propose solutions; facilitate teamwork; communicate scientific information to the public in writing and orally; articulate the relationship between service to others and effective leadership.

Prerequisite(s): COS 3015

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 4015 - Supervision in Science: Orion Living Learning Community (1 credit)

Supervision in Science is a course for junior through senior students in the Orion Living Learning Community (LLC). Students learn more advanced management and supervisory skills while working closely with Orion LLC faculty and staff to build on previously learned mentorship, leadership, and lesson/event planning skills to help younger students develop skills needed for success in college and future science careers. 4015: Recognize the needs and manage activities of first, second, and third year college students: assess self as a peer supervisor; develop an individual development plan (IDP) for peer supervisors with Orion LLC Directors; model professional and ethical conduct; effectively and positively motivate teams of first, second, and third year students to meet learning objectives and develop professional skills; help first, second, and third year college students effectively and professionally communicate needs. 4016: Apply supervisory skills to managing and coaching student teams toward completion of program activities and projects: reassess and revise individual development plan (IDP) for peer supervisory role with Orion LLC Directors; help second and third year college students effectively motivate and guide first year students toward the completion of a group research project; help younger students communicate scientific information to the public orally and in writing; facilitate conflict resolution; promote professional and timely communication for second and third year college students; articulate the role of supervision as an aspiring science professional.

Prerequisite(s): COS 3016

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 4016 - Supervision in Science: Orion Living Learning Community (1 credit)

Supervision in Science is a course for junior through senior students in the Orion Living Learning Community (LLC). Students learn more advanced management and supervisory skills while working closely with Orion LLC faculty and staff to build on previously learned mentorship, leadership, and lesson/event planning skills to help younger students develop skills needed for success in college and future science careers. 4015: Recognize the needs and manage activities of first, second, and third year college students: assess self as a peer supervisor; develop an individual development plan (IDP) for peer supervisors with Orion LLC Directors; model professional and ethical conduct; effectively and positively motivate teams of first, second, and third year students to meet learning objectives and develop professional skills; help first, second, and third year college students effectively and professionally communicate needs. 4016: Apply supervisory skills to managing and coaching student teams toward completion of program activities and projects: reassess and revise individual development plan (IDP) for peer supervisory role with Orion LLC Directors; help second and third year college students effectively motivate and guide first year students toward the completion of a group research project; help younger students communicate scientific information to the public orally and in writing; facilitate conflict resolution; promote professional and timely communication for second and third year college students; articulate the role of supervision as an aspiring science professional.

Prerequisite(s): COS 4015

Instructional Contact Hours: (1 Lec, 1 Crd)

COS 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: ENGR 4064

COS 4964 - Field Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 4974 - Independent Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 4984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 4994 - Undergraduate Research (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 5974 - Independent Study (1-19 credits)

Instructional Contact Hours: Variable credit course

COS 5984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course