

THE COLLEGE OF ENGINEERING AND MATHEMATICAL SCIENCES

<http://www.uvm.edu/~cems/>

The College offers stimulating, professionally-oriented programs for students interested in pursuing cutting-edge careers in the fields of engineering, computer science, mathematics, statistics, data science, and physics. Each undergraduate program in the College contains a core curriculum, which prepares students to succeed in an increasingly interdisciplinary, diverse, and innovative global community. Each program offers unique opportunities for students to actively engage in their learning experience and to develop as individuals and as global citizens. In addition to building technical acumen, the core curriculum supports students as they develop competencies in professional ethics, technical communication, teamwork, leadership, and data dexterity. Coursework provides multiple active, project-based, field- and service-learning opportunities. Professional development is offered in the form of elective courses, internships, research experience, and other high-impact practices. Students can expect a well-rounded academic experience, including required courses in the humanities and social sciences, mathematics, and computer programming as well as intensive faculty interaction and a culminating capstone experience.

MAJORS

- Biomedical Engineering B.S.BME. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/biomedicalengineeringbs/>)
- Civil Engineering B.S.CE. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/civilengineeringbs/>)
- Computer Science B.S.CS. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/computerscience/computersciencebs/>)
- Computer Science and Information Systems B.S. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/computerscience/computerscienceinformationbs/>)
- Data Science B.S. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/datascience/>)
- Electrical Engineering B.S.EE. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/electricalengineeringbs/>)
- Engineering B.S.E. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/engineeringbs/>)
- Engineering Management B.S.EM. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/engineeringmanagementbs/>)

- Environmental Engineering B.S.EV. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/environmentalengineeringbs/>)
- Mathematics B.S.MSC. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/mathematicsandstatistics/mathematicsbs/>)
- Mechanical Engineering B.S.ME. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/mechanicalengineeringbs/>)
- Physics B.S. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/phys/physbs/>)
- Statistics B.S.MSC. (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/mathematicsandstatistics/statisticsbs/>)

MINORS AND CERTIFICATES

- Astronomy (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/phys/astronminor/>)
- Computer-Aided Engineering Technology (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/interdisciplinaryengineeringprograms/computeraidedengineeringtechnologycertificate/>) - Undergraduate Certificate
- Computer Science (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/computerscience/computerscienceminor/>)
- Electrical Engineering (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/engineering/electricalengineeringminor/>)
- Geospatial Technologies (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/interdisciplinaryengineeringprograms/geospatialtechnologiesminor/>)
- Mathematics: Pure (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/mathematicsandstatistics/mathematicspureminor/>)
- Physics (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/phys/physminor/>)
- Statistics (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/mathematicsandstatistics/statisticsminor/>)

REQUIREMENTS

LAPTOP REQUIREMENTS AND RECOMMENDATIONS

Engineering Programs and physics

Engineering is a professional field that leverages mathematics and the sciences to design and implement solutions to societal problems. Along with the fundamentals of math and science, practicing engineers must utilize computational tools to accomplish their tasks.

With this reality in mind, all UVM engineering programs and physics require students to have a laptop computer. The engineering laptop is large enough to enable students to design complex CAD models and powerful enough to allow instructors to incorporate computational analysis and numerical examples in the classroom for immediate and powerful praxis of engineering theory.

Mathematics, Statistics, Computer Science and Data Science Programs

The computer is an essential tool for learning and professional work in all CEMS programs, and students utilize computing technologies throughout the CEMS curricula. The laptop requirement in the Mathematics, Statistics, Computer Science or Data Science programs specifies a laptop that is designed to provide ample power and meet a student's needs throughout the duration of their studies.

Laptop specifications are available on the CEMS website.

CEMS PROGRAM ELECTIVES

The CEMS Core Curriculum supports the vision and mission of the University of Vermont and the objectives of the various programs in CEMS. The courses approved for students to fulfill their Arts & Humanities (AH) and Social Science (SS) core electives as well as courses approved to fulfill the General Education (GenEd) requirement in Engineering programs are listed below.

COURSES APPROVED FOR CEMS CORE AND ENGINEERING GENERAL EDUCATION REQUIREMENTS

ARTS & HUMANITIES ELECTIVES (AH)

Any ARBC, ARTH, ARTS, ASL, CHIN, CLAS, CSD, FREN, GERM, GRK, GRS, GSWS, HEBR, HP, HST, HUMN, ITAL, JAPN, JS, LANG, LAT, LING, PHIL, PORT, REL, RUSS, SPAN, SPCH, WLIT

CALS 001, CALS 183; CDAE 024, CDAE 271, CDAE 286; EDFS 203 ; ENGS 005; ENV5 165, ENV5 167, ENV5 178, ENV5 179, ENV5 293; FTS 009, FTS 010, FTS 123, FTS 131; GEOG 060; MATH 161; MU 001, MU 005, MU 007, MU 010, MU 014, MU 015, MU 105, MU 107, MU 111, MU 112; NR 009; PRT 255; THE 150, THE 252; VS 184,

SOCIAL SCIENCES ELECTIVES (SS)

Any ANTH, EC, GEOG, POLS, PSYC, SOC

BSAD 132, BSAD 153, BSAD 183, BSAD 184, BSAD 258; CDAE 002, CDAE 004, CDAE 108, CDAE 123, CDAE 124, CDAE 127, CDAE 128, CDAE 129, CDAE 145, CDAE 157, CDAE 171, CDAE 173, CDAE 174, CDAE 176, CDAE 205, CDAE 207, CDAE 208, CDAE 218, CDAE 251, CDAE 260, CDAE 272; EDFS 001, EDFS 002; ENSC 201; ENV5 121, ENV5 142, ENV5 143, ENV5 181, ENV5 185, ENV5 188; GEOG 050, GEOG 061, GEOG 070, GEOG 148, GEOG 150, GEOG 153, GEOG 160, GEOG 170, GEOG 173, GEOG 174, GEOG 175, GEOG 178, GEOG 184,

GEOG 244, GEOG 245, GEOG 272; NR 001, NR 002, NR 006, NR 104, NR 153, NR 205, NR 207; STAT 052; THE 017

ENGINEERING GENERAL EDUCATION ELECTIVES (GENED)

Any ANTH, ARBC, ARTH, ARTS, AS, ASL, CHIN, CLAS, COMU, CRES, CSD, DNCE, EC, EDHE, EDHI, EDSC, EDSP, EDSS, ENSC, ENV5, FREN, FTS, GEOG, GERM, GRK, GRS, GSWS, HEBR, HLTH, HP, HST, HUMN, ITAL, JAPN, JS, LANG, LAT, LING, MU, NFS, NH, NR, NSCI, PA, PBIO, PH, PHIL, POLS, PORT, PSS, REL, RUSS, SOC, SPAN, SPCH, SWSS, THE, WLIT

BSAD 009, BSAD 010, BSAD 015, BSAD 025, BSAD 030, BSAD 101, BSAD 117, BSAD 118, BSAD 119, BSAD 120, BSAD 127, BSAD 132, BSAD 147, BSAD 150, BSAD 153, BSAD 155, BSAD 156, BSAD 173, BSAD 180, BSAD 181, BSAD 183, BSAD 184, BSAD 192, BSAD 222, BSAD 230, BSAD 235, BSAD 251, BSAD 252, BSAD 256, BSAD 258, BSAD 260, BSAD 263; CALS 001, CALS 183; CDAE 002, CDAE 003, CDAE 004, CDAE 006, CDAE 014, CDAE 015, CDAE 016, CDAE 024, CDAE 045, CDAE 061, CDAE 066, CDAE 095, CDAE 102, CDAE 119, CDAE 120, CDAE 121, CDAE 123, CDAE 124, CDAE 127, CDAE 128, CDAE 129, CDAE 137, CDAE 145, CDAE 157, CDAE 158, CDAE 159, CDAE 166, CDAE 167, CDAE 168, CDAE 170, CDAE 171, CDAE 173, CDAE 174, CDAE 176, CDAE 178, CDAE 186, CDAE 205, CDAE 207, CDAE 208, CDAE 218, CDAE 224, CDAE 237, CDAE 250, CDAE 251, CDAE 253, CDAE 254, CDAE 255, CDAE 260, CDAE 266, CDAE 267, CDAE 271, CDAE 272, CDAE 273, CDAE 276, CDAE 286; CIS 001; EDFS 001, EDFS 002, EDFS 203, EDTE 001 ; ENGR 010, ENGR 101; ENGS 005; HCOL 086, HCOL 185, HCOL 186; MATH 161; MMG 002; MS 011, MS 012, MS 021, MS 022, MS 131, MS 132, MS 241, MS 242; STAT 052; PRT 010, PRT 050, PRT 138, PRT 149, PRT 157, PRT 158, PRT 230, PRT 235, PRT 255, PRT 258; VS 052 , VS 184

Professional Development Electives

ME 003, ME 081, ME 111, ME 210, ME 218, ME 249, ME 259; CIS 001, CIS 196; CS 006, CS 008, CS 091, CS 142, CS 145, CS 148, CS 166, CS 191, CS 192, CS 196, CS 198, CS 205, CS 275, CS 293; EE 106; CEMS 290, CEMS 299

Students in Mathematics & Statistics should consult with their advisor to identify appropriate courses and/or experiences to fulfill the Professional Development requirement. Students are required to complete the course substitution request form available via CEMS Program Electives webpage.

Students in Civil & Environmental Engineering should consult with their advisor to develop a Professional Preparation Portfolio to meet the Professional Development requirement. Students are required to

complete the course substitution request form available via CEMS Program Electives webpage.

REGULATIONS

ACADEMIC STANDARDS

The required minimum semester and cumulative grade point average (GPA) for good academic standing in the College of Engineering & Mathematical Sciences (CEMS) is 2.00. Additional regulations for each CEMS degree are outlined in the individual department, program or degree sections of this catalogue.

Academic performance is reviewed at the end of each regular (fall and spring) semester. CEMS Student Services – a division of the CEMS Dean’s Office – is responsible for reviewing academic performance and notifying students who are not in good academic standing. Notification of trial status and dismissal for low scholarship is sent to the student’s UVM email account.

Criteria for Placement on Trial

A student earning less than a 2.00 semester or cumulative GPA will be placed on trial.

Criteria for Continuation on Trial

A student who has been on trial for one or more semesters but does not meet the criteria for removal from trial or dismissal for low scholarship (see below) will be continued on trial.

Criteria for Dismissal for Low Scholarship

A student earning less than a 2.00 semester GPA for two successive semesters, or less than 2.00 cumulative GPA for three successive semesters will be dismissed for low scholarship. A student will be dismissed for low scholarship only after the student has been on trial for the preceding graded term of attendance.

Appealing Dismissal for Low Scholarship

A student who has been dismissed for low scholarship normally has the opportunity to appeal the dismissal in writing to the CEMS Studies Committee within the timeframe stipulated in the dismissal letter. As a condition of a student’s reinstatement following an initial dismissal, the CEMS Studies Committee may prohibit a future dismissal appeal as specified in the student’s reinstatement letter.

Criteria for Removal from Academic Trial

A student who has been placed on trial or continued on trial is removed from trial when both the semester and cumulative GPA are 2.00 or higher.

DISMISSAL FOR LOW SCHOLARSHIP

First Dismissal

A student who is dismissed for low scholarship for the first time is dismissed from CEMS and UVM for a full academic year. If dismissal occurs at the end of fall semester, the student will be suspended from continued enrollment through the end of the following fall semester. If dismissal occurs at the end of spring semester, the student will

be suspended from continued enrollment through the end of the following spring semester. (Note: A student dismissed at the end of spring semester is eligible to return in the summer or fall term of the following year).

Second Dismissal

A student who is dismissed for low scholarship for the second time is dismissed from CEMS and UVM for two full academic years.

Third Dismissal

A student who is dismissed for low scholarship for the third time is dismissed from CEMS and UVM. The third dismissal for low scholarship is final.

READMISSION AFTER DISMISSAL

A dismissed student who presents evidence of the ability to perform satisfactorily may be considered for readmission on trial. A student who has been dismissed for low scholarship for a second time will not be considered for readmission on trial until at least two years have elapsed. A student who has been dismissed for low scholarship for a third time will only be considered for readmission if the student is granted an Academic Reprieve. Further information regarding readmission may be obtained from CEMS Student Services.

A student must earn a minimum 2.00 semester GPA the first semester after readmission. A student must raise the cumulative GPA to at least 2.00 by the end of the second semester after readmission, or earn a minimum semester GPA of 2.50 during the second semester back and all subsequent semesters until the cumulative GPA is 2.00 or higher. A student who fails to meet these academic performance requirements will be dismissed for low scholarship.

For additional information on academic standing and the trial, dismissal and readmission processes, please contact CEMS Student Services.

INTERNAL TRANSFER GUIDELINES

Students currently enrolled in another College or School at UVM who would like to transfer into or pursue a dual degree in CEMS should complete the appropriate form(s) available through the myUVM portal. In order to be admitted for transfer into CEMS, internal transfer applicants must be in good academic standing (not currently "on trial") in their current program(s) of study and have no pending incompletes in current or previous coursework.

Internal transfer inquiries are welcome at any time of the year. Exceptions to the requirements and timeline outlined below may be considered for students with extraordinary circumstances. To discuss the internal transfer process and curriculum matters, please contact CEMS Student Services.

MAJOR(S)	MINIMUM GPA (cumulative & semester)	ADDITIONAL GPA RESTRICTIONS	PREREQUISITE COURSES/ GRADES
Engineering (All)	2.0	Minimum 2.0 in Engineering, Mathematics, Statistics, Physics, Chemistry and Computer Science coursework	MATH 021 w/ B- or higher OR MATH 019 w/ B or higher; lab science course w/ C or higher
Computer Science; Computer Science & Information Systems	2.0	Minimum 2.0 in all courses with CS prefix	One of CS 008, CS 020 or CS 021 w/ C or higher
Mathematics; Statistics	2.0	None	MATH 021 w/ C or higher OR MATH 019 w/ B or higher
Data Science	2.0	None	MATH 021 w/ C or higher OR MATH 019 w/ B or higher & one of CS 008, CS 020 or CS021 w/ C or higher
Physics	2.0	None	None

TRANSFER APPLICATION TIMELINE

Fall Transfers

Students who wish to begin a CEMS major at the start of the fall semester are strongly encouraged to complete the application process by July 1st. CEMS cannot guarantee consideration of applications submitted during the fall add/drop period until after the close of the fall semester. All internal transfer requests submitted after the fall add/drop period will be considered after the close of the fall semester.

Spring Transfers

Students who wish to begin a CEMS major at the start of the spring semester are strongly encouraged to complete the application process by January 1st. CEMS cannot guarantee consideration of applications submitted during the spring add/drop period until after the close of the spring semester. All internal transfer requests submitted after the spring add/drop period will be considered after the close of the spring semester.

POLICY ON INTERNSHIPS FOR ACADEMIC CREDIT

Rationale for a Policy

Internships provide CEMS students the opportunity to gain practical, hands-on experience in their disciplines. Students are able to apply what they learn in the classroom within a real-world setting and, in turn, bring knowledge and skills gained in the field back to the classroom. When combined with related academic coursework, internship experiences are valuable educational experiences.

Policy Provisions

- Academic credit for internships within the College of Engineering & Mathematical Sciences (CEMS) is offered in accordance with the University's Academic Internships Policy.
- All internships for credit are overseen and facilitated by the CEMS Career Readiness Program. This enables CEMS to:
 - Appropriately advise students on the academic implications of internship credit.
 - In collaboration with the Office of International Education, appropriately advise international students on internship credit as it relates to their visa requirements.
 - Hold students accountable for establishing goals and objectives that relate to their curricula.
 - Work with employers to ensure that the internship experience aligns with college and program objectives.
 - Collect, track and report data on the internship experiences of students and employers.
 - Establish a feedback loop for continuous process improvement.
- Determinations of the applicability of internship credits toward degree requirements are determined by each department and/or program within CEMS. Each credit requires a minimum of 40 hours per semester. For example, 3 credits require a minimum of 120 hours, or at least 8 hours per week during a 15-week semester or 10 hours per week during 12 weeks in the summer.
- Students are responsible for confirming with their academic advisor that internship credits will count toward their degree plan before the beginning of the semester of their internship.
- Instructor permission overrides are required for registration and overrides will be processed only after a completed Learning Agreement with signatures from the internship supervisor and the student are emailed to the CEMS 190 Instructor.
- The Internship Learning Agreement must be submitted by the add/drop deadline for the semester the internship will be completed.
- CEMS Internships for credit are allowed during fall, spring, and summer terms and are not allowed during winter break.
- International students are required to meet with the Office of International Education to understand how immigration

status impacts paid internship opportunities before requesting a registration override into SINT or CEMS 190.

- All CEMS internships for credit will be graded S/U.

INTERNSHIP COURSE APPLICABILITY BY DEGREE

CEMS 190 counts toward up to 3 credits of free electives for the following degrees:

Computer Science and Information Systems B.S.
Data Science B.S.
Computer Science B.S.
Electrical Engineering B.S.
Engineering B.S.
Mathematical Sciences - Mathematics B.S.
Mathematical Sciences - Statistics B.S.

CEMS 190 counts toward up to 3 credits of Engineering Science electives in the following degree:

Engineering Management B.S.

CEMS 190 does not count toward the following degrees:

Biomedical Engineering B.S.
Civil Engineering B.S.
Environmental Engineering B.S.
Mechanical Engineering B.S.

UVM HONORS COLLEGE

CEMS students who are co-enrolled in the University's Honors College must follow the requirements outlined in the Honors College section of this catalogue. Specific HCOL coursework is required for first year students and sophomores. CEMS students must follow the steps outlined on the HCOL website while writing their Honors College thesis. Note that prescribed deadlines are based upon a standard eight semester path to graduation in which students enroll in thesis credits during the fall and spring semesters of a single academic year. Deadlines will be appropriately adjusted for students following an alternate path. Such students are expected to work closely with the Honors Thesis Advisor to designate deadlines.

Students are strongly encouraged to do a semester of paid research experience for undergraduates by the fall of junior year or participate in a summer research experience.

The College offers HCOL seminars each semester (about 2 / semester). Students are required to participate in at least three over the course of their sophomore and junior year.

Thesis Prep

CEMS Honors College students must do the following during the junior year:

- Enroll in CEMS 101 (1 credit - fall semester). This course introduces students to a variety of careers through industry and

faculty speakers. It also provides examples of prior thesis work. Students choose an advisor by the end of the course.

- Enroll in CEMS 095 (1 credit - spring semester). Students learn research methods and work with their advisors to finish a thesis proposal.
- Identify an Honors Thesis Advisor and an Honors Thesis Committee. The Committee is comprised of two members, including the advisor. At least one Committee member must be in the student's major department.

Thesis Proposal

In CEMS 095, CEMS/HCOL students prepare a five-page thesis proposal, which should include sections on background, related literature, a specific work plan, and the anticipated format of the final thesis. This proposal should be submitted to the student's Honors Thesis Committee during CEMS 095; The student's advisor will notify the appropriate CEMS HCOL Representative that a thesis project has been approved.

Thesis

CEMS Honors College students must enroll in a two-semester, six-credit Honors Thesis Course sequence. Course sequences vary by department. The following options exist:

- The thesis credits can be taken in the fall and spring of the senior year. This is the most common option, and the thesis must be defended by April 15.
- The thesis can begin in the spring of the Junior year and be combined with a paid summer Research Experience at UVM or in industry.
- The thesis can begin in the spring of the Junior year and be combined with a 3 credit non paid experience in the summer.

In cases 2 and 3, the thesis is submitted in the fall of the senior year and must be defended by November 10. Coordination with industry requires prior planning to ensure that the industry project is consistent with the thesis proposal.

Students who defend a thesis are required to participate in either the CEMS undergraduate research conference or the UVM undergraduate research conference.

When thesis credits are spread across two semesters, students making satisfactory progress towards completion of the thesis during the first semester are awarded a grade of Satisfactory Progress (SP) for a semester of thesis research, and course credit is awarded. Students not making satisfactory progress toward the thesis earn a grade of Unsatisfactory Progress (UP), and no credit is awarded. When the student finishes the second semester and earns a final grade, the instructor assigns that grade for the second semester, and changes the grade of SP that had been entered for the previous semester to match the final grade. The temporary SP grade does not affect a student's GPA. Once the final grade is entered and the SP is converted to a standard letter grade, that letter grade is calculated as part of the GPA.

Timing of specific thesis progress reports is at the discretion of the student's Honors Thesis Advisor and the student's Honors Thesis Committee, and should be consistent with the approved thesis proposal, as described above. The thesis is due to the student's Honors Thesis Committee by April 1 of the senior year.

Thesis Defense

Students must give some public oral presentation of the thesis, within two weeks following the initial thesis submission, and no later than April 15 of the senior year. The presentation should be about thirty minutes long, and must be attended by the Honors Thesis Committee and announced publicly at least one week prior to the presentation date. No formal evaluation is associated with the presentation, which should serve as a discussion of the thesis, with the goal of providing constructive suggestions towards improving the final manuscript. A final grade for the thesis is assigned by the thesis advisor, who also makes the determination as to whether or not the thesis work warrants honors designation. All revisions are due by April 30.

DEPARTMENTS AND PROGRAMS

- Civil and Environmental Engineering (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/civilandenvironmentalengineering/>)
- Electrical and Biomedical Engineering (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/electricalandbiomedicalengineering/>)
- Mechanical Engineering (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/mechanicalengineering/>)
- Interdisciplinary Engineering Programs (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/interdisciplinaryengineeringprograms/>)
- Computer Science (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/computerscience/>)
- Mathematics and Statistics (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/mathematicsandstatistics/>)
- Physics (<http://catalogue.uvm.edu/undergraduate/engineeringandmathematicalsciences/phys/>)