# College of Engineering

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## Degrees Offered and Accreditation

### Bachelor of Science in Engineering

The College of Engineering offers four-year programs leading to Bachelor of Science in Engineering (B.S.E.) degrees in:

* Biomedical Engineering\* (128 credits)
* Chemical Engineering\* (128 credits)
* Civil Engineering\* (128 credits)
* Computer Science and Engineering\*# (126 credits)
* Computer Engineering\* (126 credits)
* Electrical Engineering\* (126 credits)
* Engineering Physics (132 credits)
* Environmental Engineering\* (128 credits)
* Materials Science and Engineering\* (129 credits)
* Mechanical Engineering\* (128 credits)
* Multidisciplinary Engineering (128 credits)
* Robotics Engineering (126 credits)

### Bachelor of Science

The College of Engineering offers four-year programs leading to Bachelor of Science (B.S.) degrees in:

* Bachelor of Science (B.S.) degree (120 credits) in Computer Science#
* Bachelor of Science (B.S.) degree (138 credits) in Management and Engineering for Manufacturing\* (jointly offered with the School of Business) and accredited by the Association to Advance Collegiate Schools of Business (AACSB)

The programs shown above that are asterisked (\*), are accredited by the Engineering Accreditation Commission of ABET, www.abet.org. The programs shown above with the pound sign (#) are accredited by the Computing Accreditation Commission of ABET.

**EUROTECH**

The College of Engineering and the College of Liberal Arts and Sciences offer five-year, dual degree programs in German (Eurotech), French (Technopole France), Spanish (Engineering Spanish Program), and Chinese (AsiaTech). The programs include courses taught in the respective languages specifically designed to include engineering content. During the fourth year, students study abroad, taking coursework taught in their major’s language during the first semester and complete an internship during their second semester.

Students who wish to concentrate their elective work in a second field within the College of Engineering may elect a double major program. Students seeking to double major should consult with their assigned academic advisor, and may need to meet with multiple faculty or staff advisors to co-create a plan of study.

The College of Engineering also offers Minors in Bioinformatics, Biomedical Engineering, Computer Science, Construction Engineering and Management, Electronics and Systems, Engineering Management, Environmental Engineering, Information Assurance, Information Technology, Materials Science and Engineering, Nanomaterials, and Nanotechnology. Please refer to the “Minors” section of this publication for these and other relevant minor descriptions.

## Admission Requirements

See Admission to the University section of this publication. All students admitted to the College of Engineering are required to take a math placement exam prior to attending orientation and registering for their first semester. Based on the survey results, students may be required to take additional preparatory course work that may not be counted toward graduation. Students not admitted into the College of Engineering at the time of entry to the University may apply for admission to a major through the College of Engineering. Admission is competitive. Decisions will be based on several criteria including the applicant’s academic record, courses completed, and space availability. Students in the School may request a change to their major later by submitting an application to the College of Engineering and meeting the admission criteria for that major.

**Supplementary Scholastic Standards.** To be in good academic standing in the College of Engineering, students must maintain a 2.5 cumulative GPA after completing 24 or more credits. Students must maintain a minimum 2.3 cumulative GPA to continue in the College of Engineering. Students who fall below a 2.3 cumulative GPA after 24 credits in residence will be removed from the College of Engineering and moved to the Academic Center for Exploratory Students. Residence means courses completed at one of the UConn campuses and does not include Early College Experience or non-degree courses. Students will have the opportunity to appeal this decision. If a student’s cumulative GPA falls between 2.3 and 2.499, they will be considered on academic probation for the College of Engineering. Students on academic probation will be reduced to a 14-credit load until the cumulative GPA improves to at least 2.5. Students may stay in the College of Engineering while on academic probation with the reduced credit load.

**Scholarships.** The College of Engineering offers academic merit based scholarships to first-year and continuing students. The University offers merit based scholarships to eligible incoming first-year students.

**Faculty Advisors, Professional Advisors and Academic Support.** Advising in the College of Engineering is mandatory for every student, every semester. Academic advising in the College of Engineering is done jointly by trained professional staff and faculty advisors. Typically, first- and second-year students are assigned to a professional staff advisor in order to assist students in their transition to college, aid students in navigating the University, and collaborate in course selection and academic planning. Faculty advisors typically meet with engineering students with junior or senior standing in order to assist students in their course selection, counsel them in meeting their educational and career goals, and provide discipline-specific mentorship. Faculty advisors and professional staff advisors are assigned to students entering the College of Engineering according to the student’s major. The College of Engineering provides additional content-specific academic support via the Engineering Tutoring Center. The Engineering Tutoring Center is staffed by undergraduate engineering students and provides 40+ hours of weekly tutoring to all students on a walk-in basis.

## School Academic Requirements

Students in the College of Engineering must complete the following requirements:

**General Education Requirements.** The University has adopted General Education Requirements in a variety of curricular areas, which must be satisfied as part of every bachelor’s degree program. Additionally, each student must demonstrate competency in the University of Connecticut’s five fundamental areas. These requirements appear in the “General Education Requirements” section of this *Catalog*.

Additionally, all engineering students are required to complete:

* A *Plan of Study* form submitted during the first semester of the junior year
* MATH 1131Q and 1132Q, ENGR 1000 and CSE 1100 or 1010
* All majors are required to complete PHIL 1104
* All majors, except B.S. in Computer Science majors, are required to complete CHEM 1127Q and PHYS 1501Q and 1502Q or PHYS 1201Q, PHYS 1202Q and PHYS 1230 or PHYS 1401Q and PHYS 1402Q
* The University writing (W) course requirement is fulfilled through required major-specific W course work. Some programs have the required two W courses specified in the curriculum. If there are not two W courses in the program, each student must take a minimum of one W course outside the major to satisfy the University’s General Education writing requirements.

**Credit Restrictions.** Students should read carefully the course descriptions in the Undergraduate Catalog before they register because some of the course credits may not count toward graduation. The following courses may not be counted for credit toward graduation in the College of Engineering: MATH courses numbered 1110Q and below. No course taken on a Pass/Fail basis may be counted for credit toward the required credits for graduation nor toward any course requirements for the College of Engineering.

**Major Requirements and Normal Sequences.** In addition to the University General Education requirements and the School requirements listed above, the requirements for the specific majors are listed in the following pages. Additionally, students successfully completing these courses will have met their general education information literacy exit requirement for this major. Full program details, normal/updated course sequences, and accreditation requirements can be found in the respective *Guide to Course Selection* for each major.

**Accreditation Graduation Requirements.** These requirements are for the following programs: Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science and Engineering, Electrical Engineering, Environmental Engineering, Management and Engineering for Manufacturing, Materials Science and Engineering, Mechanical Engineering, Multidisciplinary Engineering, and Robotics Engineering.

### ABET Requirements

1. Math/Science Credits - Minimum of 30 credits (any CA 3 class) including all courses from BIOL, CHEM, EEB, ERTH, GEOG, MARN, MATH, MCB, NUSC, NRE, PHYS, PNB, and STAT (unless restricted by program or school). SPSS courses may be used to satisfy this requirement if approved by the Office of the Dean.
2. Engineering Credits - Minimum of 45 credits from BME, CE, CHEG, CSE, ECE, ENGR, ENVE, ME, MEM, MSE, excluding ENGR 1000 and other classes as noted.

**Accreditation Documentation Statements.** The program educational objectives are intended to be statements that describe the expected accomplishments of graduates during the first several years following graduation from the program. Each program’s educational objectives are listed within the actual program.

## Biomedical Engineering

### Bachelor of Science in Engineering

Biomedical Engineering majors may pursue one of the following four tracks: Biomaterials and Tissue Engineering, Computational and Systems Biology, Biomechanics and Mechanobiology, or Systems, Imaging and Instrumentation. All Biomedical Engineering majors are required to complete the following:

* BIOL 1107;
* BME 3120, 3900, 4900, 4910/W;
* CHEM 1128Q or 1148Q;
* CE 2110;
* ECE 2001;
* ENGR 1166;
* MATH 2110Q or 2130Q or 2143Q; MATH 2210Q; MATH 2410Q or 2420Q or 2144Q;
* MSE 2001 or 2101;
* PNB 2264 or 2274;
* STAT 3025Q;
* BME electives (six credits; taken from designated list of BME courses for each track);

### Tracks

#### Biomaterials and Tissue Engineering

BME 3400 (or ECE 3101); BME 3500, 3600, 3700, 4710; CHEM 3563; MCB 2210, Track Elective (three credits from the Track Elective list for Biomaterials and Tissue Engineering), Elective (three credits, from BME or Track Elective list for Biomaterials and Tissue Engineering).

#### Computational and Systems Biology

BME 3400 (or ECE 3101); BME 3401 (or CSE 3810), 4400 (or BME 3100), 4401 (or BME 4810); CSE 1729; MCB 2210, 2400 (or 2410); STAT 3965 or MATH 3170, Track Electives (six credits from the Track Elective list for Computational and Systems Biology).

#### Biomechanics and Mechanobiology

BME 3600, 3620; CE 2120, 3110; ME 2233, 3227 (or 3255), 3250, Track Electives (six credits from the Track Elective list for Biomechanics and Mechanobiology), Elective (three credits, from BME or Track Elective list for Biomechanics and Mechanobiology).

#### Systems, Imaging and Instrumentation

BME 3400 (or ECE 3101); BME 3500, 4201, 4500; ECE 3111, 3201 (or CSE 2301); STAT 3965 or MATH 3170, Track Elective (three credits from the Track Elective list for Systems, Imaging and Instrumentation), Elective (three credits, from BME or Track Elective list for Systems, Imaging and Instrumentation).

No more than three credits of independent study (BME 4999) can count toward the 6-9 credits of BME electives.

The professional requirements and electives are specified in the *Biomedical Engineering Guide to Course Selection* www.bme.uconn.edu.

The Biomedical Engineering undergraduate program educational objectives are that our alumni/ae: will be engaged in professional practice as engineers and/or scientists in occupational settings primarily involving human health and well-being; will advance in their professional careers; and will engage in professional development, or post-graduate education, to continuing their self-development in biomedical engineering or other related fields.

The Biomedical Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Chemical Engineering

### Bachelor of Science in Engineering

Chemical Engineering majors are required to complete the following:

* CHEG 2103, 2111, 3112, 3123, 3124, 3145, 3151, 4139, 4140, 4143W, and 4147;
* CHEG Electives (six credits minimum);
* CHEM 1128Q (or 1148Q), 2443, 2444, 2446;
* ENGR 1166; MATH 2110Q and 2410Q;
* Professional/Engineering Requirements (nine credits); Professional requirements are satisfied by any 2000 level engineering, science or math courses, except ME 2233, due to the significant overlap in content. Engineering requirements are satisfied by any 2000 level engineering course, except ME 2233, due to the significant overlap in content;
* Elective courses (five credits).

Selection of Professional Requirements courses must include engineering design work as detailed in the *Chemical Engineering Guide to Course Selection*. At least three credits of Professional Requirements must be outside of Chemical Engineering. A maximum of six credits of independent chemical engineering research credits may be applied toward degree requirements.

The Chemical Engineering undergraduate program educational objectives are that our alumni/ae: our graduates will be gainfully employed in chemical engineering or related career paths including industrial, academic, governmental and non-governmental organizations. Our graduates will continue their professional development by engaging in professional activities and/or training to enhance their careers and/or pursue post-graduate studies.

Students admitted as first-year students to the College of Engineering may transfer, at most, one core (non-elective) 3000 (CHEG 3112, 3123, 3124, 3128, 3145, 3151) or 4000 (CHEG 4139, 4140, 4142, 4143W, 4147) level chemical engineering course from an ABET accredited program at another university. Students transferring to UConn after their first year from another university will have previous credits earned transferred via the University transfer credit rules, but any credits earned once at UConn are subject to the same restriction above.

The Chemical Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Civil Engineering

### Bachelor of Science in Engineering

Civil Engineering majors are required to complete the following:

* CE 2110, 2211, 2251; CE 2411/ENVE 2411; CE 2710, 3110, 3220, 3510; CE 3520 or ENVE 3200; CE 3610, 4900W and 4920W;
* ENVE 2310E, 3120;
* CHEM 1128Q or 1148Q;
* ENGR 1166;
* MATH 2110Q and 2410Q;
* Professional Requirements courses (21 credits);
* Science elective (minimum of three credits);
* Elective courses (as needed to reach 128 credits total).

The science elective may be satisfied by: BIOL 1107; CHEM 2241, 2443; EEB 2208; ERTH 1050, 1051; GEOG 1300, 1302, or 2300E; MARN 1002; NRE 1000, 1235, 2215E, 3105, 3145. Other courses in areas complementary to Civil Engineering, such as biology, ecology, geology, or natural resources, may also be approved.

The professional requirements are satisfied by 21 credits of 2000-level or higher courses in engineering, science, mathematics, or statistics, including AH 3275; MENT 5335; OPIM/BADM 3603; or up to three credits of ART 3670. No more than one science course at the 2000-level may be used. Any number of engineering, mathematics or statistics courses at the 2000-level may be used. At least one course each from four of the following different technical areas must be selected:

**Construction Engineering and Management:** CE 4210, 4220

**Environmental Engineering:** ENVE 3220, 4310

**Geotechnical Engineering:** CE 4510, 4530, 4541, 4560; ENVE 4540

**Structural Engineering:** CE 3630, 3640

**Geodetic/Site Engineering:** CE 2500, 4410

**Transportation Engineering:** CE 4710, 4720, 4730, 4740, 4750

**Water Resources Engineering:** ENVE 4810, 4820

No course that was used to meet another requirement for the Civil Engineering program may double count as a Professional Requirement. This includes university general education requirements and requirements for the College of Engineering or the Civil Engineering Program, for example, the science elective. Courses taken from the above list but not used to fulfill the four technical area requirements may be used to satisfy remaining professional requirements.

The Civil Engineering undergraduate program educational objectives are to prepare our alumni/ae with the knowledge and skills needed to:

* Actively contribute to the practice and profession of engineering, including management and administration, in the public, private or academic sectors in the technical areas of construction, environmental, geotechnical, structural, transportation, and water resources engineering;
* Follow a path towards leadership in the profession that can include licensure as professional engineers who design and construct solutions to civil engineering problems in the natural and built environments; and
* Practice life-long learning through post-graduate and professional education.

The Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Computer Engineering

*Offered jointly by the Departments of School of Computing and Electrical and Computer Engineering*

### Bachelor of Science in Engineering

Computer Engineering majors are required to complete the following:

* CSE 2050, 3100, 2301, 2500, 3150 or 3160, 3666, 4300, 4302 (or ECE 5402/CSE 5302);
* ECE 2001, 3101, 3201, 3401 (or ECE 5401), 3421, 4900W, 4901, 4902;
* MATH 2110Q, 2210Q and 2410Q;
* STAT 3345Q;
* Professional Requirements courses (nine credits);
* Design Laboratory courses (six credits including ECE 3411);
* Elective course (three credits).

Further details and course sequences are given in the Computer Engineering Guide to Course Selection.

**Naval Science and Technology:** The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

All Computer Engineering majors must also complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

* At least three credits of ENGR 3109.
* Six credits from the following courses with at least one course outside the senior design sequence: CSE 4095, 4099, 4939W, 4940.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other concentrations or minors. The concentration in Naval Science and Technology is restricted to U.S. citizens.

The Computer Engineering program combines coursework in computer science and electrical engineering providing a program that focuses on the design of computer hardware and digital systems.

The Computer Engineering undergraduate program educational objectives are that our alumni/ae: make technical contributions to design, development, and manufacturing in their practice of computer engineering, advance in their professional career and engage in professional development or post-graduate education to pursue flexible career paths amid future technological changes.

The Computer Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Computer Science

### Bachelor of Science

Computer Science majors are required to complete the following Computer Science and Engineering (CSE) courses: CSE 1010, 2050, 2500, 3000, 3100, 3140, 3150 or 3160, 3500, 3666, 4939W and 4940;

Computer Science majors must complete one of the following concentrations:

**Algorithms and Theory:** CSE 3502 or 5503 and three of the following: CSE 3802, 4100, 4412, 4502 or 5717, 4702, 4820 or 5819, 5500, 5506, 5512, 5820, 5854, 6512.

**Systems and Networks:** CSE 3300 or 5299 and three of the following: CSE 3400 or 5850, 4300 or 5305, 4302 or 5302, 4412, 4709 or 5309, 5300, 5306, 5312.

**Cybersecurity:** CSE 3400 or 5850 and three of the following: CSE 3300 or 5299 or 3502 or 5503 or 4300 or 5305, 4400 or 5400, 4402 or 5402, 4412 or 5512, 4702 or 5852, 5854, 5910.

**Bioinformatics:** CSE 3800 or 5800 and three of the following: CSE 3810 or 6800, 4502 or 5717, 4820 or 5819, 4830, 5810, 5815, 5820, 5825, 5830, 5840, 5860.

**Software Design and Development:** CSE 2102 and three of the following: CSE 3150 or CSE 3160 that was not used to meet core requirements, 3200, 4102 or 5102, 4300 or 4701 or 5305, 5095 (as Social Media Mining and Analysis), 5103, 5810.

**Software Design for Mobile Computing:** CSE 3200 and three of the following: CSE 2102, 3150 or 3160 that was not used to meet core requirements, CSE 3300 or 5299, CSE 3400 or 5850, 4502 or 5717; CSE 4701, 4705, 4820 or 5819.

**Computational Data Analytics:** CSE 4502 or 5717 and three of the following: CSE 4095 (as Dynamic Data Visualization) or BADM 3302, CSE 4701, CSE 4705, CSE 4820 or 5819, CSE 4830, CSE 5095 (as Social Media Mining and Analysis), CSE 5820, CSE 5825 or 5830 or 5835, CSE 5707 or BADM 3301, CSE 5713 or BADM 3203, CSE 5910.

**Naval Science and Technology:** The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

All Computer Science majors must also complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

* At least three credits of ENGR 3109.
* Six credits from the following courses with at least one course outside the senior design sequence: CSE 4095, 4099, 4939W, 4940.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other concentrations or minors. The concentration in Naval Science and Technology is restricted to U.S. citizens.

**Unspecialized:** Three of the following: CSE 2102, 3300, or 5299, 3400 or 5850, 3502 or 5503, 3800 or 5800, 4502 or 5717; and any other 2000-level or higher CSE course not used to fulfill another major requirement.

**Individually Designed:** Students may propose an individually designed concentration to fit their academic or career interests. This will be a minimum of 12 credits at the 2000 level or above, proposed by the student and approved by the student's advisor and the CSE Department Undergraduate Committee. The expectation is that such a concentration will have a strong unifying theme. This may include non-CSE courses, but the student will still be subject to the required 43 CSE credits.

All Computer Science majors must also complete the following:

* MATH 2110Q and 2210Q;
* One of MATH 3160; STAT 3025Q, 3345Q, or 3375Q;
* One two-semester laboratory course sequence from either chemistry (CHEM 1127Q-1128Q, 1137Q-1138Q or 1147Q-1148Q) or physics (PHYS 1401Q-1402Q, 1501Q-1502Q or 1601Q-1602Q);
* One additional science course from the following list (but not in the same department as the two semester sequence): BIOL 1107, 1108, or 1110; CHEM 1127Q, or 1128Q; PHYS 1401Q, 1402Q, 1502Q, 1601Q, or 1602Q; ERTH 1050, or ERTH 1051 and 1052;
* Additional CSE courses as required to reach 43 credits in CSE courses;
* Elective courses to reach a minimum of 120 credits.

Further details and course sequences are given in the Computer Science Guide to Course Selection.

The Computer Science program combines a rigorous education in computer science with added coursework in an area outside of computing, in the sciences, business or humanities. With a background that combines computer science and a non-computing discipline, our graduates have the breadth of understanding to apply computer science to other disciplines, which is particularly valuable as computing has become a key aspect of nearly all endeavors.

The Computer Science undergraduate program educational objectives are that our alumni/ae: practice and grow as computing professionals, conducting research and/or leading, designing, developing or maintaining projects in various technical areas of computer science; utilize knowledge and skills in Computer Science effectively for improving the society; and use new technical advancements of Computer Science to produce tangible contributions in the profession.

The Computer Science program is accredited by the Computing Accreditation Commission of ABET, www.abet.org.

## Computer Science and Engineering

### Bachelor of Science in Engineering

Computer Science and Engineering majors are required to complete the following: CSE 1010, 2050, 2300W or 2301, 2500, 3000, 3100, 3140, 3150 or 3160, 3500, 3504, 3666, 4939W and 4940; ECE 2001.

Computer Science and Engineering majors must complete one of the following concentrations:

**Algorithms and Theory:** CSE 3502 or 5503 and three of the following: CSE 3802, 4100, 4412, 4502 or 5717, 4702, 4820 or 5819, 5500, 5506, 5512, 5820, 5854, 6512.

**Systems and Networks:** CSE 3300 or 5299 and three of the following: CSE 3400 or 5850, 4300 or 5305, 4302 or 5302, 4412, 4709 or 5309, 5300, 5306, 5312.

**Cybersecurity:** CSE 3400 or 5850 and three of the following: CSE 3300 or 5299 or 3502 or 5503 or 4300 or 5305, 4400 or 5400, 4402 or 5402, 4412 or 5512, 4702 or 5852, 5854, 5910.

**Bioinformatics:** CSE 3800 or 5800 and three of the following: CSE 3810 or 6800, 4502 or 5717, 4820 or 5819, 4830, 5810, 5815, 5820, 5825, 5830, 5840, 5860.

**Software Design and Development:** CSE 2102 and three of the following: CSE 3150 or CSE 3160 that was not used to meet core requirements, 3200, 4102 or 5102, 4300 or 4701 or 5305, 5095 (as Social Media Mining and Analysis), 5103, 5810.

**Software Design for Mobile Computing:** CSE 3200 and three of the following: CSE 2102, 3150 or 3160 that was not used to meet core requirements, CSE 3300 or 5299, CSE 3400 or 5850, 4502 or 5717, CSE 4701, 4705, 4820 or 5819.

**Computational Data Analytics:** CSE 4502 or 5717 and three of the following: CSE 4095 (as Dynamic Data Visualization) or BADM 3302, CSE 4701, CSE 4705, CSE 4820 or 5819, CSE 4830, CSE 5095 (as Social Media Mining and Analysis), CSE 5820, CSE 5825 or 5830 or 5835, CSE 5707 or BADM 3301, CSE 5713 or BADM 3203, CSE 5910.

**Naval Science and Technology:** The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

All Computer Science and Engineering majors must also complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

* At least three credits of ENGR 3109.
* Six credits from the following courses with at least one course outside the senior design sequence: CSE 4095, 4099, 4939W, 4940.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other concentrations or minors. The concentration in Naval Science and Technology is restricted to U.S. citizens.

**Unspecialized:** Three of the following: CSE 2102, 3300 or 5299, 3400 or 5850, 3502 or 5503, 3800 or 5800, 4502 or 5717; and any other 2000 level or higher CSE course not used to fulfill another major requirement.

**Individually Designed:** Students may propose an individually designed concentration to fit their academic or career interests. This will be a minimum of 12 credits at the 2000+ level, proposed by the student and approved by the student's advisor and the CSE Department Undergraduate Committee. The expectation is that such a concentration will have a strong unifying theme. This may include non-CSE courses, but the student will still be subject to the required 50 CSE credits.

All Computer Science and Engineering majors must also complete the following:

* MATH 2110Q, 2210Q, and 2410Q;
* One of MATH 3160, STAT 3025Q, 3345Q, *or* 3375Q;
* Additional CSE courses as required to reach 50 credits in CSE courses;
* Elective courses to reach a minimum of 126 credits.

Further details and course sequences are given in the Computer Science and Engineering Guide to Course Selection.

The Computer Science and Engineering program combines a rigorous education in computer science with added emphasis on the physical and architectural underpinnings of modern computer system design. With a background that spans computer science and computer engineering, the graduates are able to address computing systems across the hardware-software spectrum.

The Computer Science and Engineering undergraduate program educational objectives are that our alumni/ae: practice and grow as computing professionals, conducting research and/or leading, designing, developing or maintaining projects in various technical areas of computer science; utilize knowledge and skills in Computer Science and Engineering effectively for improving the society; and use new technical advancements of Computer Science and Engineering to produce tangible contributions in the profession.

The Computer Science and Engineering program is accredited by the Engineering Accreditation Commission and the Computing Accreditation Commission of ABET, www.abet.org.

## Data Science and Engineering

**Data Science and Engineering majors are required to complete the following Computer Science and Engineering (CSE) courses:**

* CSE 1010, 2050, 2500, 2600, 3000, 3140, 3500, 4502, 4701, 4820, 4939W, and 4960.

**All Data Science and Engineering majors must also complete the following:**

* MATH 2110Q and 2210Q;
* One of MATH 3160; STAT 3025Q, 3345Q, or 3375Q;
* One two-semester laboratory course sequence from either chemistry or physics. Chemistry: CHEM 1127Q–1128Q, 1137Q–1138Q, or 1147Q–1148Q; Physics: PHYS 1401Q–1402Q, 1501Q–1502Q, or 1601Q–1602Q.
* One additional science course from the following list (but not in the same department as the two-semester sequence): BIOL 1107, 1108, or 1110; CHEM 1127Q, or 1128Q; PHYS 1401Q, 1402Q, 1502Q, 1601Q, or 1602Q; ERTH 1050, or ERTH 1051 and 1052;
* A minimum of four courses totaling a minimum of 12 credits from the following list: CSE 2102, 3400 or 5850, 3800 or 5800, 3802 or ECE 3431, 4705, 5520, 5713, 5820; BME 3401 or 4810; ECE 4131, 4132; STAT 3965 or MATH 3170;
* Additional elective courses to reach a minimum of 120 credits.

Further details and course sequences are given in the Data Science and Engineering Guide to Course Selection.

## Electrical Engineering

### Bachelor of Science in Engineering

Electrical Engineering majors are required to complete the following:

* CSE 1102 or 2050 or ENGR 1166;
* CSE 2301;
* ECE 1401, 2001, 3001, 3101, 3111, 3201, 3211 or 3212 or 3231, 3221 or 4201, 4900W, 4111 or 4112, 4211 or 5211 or 4225 or 5225, 4901 and 4902;
* MATH 2110Q, 2210Q and 2410Q;
* STAT 3345Q or MATH 3160;
* Professional Requirements courses (12 credits);
* Design Laboratory courses (six credits);
* Elective courses (seven credits).

Further details and course sequences are given in the Electrical Engineering Guide to Course Selection.

### Concentration in Naval Science and Technology

The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

To complete this concentration, students must complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

1. At least three credits of ENGR 3109.
2. Six credits from the following courses (or five if using Senior Design): ECE 4095, 4900W, 4901, 4902.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other concentrations or minors.

The concentration in Naval Science and Technology is restricted to U.S. citizens.

The Electrical Engineering program educational objectives are that our alumni/ae: make technical contributions to design, development, and manufacturing in their practice of electrical engineering; advance in their professional career; and engage in professional development or post-graduate education to pursue flexible career paths amid future technological changes.

The Electrical Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Engineering Physics

*Offered jointly by the Physics Department of the College of Liberal Arts and Sciences and the College of Engineering*

### Bachelor of Science in Engineering

Students choose the college/school that they wish to graduate from and must satisfy the course requirements of either the College of Liberal Arts and Sciences or the College of Engineering to complete their degree.

#### Physics Requirements

PHYS 2300, 3101, 3201, 3202, 2501W, 3401, 3300, and six credits of PHYS 2000-level or above electives.

#### Engineering Requirements

* CSE 1010;
* ENGR 1000, 1166, 4001, 4002W;
* MSE 2001 or 2101, and MSE 2002 or 2102;
* CE 2110, 3110, 3120;
* CHEG 2103;
* ECE 2001;
* Thermal Science Elective: one from MSE 3001, ME 2233, or CHEG 2111
* Nine credits ENGR electives (three credits may be 2000-level, at least six credit must be 3000-level)

#### Additional Requirements

* MATH 2110 and 2410
* STAT 3025

The Engineering Physics undergraduate program educational objectives are that our alumni/ae: contribute to current and future scientific and technological developments in the areas of physics and electrical, mechanical and materials science engineering; excel in engineering and physics careers and responsible citizenship in industry, government, academia and other professional practices; and engage in professional development or graduate education to pursue flexible career paths.

## Environmental Engineering

### Bachelor of Science in Engineering

Environmental Engineering majors are required to complete the following:

* CE 2110, 2211, CE 2251;
* CHEM 1128Q (or 1148Q); CHEG 2111;
* ENGR 1166; MATH 2110Q and 2410Q;
* ENVE 1000E, 2310E; CE 2411/ENVE 2411; ENVE 3120 (or CHEG 3123), ENVE 3201, 3202, 3220, 3230, 3270, 4210, 4310, 4320, 4530 or 4540, 4810, 4910W, 4920W;
* Biological Science requirement;
* Earth Science requirement;
* Professional Requirements courses (12 credits);
* Elective course (as needed to reach 128 credits).

The Earth Science requirement may be fulfilled by ERTH 1051 or 3710/ENVE 3530; MARN 1002; NRE 3145, 3146 or 4135; SPSS 2120, 3420 or 4420; or other appropriate courses by petition.

The Biological Science requirement may be fulfilled by BIOL 1108; EEB 2100E; ENVE 3270; NRE 3105, 3265, 4205, or 4340; or other appropriate courses by petition.

Professional Requirements include: at least three credits in the area of Management and Policy from the following list of courses: AH 3275; ARE 3434E, 4462E; EEB 3205E; ENVE 3100, 4850; GEOG 3320W, 3340; LAND 3230WE; MEM 2221; NRE 3245E; OPIM 3603. At least three credits from any 3000-level or higher CE or ENVE courses. At least six credits from any 3000-level or higher courses in engineering or science (BIOL, CHEM, EEB, GEOG, ERTH, LAND, MARN, MATH, MCB, NRE, PHYS, SOIL, TURF), or CE 2500 or CHEM 2241, 2243.

No course that was used to meet another requirement for the Environmental Engineering Program may double count as a Professional Requirement. This includes university general education requirements and requirements for the College of Engineering. Environmental Engineering Honors students are required to take three credits of ENVE 4886 and/or 4897 in place of three credits of Professional Requirements.

The Environmental Engineering undergraduate program educational objectives are to impart our alumni/ae with the knowledge and skills needed to: actively contribute to the practice and profession of engineering, including management and administration, in the public, private or academic sectors in the technical area of environmental engineering; follow a path towards leadership in the profession that can include becoming licensed professional engineers, assessing the impact of human activities on the environment, designing and constructing solutions to minimize and mitigate such impacts, and tending to the natural environment as our life support system; and practice lifelong learning through post-graduate and professional education.

The Environmental Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Management and Engineering for Manufacturing

*Jointly offered by the School of Business and College of Engineering granting a single joint Bachelor of Science degree from the College of Engineering and School of Business.*

### Bachelor of Science

Requirements for all Management and Engineering for Manufacturing students, both through the School of Business and through the College of Engineering, are the same. Students must work very carefully with a Management and Engineering for Manufacturing advisor. Completion of all major requirements also fulfills all School of Business, College of Engineering, and ABET requirements.

Management and Engineering for Manufacturing majors are required to complete the following:

**Expository Writing:** ENGL 1007, 1010 or 1011 (or for Honors Scholars, ENGL 2011).

**Quantitative Analysis:** MATH 1131Q and MATH 1132Q; MATH 2110Q and 2410Q; and STAT 1000Q or 1100Q.

**Other Required Courses:**

* History Requirement: HIST 1201, 1400, 1501/W, 1502/W, 1600 (LLAS 1190/W), 1800, 3705, or ECON 2102/W
* Ethics Requirement: PHIL 1104
* Economics Requirement: ECON 1200, or ECON 1201 and 1202
* International Requirement: ANTH 1000/W; GEOG 1700, 2000; HRTS 1007; POLS 1202, 1207; WGSS 2124
* Engineering Science Requirement: CHEM 1127Q; PHYS 1501Q and 1502Q
* Additional Content Area Four course

ACCT 2001, 2101; BLAW 3175; CE 2110 and 3110; CSE 1010 or 1100; ECE 2000; ENGR 1000; FNCE 3101; ME 2233, 3221, 3227, and 3263; MEM 1151, 2211, 2212 or 2213, 3221, 3231, 4225, 4971W, and 4972W; MENT 3101 and 4900; MKTG 3101; MSE 2101; OPIM 3652 or ENGR 3215; OPIM 3603, 3701 or 5270; a Business Technical Elective course (three credits); an Engineering Technical Elective course (three credits).

Neither OPIM 3103 nor OPIM 3104 may be used to fulfill business-elective credit by MEM majors. ME 3222 may not be used to fulfill engineering-elective credit by MEM majors.

The Business Technical Elective must be from a 3000-level or higher course from one of the following five departments in the School of Business: Accounting, Finance, Management, Marketing, or Operations and Information Management.

The Engineering Technical Elective must be from a 3000-level or higher course from the College of Engineering or from the following list of Allied Health courses: AH 3270, 3570, or 3574.

MEM students who have completed CSE 1010 or 1100 will not be required to take OPIM 3103 and will satisfy the requirements for courses that will have OPIM 3103 as a requisite.

The Management and Engineering for Manufacturing undergraduate program educational objectives are that our alumni/ae: practice their profession with solid engineering and business knowledge and skills and have a total enterprise vision of world class manufacturing and service organizations; compete successfully using lean manufacturing and quality management principles in the design, manufacture of products, and development of services; and apply high professional standards, with up to date knowledge and personal skills, integrating global factors in their approach to engineering and business decisions.

### Information Literacy

In addition to the basic competency achieved in ENGL 1007, 1010, or 1011 or equivalent, all students will receive instructions on how to conduct an effective search for information in the library and how to conduct an effective search on the web for applicable engineering topics in ENGR 1000 or equivalent. As the student progresses in their program, various courses will require assignments to increase their information literacy competency. The advanced level of information technology competency will be achieved at the completion of MEM 4971W and 4972W.

### Writing in the Major

MEM 4971W and 4972W are the senior design project courses for the program. All students must write reports on their projects. These courses provide opportunities to write professional reports with appropriate feedback and criticism from two faculty members. The report writing provides instruction in proper report structure for professional work in practice.

Students are encouraged to seek faculty-supervised manufacturing summer internships prior to their junior and senior years. Such internships may be shown on the student records by registering for MEM 3281, with instructor and advisor approval.

MEM students have available a one-semester exchange program with the Industrial Engineering and Management program from Lund University, Sweden.

### Concentration in Naval Science and Technology

The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

To complete this concentration, students must complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

1. At least three credits of ENGR 3109.
2. Six credits from the following courses (or four if using Senior Design): MEM 3295, 3299, 4971W, 4972W, 4296.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other concentrations or minors.

The concentration in Naval Science and Technology is restricted to U.S. citizens.

### Admission to the Management and Engineering for Manufacturing Major

Students who apply to the Management and Engineering for Manufacturing major with admission requirement coursework in transfer must apply through the College of Engineering at ppc.engr.uconn.edu. Admission to the Management and Engineering for Manufacturing (MEM) major is competitive. The following requirements must be met for consideration of admission into the MEM major. The following admission requirements must be complete at time of application to be considered for admission:

1. Be in good academic standing (not on probation or eligible for dismissal).
2. Have earned 24 credit hours.
3. Have completed each of the following areas with no grades less than a “C” (no substitutions).
   * MATH 1131Q; both MATH 1120Q and 1121Q; or both MATH 1125Q and 1126Q.
   * One of the following: CHEM 1127Q or 1147Q, PHYS 1501Q, or other lab science.
   * One of the following: ACCT 2001; ECON 1200, 1201, 1202; STAT 1000Q, 1100Q.
4. To be admitted to the MEM Program, students must have demonstrated academic success and the potential to maintain a strong enough cumulative GPA to remain in the program.

Incoming first-year students may be admitted into the major by the Office of Undergraduate Admissions at the time of enrollment at UConn, based on their credentials at the time of enrollment. Similarly, a first-semester student enrolled in the School of Business or the College of Engineering may freely transfer into the MEM program via ppc.engr.uconn.edu, but only prior to the completion of the first semester. After the end of the first semester, all admissions to MEM are subject to the above restrictions.

### Supplemental Academic Standards

After admission into the Management and Engineering for Manufacturing program, students must maintain a high standard of scholastic achievement to continue in the major program. Any student having completed 24 or more credit hours must maintain a minimum 2.79 cumulative grade point average. A student failing to meet this standard is subject to dismissal from the program.

The Management and Engineering for Manufacturing program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Materials Science and Engineering

### Bachelor of Science in Engineering

Materials Science and Engineering majors are required to complete the following:

* CHEM 1128Q or 1148Q;
* ENGR 1166;
* MATH 2110Q and 2410Q;
* CE 2110;
* MSE core: 2001, 2002, 3001, 3002, 3003, 3004, 4001, 4003, 4004;
* MSE labs: MSE 2053, 3055, 3056, 4901W, and 4902W;
* Professional requirement courses (15 credits);
* Technical Elective courses (nine credits).

#### Professional Electives

Recommended professional elective courses: 15 credits from: any 3000 or 4000 level MSE elective course, BME 3700 or 4701; CHEG 3156 or ME 3217 or 3228. Up to three credits of MSE 4097 or 4996 and up to three credits of MSE 4099 can satisfy the Professional Elective requirement. Students may take multiple instances of MSE 4095 or 4098, which all may count as Professional Electives in MSE, provided each instance covers a different topic. Students with GPA of 3.2 or greater may elect letter-grade graduate courses. Any substitutions must be approved by the Director of Undergraduate Studies and the College of Engineering Undergraduate Dean.

#### Technical Elective Requirement

Nine credits, selected from all 2000, 3000, and 4000 courses in the basic sciences, mathematics, and in any engineering discipline other than Materials Science and Engineering are accepted as technical electives. At least three credits must be selected from the basic sciences or mathematics: Mathematics (MATH), Biological Sciences (BIOL), Chemistry (CHEM), Molecular and Cell Biology (MCB), Physics (PHYS), and Statistics (STAT).

Selection of courses is detailed in the *Materials Science and Engineering Guide to Course Selection* at mse.engr.uconn.edu/curriculum-and-course-guide.

#### Free elective

Three credits, selected from courses at any level in any discipline at student’s discretion.

### Concentration in Naval Science and Technology

The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

To complete this concentration, students must complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

1. At least three credits of ENGR 3109.
2. Six credits from the following courses: MSE 4095, 4901W, 4902W, 4989.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other concentrations or minors.

The concentration in Naval Science and Technology is restricted to U.S. citizens.

### Program Educational Objectives (PEOs):

**Program Educational Objective 1:** Within three to five years after graduation, in their professional careers and/or graduate programs, our alumni/ae will have progressed in responsible professional positions, pursued continual learning, and/or will have attained or will be successfully moving toward attaining post-graduate degrees.

**Program Educational Objective 2:** Within three to five years after graduation, in their professional careers and/or graduate programs, our alumni/ae will have earned recognition for applying and continually expanding special, in-depth competencies in materials design, selection, processing, characterization, modeling and simulations.

**Program Educational Objective 3:** Within three to five years after graduation, in their professional careers and/or graduate programs, our alumni/ae will have earned recognition for applying and continually expanding professional skills of critical and cooperative thinking, communication, leadership, teamwork, including in multidisciplinary settings, innovation, and project management.

**Program Educational Objective 4:** Within three to five years after graduation, in their professional careers and/or graduate programs, our alumni/ae will have become engaged with and will be contributing to professional societies. Our alums will also begin to identify and promote opportunities for collaboration with the MSE department, faculty, students, and other alumni/ae.

The Materials Science and Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Mechanical Engineering

### Bachelor of Science in Engineering

Mechanical Engineering majors are required to complete the following:

* CE 2110, 2120, and 3110;
* ECE 2000 or 2001;
* ENGR 1166;
* MATH 2110Q and 2410Q;
* ME 2233, 2234, 3220, 3227, 3242, 3250, 3253, 3255, 3263, 3264, 4972, and 4973W;
* MSE 2001 or 2101;
* ME Requirement (nine credits);
* Professional Requirements (six credits);
* Electives (five credits).

All mechanical engineering students are required to have at least six credits of work in the mathematical sciences and sciences beyond those courses specifically required in the program. The course credits can be met at any course level. Those at the 2000 level and above can be used to meet the professional requirements of the program. Restrictions on courses are noted in the following:

All MATH 2000-level and above courses except MATH 2720W, and 2794W; all STAT courses except STAT 1000Q; all BIOL, EEB, MCB, and PNB courses; all CHEM courses except CHEM 1101; all GSCI courses, all MARN courses may be used.

**Concentration requirements:** nine credits (three courses, 2000 level and above); no course grades of less than “C”; plan of study for concentration; must take courses from a subset of identified courses.

**Aerospace Concentration:** Three courses from: ME 3239, 3251, 3275, 3276, 3280, 5311, 6160, or 3295 Special Topics taught as any of these: Acoustics, Aerodynamics, Aerodynamics and Flight Mechanics, Aerospace Control Systems Aircraft Performance; Stability and Control; Analysis of Composite Materials and Structures; Introduction to the Finite Element Method; Mechanics of Composite Materials, Orbital Mechanics, or Structural Dynamics.

**Energy and Power Concentration:** Three courses from: ME 3239, 3251, 3270, 3275, 3276, 3280, 3285, 5311, 6160, or 3295 (Special Topics) taught as any of the following: Aerodynamics, Aerodynamics and Flight Mechanics, Radiation Heat Transfer.

**Dynamic Systems and Control Concentration:** Three courses from: ME 3214, Special Topics 3295 when taught as any of these: Aerospace Control Systems; Acoustics; Advanced Vibrations; Aircraft Performance; Stability and Control; Intelligent Material Systems and Structures; Manufacturing Robotics, Mechatronics; Modeling and Simulation for Materials and Biology; Optimal and Adaptive Controls; Orbital Mechanics, or Structural Dynamics, ME 5160, 5180, 5210, 5420, 6330, or 5895 Special Topics when taught as Mechatronics.

**Design and Manufacturing Concentration:** Three courses from: ME 3217, 3221, 3222, 3224, 3225, 3228, 5511, 5155, 5150, 5210, 5220, 5895 when taught as Probabilistic Engineering Design or Special Topics 3295 when taught as any of the following: Advanced Biomechanics of Soft Tissues; Analysis of Composite Materials and Structures; Computational Foundations of Digital Manufacturing; Computers in Manufacturing; Flexible and Stretchable Electronics; Geometric Modeling; Intelligent Material Systems and Structures; Introduction to Products and Processes; Introduction to the Finite Element Method; Manufacturing of Biointegrated Materials and Devices at Micro and Nanoscales; Mechanics of Architected Materials; Mechanics of Composite Materials; Principles of Optimum Design, or Six Sigma Green Belt Using Minitab.

### Concentration in Naval Science and Technology

The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

To complete this concentration, students must complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

1. At least three credits of ENGR 3109.
2. Six credits from the following courses: ME 3396, 3299, 4975, 4976.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other concentrations or minors.

The concentration in Naval Science and Technology is restricted to U.S. citizens.

The faculty of the Mechanical Engineering program at the University of Connecticut strives to continuously improve our undergraduate program in Mechanical Engineering. The program’s educational objectives are that our graduates: will be gainfully employed in Mechanical Engineering or related career paths including industrial, academic, governmental and non-governmental organizations and will continue their professional development by engaging in professional activities and/or training to enhance their careers and/or pursue post-graduate studies.

The Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

## Multidisciplinary Engineering

### Bachelor of Science in Engineering

Multidisciplinary Engineering majors are required to complete the following:

* CHEG 2103;
* CHEM 1128Q or 1148Q;
* CE 2110, 3110, and 3120;
* ECE 2001;
* ENGR 1166, 4001, 4002W;
* MATH 2110Q and 2410Q;
* MSE 2001 or 2101, and MSE 2002 or 2102;
* STAT 3025 or an equivalent approved statistics course (advisor approval required);
* Thermal Science Elective: One from MSE 3001, ME 2233, or CHEG 2111;
* Engineering Electives (nine credits);
* Area Elective Credits (twenty-four credits).

All multidisciplinary engineering students are required to have at least nine credits of work in engineering beyond those courses specifically required in the program. Three credits may be met by courses offered in the College of Engineering at the 2000 level or higher, and six credits must be met by courses in the College of Engineering at the 3000 level or higher.

Area Elective Credits can be used to pair the Multidisciplinary Engineering degree with other partner programs at the university. For students not seeking a paired program, consult with your academic advisor and the Guide for Multidisciplinary Engineering Majors for guidance on selecting courses based on your interests.

The Multidisciplinary Engineering Degree is overseen by faculty from the College of Engineering as well as the Engineering Undergraduate Programs Office, who strive to continuously improve our undergraduate program in Multidisciplinary Engineering. The program’s educational objectives (PEOs) are that our graduates: will be gainfully employed in Engineering or related career paths including industrial, academic, governmental and non-governmental organizations, and will continue their professional development by engaging in professional activities and/or training to enhance their careers and/or pursue post-graduate studies.

#### Multidisciplinary Engineering with a Specialization in Entertainment Engineering

Students choosing the Entertainment Engineering specialization will take coursework in the School of Fine Arts focused on stagecraft and technical theater, with a focus on hands-on and experiential learning in SFA dramatic productions. Students with this specialization will be well positioned to work in the theater and entertainment industries with a strong engineering background that intersects with the performing arts.

##### **Required Courses (24 credits):**

* DRAM 1219
* DRAM 3201
* DRAM 3202
* DRAM 3203
* DRAM 3204
* DRAM 3199 Independent Study and Production Assignment (three credits each, six credits total)
* Any three credit DRAM 3000-level course not used in fulfillment of another requirement

##### **Suggested Content Area/General Education Courses**

The specialization in Entertainment Engineering will require the 24 credits of required courses as described above. In addition, students pursuing this specialization are encouraged to choose at least one of their content area or General Education courses from the curated list below to provide additional depth in the Dramatic Arts according to their interests.

* AFRA/DRAM 3131 (CA 4)
* AAAS 2136W (CA 1/CA 4-INT)
* DRAM 1101 (CA 1)
* DRAM 1501 (CA 1/CA 4-INT)
* DMD 2620 (CA 2)
* DRAM 3133 (CA 4)

#### Multidisciplinary Engineering with a Specialization in Human Rights and Sustainability

The specialization in Human Rights and Sustainability is a joint program between the College of Engineering, the Human Rights Institute, and the College of Liberal Arts and Sciences. The Multidisciplinary Engineering (MDE) major with Specialization in Human Rights and Sustainability requires a student to be enrolled in the College of Engineering. In addition to providing students with a broad background in numerous engineering fields, this specialization aims to emphasize a human rights-based approach to engineering. Students will complete a minimum of 24 Human Rights credits, chosen from the courses outlined below, and will design a capstone project that follows a human-rights based approach to engineering.

Students will select 24 credits of specialization coursework according to the distribution below.

* ENGR/HRTS 2300: ideally taken during the second semester of first year in the program.
* Three Core Courses: one from each area.
  + A: Institutions and Laws
  + B: History, Philosophy, and Theory
  + C: Applications and Methods
* Two Core Sustainability Courses (Area D)
* Two additional courses that may be taken from any of the Core or Elective courses (A-E) on the list below.

**Note:** Courses solely or cross listed between ENGR and other disciplines listed below may be used to fulfill either ENGR elective credits or be counted as part of the 24 HRTS credits, but not both.

Students are encouraged, but not required, to take a W course in Human Rights as part of the 24 credits.

A capstone engineering design project (ENGR 4001 and ENGR 4002W) with strong Human Rights (HR) content as approved by the MDE faculty advisory board and Human Rights Institute Director, or Internship in HR (HRTS 4291) for students whose capstone design project does not have a significant HR theme. HRTS 4291 would count as one for the two “additional courses” above.

* Note: Students can elect to do both an HR-themed capstone and an HR internship if desired but must have at least one HR-themed experiential learning experience.

The MDE advising team will be responsible for ensuring that students successfully navigate the program requirements. The Human Rights undergraduate advising team will work with the students to identify experiential learning opportunities for students in the major.

**Core Courses**

**A. Institutions and Laws**

ANTH/HRTS 3230/W; HIST/HRTS 3202; HRTS 3050, 3055, 3200/W; POLS/HRTS 3212, 3420, 3428; SOCI/HRTS 2800, 2845/W.

**B. History, Philosophy, and Theory**

ANTH/HRTS 3326; ANTH/HRTS/LLAS 3327; ENGL/HRTS 3631; HIST/HRTS 3201, 3207, 3232; HRTS 2100W, 3460, 3710; HRTS/LLAS 2450; HRTS/PHIL 3220/W; HRTS/POLS 3042.

**C. Applications and Methods**

BADM or BLAW or HRTS 3252, 3254; DRAM/HRTS 3139; HRTS 3149/W, 3250/W, 3475, 3540; POLS/HRTS 3256/W, 3430; SOCI/HRTS 3835/W.

**D. Sustainability** (\**Courses that can also count as ENGR credits*)

\*ENGR/HRTS 3257; \*ENVE/ENVS/EVST 3100; \*ENVE 3110E; \*ENVE 4850; GEOG 2400E; NRE 2600E; \*POLS/ENGR/HRTS 3209; POLS 3203.

**E. Elective Courses**

Any HRTS course numbered 2000 or above not already taken; ANTH/HRTS 3028/W; ANTH 3150W; ARTH/HRTS 3575; ECON 3473/W; ECON 2445/HRTS/WGSS 3445; EDCI 2100; GEOG 4240; HIST 2570, 3418; HIST/AAAS 3531; (with advisor approval) HRTS 3293, 3295, 3298, 3299; PHIL/HRTS 2170W; PHIL 2215/W; POLS/HRTS 3418/W, 3807; POLS 3240E; AAAS/HRTS/SOCI 2220; SOCI/HRTS 2830/W, 2898; SOCI/HRTS/AFRA 2520, 2530; WGSS/HRTS 2263; WGSS 2255, 3105, 3257, 3269.

**Capstone Course: HRTS 4291**

This course is only required for students whose Senior Design sequence does not have a strong human rights component. Any student can complete an HRI internship and have it count for elective credit.

#### Multidisciplinary Engineering with a Specialization in Industrial Design

This specialization covers all the necessary classes to obtain a well-rounded education in engineering, such as chemistry, calculus, physics, and materials science, but leaves a significant number of courses for a solid framework in industrial design. This approach gives students a strong foundation of industrial design studio practices, and a unique understanding of fabrication methods, presentation skills, human factors, and concept development methods that will make them uniquely qualified to address new challenges in the field of engineering and design.

##### **Required Courses (24 credits):**

* ART 3701
* ART 3705
* ART 3710
* ART 3720
* ART 3725
* ART/ENGR 3735
* Two Industrial Design electives taken during Fall and Spring totaling six credits, selected from the following list (not all courses are available all semesters):
  + ART 3730
  + ART/ENGR 3740
  + ART/ENGR 3750
  + ART/ENGR 3760

## Robotics Engineering

**Bachelor of Science in Engineering**

Robotics Engineering majors are required to complete the following:

* ENGR 1166;
* CSE 2050, CSE 2500 or MATH 2710, CSE 3500, CSE 4820;
* ECE 1401, 2001, 3101, 3411, ECE [3111](https://catalog.uconn.edu/ECE/#3111) or ME 3253 or ME 3254, ECE/ME 3161, ECE/ME 3162, ECE/ME 3163, ECE/ME 4161;
* [MATH 2110Q](https://catalog.uconn.edu/MATH/#2110Q), [2210Q](https://catalog.uconn.edu/MATH/#2210Q), and [2410Q](https://catalog.uconn.edu/MATH/#2410Q);
* [STAT 3345Q](https://catalog.uconn.edu/STAT/#3345Q) or [MATH 3160](https://catalog.uconn.edu/MATH/#3160);
* Senior design and in-major writing: Complete one of the senior design sequences below:
  + ECE [4900W](https://catalog.uconn.edu/ECE/#4900W), 4901 and 4902;
  + ME 4972/4973W or ME 4974W/4975/4976;
  + CSE 4939W, 4940.
* Track Electives (Three courses; taken from designated list of courses for each track);
* Robotics Electives (Two additional courses; taken from designated list of courses from any of the track lists).
* Elective courses (Two credits if taking ECE 3111 or three credits if taking ME 3253 or 3254).

**Tracks**

**Electronics Track**

CSE 2301; ECE 3201, 3211, 3212

**Systems Track**

CSE 3100, 4705, 4709; ECE 4131, 4132

**Mechanical Track**

CE 2110, 3110; ME 2120, 3220, 3221, 3227, 3256, 3262

**Biomedical Track**

BME 3500, 3600, 4120, 4130, 4300, 4500

Robotics is a multidisciplinary field that draws on aspects from electrical engineering, mechanical engineering, and computer engineering. The proposed curriculum is built around fundamental core courses in each of these areas that are then brought together with specific robotics engineering courses. The Robotics Engineering program educational objectives are that our alumni/ae:

* make technical contributions to design, development, and manufacturing in their practice of robotics engineering.
* advance in their professional career.
* engage in professional development or post-graduate education to pursue flexible career paths amid future technological changes.