College of Engineering, Technology, and Architecture

The College of Engineering, Technology, and Architecture (CETA) provides challenging programs that prepare graduates for stimulating, meaningful, and rewarding professional careers. Engineering is widely regarded as one of the most rewarding of the professions. It provides highly satisfying and diverse career opportunities, substantial tangible rewards, and the prospect of community recognition and respect. Preparation for the profession is demanding. Engineers must be adept in applying the fundamentals of mathematics and science to the ever-changing problems of society. They work in such complex and dynamic areas as transportation, energy systems, manufacturing, space, and undersea exploration. Undergraduate preparation in engineering lead to employment in a specialization, graduate studies, further professional training and skill development, and ultimately, executive responsibilities. The accelerating growth of engineering and its dispersion in all areas of modern society ensure a continuing demand for the skilled professional engineer. At the same time, engineers are in great demand to fill leadership roles in industry, government, and education, where their experience and training in analysis, organization, and problem solving are highly regarded.

An education in engineering technology prepares students to work as members of professional-design or manufacturing teams in large companies or to be entrepreneurs and develop an innovative product in a small company. Students are prepared for immediate employment upon graduation, with possibilities for upward mobility in their chosen fields. They may also continue toward graduate study. Engineering technologists have a strong background in mathematics, basic science, communication skills, and the fundamentals of their discipline (architecture, electronics, mechanical, computer, or audio), as well as many practical, hands-on skills. Hence, engineering technologists can work with the architect or engineer in design work and then supervise the draftsman or technician who documents or implements that design. Engineering technology is a dynamic academic discipline affording flexibility to the aspiring and talented student who enjoys both a hands-on approach to technology and an intellectual curiosity about how things work.

Our Architectural Engineering Technology program now has two tracks, or paths of emphasis. For those students interested in applying to the professional graduate programs needed to sit for the architecture licensing exams, we offer a studio-intensive track. This path provides more hours of conceptual studio training with architectural models and other tools for developing architectural design skills. Those students more interested in the technology or business aspects of the building professions are encouraged to select the conventional track, which allows more opportunities for electives to develop those particular skills of construction management and site development. Both tracks lead to the same degree in Architectural Engineering Technology, but they prepare students for different paths after graduation.

CETA offers expanded possibilities for study in the fields of engineering, technology, and architecture. A student may choose engineering, with its emphasis on theory, analysis, and design; technology, with an emphasis on hands-on application of theory; or architecture, with its emphasis on building technologies and building design methodology. We promote interdisciplinary education, and our college affords many opportunities to work with other engineers, technologists, and architects on the challenging problems that face today’s world.

Programs of Study

CETA offers both day and evening programs leading to the following degrees:

Engineering:
Associate in Science
- Engineering Science

Bachelor of Science (Engineering)
- Acoustical Engineering and Music (B.S.E.)
- Biomedical Engineering (B.S.E.)
- Interdisciplinary Engineering (B.S.E.)
- Civil Engineering (B.S.C.E.)
  - Environmental Concentration
- Computer Engineering (B.S.Cmp.E.)
- Electrical Engineering (B.S.E.E.)
- Mechanical Engineering (B.S.M.E.)
  - Acoustics Concentration
  - Energy and Sustainability Concentration
  - Manufacturing Concentration
Technology:
Associate in Science
• Computer Engineering Technology
• Electronic Engineering Technology
Bachelor of Science
• Architectural Engineering Technology
• Audio Engineering Technology
• Computer Engineering Technology
• Electronic Engineering Technology
• Engineering Technology
• Mechanical Engineering Technology

Mission
The mission of the College of Engineering, Technology, and Architecture is to deliver a high-quality education and prepare individuals for professional careers in engineering, technology, and architecture, or for further graduate studies. Preparing individuals to function as effective members of a global society, our programs promote technical excellence, reasoning ability, communication and interpersonal skills, and an understanding of ethical and moral issues. Our graduates are strongly encouraged to pursue professional registration in their chosen fields. Programs are available to both day and evening students. Practice-oriented educational experiences are offered at the undergraduate and graduate levels.

Faculty
The faculty combines impressive educational backgrounds with broad experience in business and industry; their primary commitment is to instruct undergraduate and graduate students. Most are registered professional engineers who are currently engaged in consulting and research in their specialties. This professional involvement and the leadership roles that faculty play in their professional communities are transferred into the classroom, where students are kept apprised of contemporary developments in the field and are introduced to the professional networks into which they will shortly enter.

This mission is carried out by excellent, dedicated, and student-focused faculty who remain on the cutting edge of their specializations. Faculty and their students work with industry to bring the principles of professional practice into the classroom to achieve goals beneficial to all.

Facilities
Facilities are extensive and modern, with space in United Technologies Hall, Dana Hall, the Biology-Chemistry Building, and the Harry Jack Gray Center. These areas provide ample classroom and conference space as well as state-of-the-art laboratories and computer hardware/software. The college provides laboratories for research and hands-on applications in acoustics, vibrations (including anechoic and reverberation chambers), heat power, energy conversion, automatic controls, electronics, microprocessor, FPGA/CPLD, VLSI, communication, digital signal processing, fluid mechanics, water resources, instrumentation, mechatronics, geographical information systems, materials, computer science, soil mechanics, manufacturing, and computer-aided engineering design, as well as architectural and audio studios.

Facilities are also available in the Hartford Art School and The Hart School. The college provides access to its equipment and facilities through open lab and studio time available to students weekdays, nights, and weekends.

Admission Requirements
General requirements and procedures for admission are given on page 39. In reviewing applications for admission, the college considers a number of factors, including high school performance, the nature of the high school program, scores on standardized tests, and any evidence of special skills and talents relevant to engineering, technology, and architecture.

Engineering Program Requirements*
For admission to engineering programs, 16 units of secondary subjects are expected; these should include the following:
English .................................................. 4 units
Social studies ....................................... 2 units
One language ...................................... 2 units

*Those whose secondary school preparation does not include all of these requirements—for example, those pertaining to laboratory science and mathematics—may be required to undertake preparatory course work during the summer or other period as part of a provisional admission to the University of Hartford. A personal interview with a department chair is strongly recommended for those students whose admission is contingent on such additional preparation.
Laboratory science ......................... 2 units
Chemistry and physics are strongly recommended.
Mathematics ........................... 3.5 units
These must include the following specific units: algebra, 2 units; plane geometry, 1 unit; trigonometry, .5 unit.
Other academic subjects .................. 2.5 units

Additional units are recommended in elective courses, such as calculus or precalculus, computer programming, mechanical drawing, and industrial arts.

Technology Program Requirements
For admission to technology programs, candidates must meet the following requirements:
English ............................................. 4 units
Social Studies ..................................... 1 unit
Laboratory Science .................... 1 unit of physics or 2 units of another lab science
Mathematics ............................. 2.5 units
(including two units of algebra)
These must include the following specific units: algebra, 2 units; trigonometry, .5 unit.

Transfer Students
The college will apply transfer credits granted by the University for prior college work, subject to evaluation of the details of such work by the transfer evaluator in consultation with the appropriate department chair. Prospective students with prior college work should request an interview with the transfer evaluator/department chair to discuss transfer credit options.

Students who have received an associate’s degree from a ABET-accredited program of study (EAC/TAC) in a discipline similar to those offered by the college may normally enter a baccalaureate program, subject to evaluation.

The University of Hartford is a member institution of the Connecticut College of Technology (COT). COT offers an engineering pathway that allows a student to begin engineering studies at any of the state’s 12 community colleges with the ultimate goal of achieving a four-year baccalaureate degree in engineering or technology at the University of Hartford.

Academic Regulations
Students in the college must meet the University requirements for satisfactory academic progress and good academic standing. These are specified in the section on Academic Regulations on page 76.

Students who do not make satisfactory academic progress are subject to actions ranging from probation or removal from degree candidacy to dismissal from the University. Students who receive notification of such actions are strongly encouraged to consult immediately with their advisors to develop a plan of corrective action.

Satisfactory Progress
Students in the College of Engineering, Technology, and Architecture must meet both qualitative and quantitative academic progress (see page 76).

Pass/No Pass Option
Students matriculated in CETA degree programs must take all courses within CETA for a letter grade, unless the course is only offered Pass/No Pass (P/NP).

Students matriculated in CETA degree programs must take all courses within the University of Hartford that are required for their major(s) for a letter grade.

Students may not take mathematics, science, professional electives, or computer science elective courses on a P/NP basis.

Engineering students may not take AUCS 340 or AUCW 180 on a P/NP basis.

Humanities and social science elective courses may be taken on a P/NP basis, subject to the limits imposed by the University for the frequency of such courses.

Internships, when taken for credit as a professional elective, may be graded on a P/NP basis.

Students matriculated in other colleges of the University of Hartford may take any CETA course on a P/NP basis. If, however, the student later matriculates into a CETA degree program, the course(s) taken P/NP may not be accepted for credit toward a CETA degree.

Course Prerequisites
CETA follows a system of prerequisites and corequisites for every undergraduate course as stated in the course descriptions in this Bulletin. These requirements are designed to ensure that students have the necessary background knowledge for the courses in which they are enrolled. This strategy is also essential to ensure that students will successfully complete those courses and to maintain our ABET (Accreditation Board for Engineering and Technology, www.abet.org) accreditation. Thus, the departments adhere strictly to this established policy,
and waivers are considered only for truly exceptional cases.

Any request for waiving an established department or college rule must be submitted to and discussed with the instructor who will use the standard college form that both the student and instructor must sign and forward a copy to the department chair. If it is approved, the advisor forwards the waiver to the chair of the department or his/her representative for approval. If approved, the form is forwarded to the dean or his representative for final approval.

Although the Banner system is primarily used for prerequisite and preprofessional checks, students will be administratively withdrawn at any time during the term if found to be lacking the necessary pre- and corequisites without the proper approvals.

Honors Program
The college encourages students to participate in the University Honors program (see page 18).

Engineering Students. CETA makes the following available to participating engineering students: freshman honors seminar; honors sections in selected engineering science courses; engineering departments’ selected honors courses and activities specific to the majors administered by them; upper-level independent study and research projects; and interaction with local industries, including participation in the school’s Engineering Applications Center’s projects.

Selection of students for participation is based on academic achievement. A minimum overall GPA of 3.0 must be achieved to receive the honors designation. Questions regarding this program should be directed to the dean’s office.

Technology Students. Students may participate in the program when they have attained a minimum GPA of 3.0 based on the completion of at least 15 credits in CETA. To continue in the program, students must maintain a minimum overall GPA of 3.0 and 3.25 in their major. The program requires 18 credits of honors course work distributed as follows: 6 credits of honors All-University Curriculum courses, 6 credits of honors courses or contract honors courses at the 200 level or above that are part of the student’s major, and 6 credits in senior-level independent study courses, such as the Senior Project course and/or the University Scholar program.

Registration
Registration for any part of CETA’s programs must be initiated through the student’s faculty advisor each semester. Advisors are assigned at matriculation and may maintain their association with their advisees for the duration of the student’s undergraduate program. The faculty advisor must approve each registration. The advisor will also assist the student in course scheduling and in understanding the requirements of the complete degree program.

The degree programs are designed primarily to prepare the student for future practice in a profession and to lay the academic groundwork for employment and/or graduate school. Most faculty members in engineering have had industrial and teaching experience prior to joining the University. Strong emphasis is placed on the professional aspects of engineering technology. Graduation study beyond the baccalaureate level is encouraged.

Depending on the major, 126–145 credits are required for the bachelor’s degree. Applicable transfer credits from other institutions are included and are awarded and applied toward the degree program after the student is admitted and official transcripts are evaluated by the Office of Admission and a department chair.

Dual Major or Degree Program
Students desiring a double major or second baccalaureate degree should refer to page 75. Students should also consult the deans of the colleges concerned.

Minors
The college supports minors offered by other University programs as long as all degree program requirements are met. In many instances, course work beyond the 126–145 credits required for the engineering/technology degree will be necessary to satisfy the requirements of the minor as well. Students should consult the chair of the department in which the minor area is offered.

The College of Engineering, Technology, and Architecture offers minors in biomedical, civil, computer, electrical, mechatronics, and mechanical engineering, as well as architectural audio, computer, electronic, and mechanical engineering technology, to students matriculating in bachelor’s programs in other colleges at the University. These cross-college minors enable students to satisfy their individual educational or career objectives by supplementing their major programs of study in other fields.
Students must apply for admission into the minors no earlier than the end of their first year. Students must have a 2.0 overall grade point average and must maintain at least a 2.00 grade point average for courses in the minors, unless otherwise noted. Approvals by the student’s major advisor and dean are required. An advisor for the minor will be assigned by CETA.

3+2 Program (B.S.E. + M.Eng. degrees)
The program is designed to allow full-time engineering students to earn both their B.S.E. and M.Eng. (Master of Engineering) degrees in five years. Two graduate-level courses taken in the senior year may be applied to both the undergraduate and graduate degree requirements. Students usually must commit to the program at the start of the second semester of their junior year, and juniors who are interested should contact the department chair or call 860.768.4858 for application materials.

In order to be accepted into the program, students must have a 3.0 cumulative grade point average (GPA) at the end of their junior year (less than 3.0 will be considered on a case-by-case basis). For further details, see the Graduate Bulletin.

All-University Curriculum
A distinctive feature of the University of Hartford educational experience is the All-University Curriculum (AUC) (see page 79). The All-University Curriculum requirement for the associate’s degree is a minimum of one AUC course; for the baccalaureate degree, the requirement is a minimum of four AUC courses.

Engineering students must take five to six courses (15–18 credits) in the humanities and social sciences, selecting two AUC courses from the following categories: AUCC (Living in a Cultural Context: Other Cultures) and AUCA (Living Responsively to the Arts). In addition, they are required to take AUCW 180 A Western Heritage: The Humanities, AUCS 340 Ethics in the Professions, and one or two elective courses in the humanities and social sciences.

Technology students desiring the baccalaureate degree must take five courses (15 credits) in the humanities and social sciences, selecting one humanities/social science elective and one AUC course from each of the following categories: Western Heritage, Other Cultures, the Arts, and the Social Context. Students desiring the associate’s degree must select one AUC course from any of those categories.

CETA Engineering and Technology Internship Program
The CETA internship program enhances traditional classroom and laboratory education with work opportunities. Internships provide the opportunity for students to apply their academic education while allowing them to obtain the practical experience necessary to perform successfully in today’s world. The director of the CETA internship program administers the program. The student’s faculty advisor assists in identifying an appropriate internship, clarifying job expectations, and granting academic credit for the internship.

CETA undergraduate students majoring in engineering and engineering technology (other than architectural engineering technology) are eligible to participate in the internship program. Positions may be full time or part time, with course credit awarded based on the number of hours worked. To receive 1 credit, the internship must be for at least 80 hours; to receive 2 credits, the internship must be for at least 160 hours; and to receive 3 credits, the internship must be for at least 240 hours. A student may only earn 3 internship credits during a semester.

In all internships, the work performed must be consistent with the student’s current level of education and experience.

With their academic advisor’s approval, students may apply credit earned toward their degree requirements as professional electives or unrestricted electives but not toward required courses or technical specialties. The number of credits earned through internships that may be applied to a student’s degree varies among programs. For engineering degrees, 3 credits may be applied to a degree. For engineering technology the number of credits that may be applied is as follows:

- Audio engineering technology: 6 credits
- Computer engineering technology: 3 credits
- Electronic engineering technology: 3 credits
- Mechanical engineering technology: 6 credits

CETA students who have completed their sophomore year, have junior class standing, and have a cumulative grade point average of 2.5. Above are eligible for an internship. Transfer students become eligible for an internship after one semester of full-time study and junior standing, upon the recommendation of their academic advisor and approval of the department chair. Engineering technology associate’s degree candidates may participate in an internship;
however, the credits earned may only be used to fulfill B.S. degree requirements.

To remain active in the program, students must complete all internship reporting requirements and maintain satisfactory academic standing.

CETA receives many inquiries, mostly from Connecticut-based firms, on internship availability. In addition, the Career Center maintains a website listing internships by geographic location and field of study. The Office of Experiential Education and Student Employment in the Career Center can assist in finding internship positions.

Questions regarding the engineering and engineering technology internship programs should be directed to the director of CETA internship programs.

Engineering Programs

Students who have completed their sophomore year, have class standing as juniors, and have maintained a grade point average of 2.5 may apply for an engineering internship.

Transfer students generally may become eligible after one semester of full-time study and junior standing. Transfer students are eligible for the program upon the recommendation of the academic advisor and approval of the department chair.

To remain active in the program, students must complete all course report requirements and maintain satisfactory academic standing.

Technology Programs

To be eligible for the program, except when decided otherwise by the academic advisor, students must have junior standing, must have completed two years of study at CETA with a cumulative GPA of 2.5 or better, and must have the permission of the academic advisor. Associate’s degree candidates are awarded additional credits that fulfill degree requirements only if the students become B.S. candidates. A student may enroll for a maximum of 6 credits. The maximum number of credits that may be applied toward a baccalaureate degree in each of the disciplines of technology is as follows:

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Engineering Technology</td>
<td>3</td>
</tr>
<tr>
<td>Audio Engineering Technology</td>
<td>6</td>
</tr>
<tr>
<td>Electrical and Computer Engineering Technology</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Engineering Technology</td>
<td>6</td>
</tr>
</tbody>
</table>

Transfer students are eligible for the technology internship program upon the recommendation of the academic advisor and the approval of the department chair.

Accreditation

All programs in CETA are licensed and accredited by the State of Connecticut Board of Higher Education.

The following programs within the College of Engineering, Technology, and Architecture are accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET): the Bachelor of Science in Engineering in acoustical engineering and music, the Bachelor of Science in Engineering in biomedical engineering, the Bachelor of Science in Civil Engineering, the Bachelor of Science in Computer Engineering, the Bachelor of Science in Electrical Engineering, and the Bachelor of Science in Mechanical Engineering. Contact ABET at 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; 410.347.7700; www.abet.org.

The Associate in Science in Electronic Engineering Technology and the Bachelor of Science programs in Electronic Engineering Technology, Architectural Engineering Technology, and Mechanical Engineering Technology are accredited by the Technology Accreditation Commission (TAC) of ABET. Contact ABET at 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; 410.347.7700; www.abet.org.

The Master of Architecture program is accredited by the National Architectural Accrediting Board (NAAB), 1735 New York Avenue NW, Washington, DC 20006; www.naab.org.

Certification

Graduates of all technology programs are eligible for certification by the National Institute for Certification in Engineering Technologies (NICET), sponsored by the National Society of Professional Engineers (NSPE), 1420 King St., Alexandria, VA 22314-2794.

Professional Societies

The University is a member of the American Society for Engineering Education (ASEE) and the Association of Collegiate Schools of Architecture (ACSA). The college has active chapters of ASME, ASCE, IEEE, SWE, SAE, ASA, AIAS, AES, FSAE, NSBE, BMES, and IAS, as listed under Student Activities below. CETA is
also a member of the Engineering Research Council of the American Society for Engineering Education.

Student Activities
The college supports the major student professional associations, including student chapters of technical societies and professional organizations, such as the American Society of Mechanical Engineers (ASME), the Institute of Electrical and Electronics Engineers (IEEE), the American Society of Civil Engineers (ASCE), the Society of Women Engineers (SWE), the Society of Automotive Engineers (SAE), Acoustical Society of America (ASA), American Institute of Architects (AIAS), Audio Engineering Society (AES), Instrument Society of America (ISA), and the Construction Institute.

Honor societies include Pi Tau Sigma, the National Mechanical Engineering Honor Society; Eta Kappa Nu, the National Electrical Engineering Honor Society; and Sigma Epsilon, the Civil Engineering Honor Society. Tau Beta Pi, the National Engineering Honor Society, draws membership from all engineering disciplines. Tau Alpha Pi, the National Honor Society for engineering technologies, draws its membership from all technology disciplines.

Engineering Programs
Engineering is widely regarded as one of the most rewarding of the professions. It provides its members with highly satisfying and diverse career opportunities, substantial tangible rewards, and the prospect of community recognition and respect. Preparation for the profession is demanding. Engineers must be adept in applying the fundamentals of mathematics and science to the ever-changing problems of society. They work in such complex and dynamic areas as transportation, energy systems, manufacturing, space, and undersea exploration.

Undergraduate preparation in engineering may lead to employment in a specialty area, to further professional training in engineering, and, ultimately, to executive responsibilities. The accelerating growth of technology and its dispersion to all areas of modern society ensure a continuing demand for the skilled professional engineer. At the same time, engineers are in great demand to fill leadership roles in business, industry, government, and education, where their experience and training in analysis, organization, and problem solving are equally applicable.

Engineering Mission
The mission is to provide high-quality engineering education at the undergraduate and graduate levels, directed primarily toward preparing engineers for professional careers in industry and the public sector and for professional engineering registration, continually updated and consistent with the trends active within the engineering profession. This education is provided to full- and part-time students and offers continuing educational opportunities to graduate engineers. It is achieved through the efforts of excellent, dedicated, and student-focused faculty and staff, supported by University and industrial facilities and resources. CETA provides well-equipped, up-to-date facilities as well as a dedicated faculty and staff whose foremost commitment is to the preparation of future generations of engineers.

The college offers baccalaureate degree programs in five central areas of engineering: Mechanical, Electrical, Biomedical, Computer, and Civil. These are carefully coordinated with the programs of the other schools and colleges of the University to provide the balanced preparation that future professionals will require. Available in both day and evening offerings, these programs are accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET). CETA also has State of Connecticut accreditation to offer a Bachelor of Science in Interdisciplinary Engineering Studies. In addition, the college cooperates with other schools and colleges of the University to make available a variety of interdisciplinary programs and minors to students with special interests.

CETA is strongly committed to a personalized style of instruction that emphasizes one-on-one interaction between students and faculty. This is reflected in its strong academic advising, close coordination with the University’s Career Center and Cooperative Education Services, and the many preprofessional activities that it makes available to students.

Technology Programs
Engineering technology prepares students for careers that are stimulating and rewarding. Graduates find themselves well prepared for upward mobility as members of professional technological design teams in their chosen fields of architectural, audio, computer, electronic, or mechanical engineering technology,
or in an individually designed contract major in engineering technology. The engineering technologist’s preparation includes a strong background in mathematics, basic science, communication skills, fundamentals of the discipline, and practical, hands-on skills. This substantial readiness allows interface with an architect or engineer preparing a design as well as supervision of the draftsman or technician implementing the design.

The strong elective component of the baccalaureate programs in Architectural, Audio, Computer, Electronic, and Mechanical Engineering Technology allows preparation for a diversity of career goals, including graduate study. Many students take additional technical courses to supplement their elective requirements, while others take courses in business, science, mathematics, engineering, fine arts, or education. The contract major option allows students to prepare for specialized careers in technology, management, and teaching, or for graduate study.

Technology itself is changing and changing our world at a rate unprecedented in the history of humankind. Opportunities for an engineering technology graduate who enjoys a hands-on approach and has an intellectual curiosity about how things work are virtually limitless.

**Technology Mission**

The mission is to offer men and women opportunities to prepare for professional careers as architects, engineering technicians, and technologists; and, at the same time, to develop their abilities to function as effective members of society. Academic programs are designed to promote technical excellence, reasoning ability, communication and interpersonal skills, and an understanding of the ethical and moral issues associated with the application of technology in contemporary society.

**Mathematics and Technical Communications**

Mathematics and technical communications are taught in the college for technology (including architecture) students as a means of ensuring that they have the tools necessary to succeed in course work and in their careers. Both subject areas are taught as hands-on activities with an emphasis on practical applications.

Those technology students who wish to minor in engineering fields or pursue their education in graduate school are advised to take their mathematics courses in the College of Arts and Sciences, where the emphasis is on theory and broad coverage of the discipline.
Professor Davis
Associate Professors Crosbie (Chair), Fuller, Petry, Sawruk
Assistant Professors Carloni, Cobb

Degree offered:
Bachelor of Science (B.S.)
• Architectural Engineering Technology

Architectural Engineering

Technology Program
Architectural engineering technology is a rigorous academic discipline that prepares students for a variety of professional careers in the design and building industries. The major is structured to provide a foundation in mathematics and the basic sciences, with laboratories and studios that are part of the architectural and engineering technologies. A strong component of general education, with particular emphasis on communication skills, ensures that students who pursue this program of study will have a broadly based education that prepares the graduate for continued education in architecture or entry into architecture or the building industries. While the career objectives of graduates vary greatly depending on their concentration of electives, all involve interaction with other professions in the design and building industries.

The Bachelor of Science program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) 111 Market Place, Suite 1050, Baltimore, MD 21202; 410.347.7700. The Master of Architecture program is accredited by the National Architectural Accrediting Board (NAAB), 1735 New York Avenue NW, Washington, DC 20006; www.naab.org.

Educational Objectives
The architecture undergraduate B.S. degree objectives are to

• provide a proper foundation in mathematics and the basic sciences;
• provide the laboratory and studio experiences that are part of pre-architecture programs;
• prepare graduates for continued education in architecture or entry into architecture or the building industries;
• prepare graduates to apply problem-solving, communication, and reasoning skills, and to have an understanding of economic issues associated with the application of technology in contemporary society; and
• provide a broad-based education that extends beyond the bounds of technical competence.

Requirements for Bachelor of Science in Architectural Engineering Technology:

130 credits
Credits in the major: 68

Freshman Year—First Semester
AET 110 Intro to Architectural Processes 4
AET 155 History of Architecture I 4
TC 111 English I: Expos. Comm. 3
ET 111 Intro to Engineering Technology 1
MTH 112 College Algebra for Techs 3
Total credits for the semester 15

Freshman Year—Second Semester
AET 123 Architectural Design I 3
AET 156 History of Architecture II 4
MTH 122 Precalculus for Techs 3
PHY 120 Algebra-Based Physics I 4
Total credits for the semester 15

Sophomore Year—First Semester
AET 232 Mat./Meth. of Const./Docum. 4
AET 233 Architectural Design II 4
MTH 232 Calculus I for Techs 3
PHY 121 Algebra-Based Physics II 4
Total credits for the semester 15

Sophomore Year—Second Semester
AET 241 Mech. Elec. Plumb. Sys. 4
AET 242 Construction Documents 4
AET 244 Architectural Design III 4
MTH 241 Calculus II for Techs 3
Total credits for the semester 15

Junior Year—First Semester
AET 352 Architectural Design IV 3
AET 355 Engineering Mechanics 4
Humanities/social science elective 3
Technical specialty 4
All-University Curriculum 3
Total credits for the semester 18

Junior Year—Second Semester
AET 364 Strength of Materials 4
AET 367 Architectural Design V 4
TC 241 English II: Technical Comm. 3
Technical specialty 4
All-University Curriculum 3
Total credits for the semester 18

See Program Requirement Notes, page 328.
Senior Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AET 474 Design Steel Structures</td>
<td>4</td>
</tr>
<tr>
<td>Lab science elective(^7)</td>
<td>4</td>
</tr>
<tr>
<td>Professional elective(^7)</td>
<td>3</td>
</tr>
<tr>
<td>All-University Curriculum</td>
<td>3</td>
</tr>
<tr>
<td>Total credits for the semester</td>
<td>17</td>
</tr>
</tbody>
</table>

Senior Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AET 484 Design Concrete/Wood Structures</td>
<td>4</td>
</tr>
<tr>
<td>Professional elective(^7)</td>
<td>3</td>
</tr>
<tr>
<td>Professional elective(^7)</td>
<td>3</td>
</tr>
<tr>
<td>Technical specialty(^7)</td>
<td>4</td>
</tr>
<tr>
<td>All-University Curriculum</td>
<td>3</td>
</tr>
<tr>
<td>Total credits for the semester</td>
<td>17</td>
</tr>
<tr>
<td>Total credits for the program</td>
<td>130</td>
</tr>
</tbody>
</table>

Minor in Architectural Engineering Technology

The requirements for a minor in architectural engineering technology are governed by the Bulletin in effect when the application for the addition of the minor is approved.

A minor in architecture is available for students in programs other than AET who have interests and abilities in architectural design. Students must announce their intention to minor in architecture any time prior to the end of their junior year. Students interested in this minor must be accepted by the Department of Architecture and complete the following courses.

Required Course Work

- AET 123 Architectural Design I\(^3\)
- AET 155 Ancient through Renaissance Architecture
- Four other AET courses approved by the program chair

Total: 6 courses

Students attending other colleges within the University of Hartford may pursue a minor in Architectural Engineering Technology by taking the six courses listed above. Additional course work may be required in order to meet prerequisite requirements.

Department of Civil, Environmental, and Biomedical Engineering

Professors Hadad, Keshawarz

Associate Professors Fang, Nowak, Pines (Chair)

Assistant Professors Arico, Grant, Swartz, Townsend

Degrees offered:

Engineering:

- Bachelor of Science (Engineering)
  - Biomedical Engineering (B.S.E.)
  - Civil Engineering (B.S.C.E.)
  - Environmental Engineering
  - Interdisciplinary Engineering (B.S.E.)

Technology:

- Bachelor of Science
  - Engineering Technology

Biomedical Engineering Program

Program Director: Nowak

The Biomedical Engineering program was instituted in 1994 and became the first in Connecticut and third in New England to earn ABET accreditation. The faculty work closely with healthcare professionals at leading regional and national hospitals, health centers, research facilities, and biomedical engineering companies. Students in biomedical engineering have opportunities to complete internships and research programs at these and other facilities. The Biomedical Engineering program, under the direction of Michael Nowak, D.Sc., is designed for those students who wish to focus their technical careers on assisting in the struggle against illness and disease by providing materials, tools, and techniques that can be applied to research, diagnosis, and treatment by healthcare professionals. Two versions of the program are available, both leading to the Bachelor of Science in Engineering. The second version is considered suitable for students preparing for medical school.

Educational Objectives

The Biomedical Engineering program seeks to prepare qualified students for productive, rewarding careers in the engineering profession, either for entry-level practice in biomedical engineering or for entrance into appropriate graduate programs. During their careers, our alumni will become successful practicing engineers in biomedical engineering fields and will advance professionally by accepting responsibilities and, potentially, pursuing leadership.

See Program Requirement Notes, page 328.
2. roles; in addition, those who enter the health professions will utilize their engineering knowledge in this pursuit;
3. will advance their knowledge of engineering, both formally and informally, by engaging in lifelong learning experiences; and
4. will, as contributing members of multidisciplinary engineering teams, successfully apply the fundamentals of engineering analysis and engineering design to the formulation and solution of emerging technical problems.

The engineering design experience is distributed over the entire engineering curriculum. This experience begins in the first year with engineering and design and continues through and culminates in Senior Capstone Research II and the senior Biomedical Engineering Design Project I and II. The senior-level design work ensures that the students have mastered preparatory engineering and engineering science courses.

Basic concepts of physics, chemistry, and mathematics are the foundations on which all engineering education is built. Basic tools of engineering, such as graphic communications, computer usage, mechanics, and thermodynamics complete the introductory phase of the program. All Biomedical Engineering program graduates are required to complete courses designed to give the students a grounding in anatomy and physiology, biomechanics, biofluids, bioinstrumentation, and the structure of materials used by biomedical engineers. Along with the engineering courses described above, students are required to obtain a background in electrical engineering.

Extensive laboratory experience enhances the course work. There are several required laboratory classes in the sciences, materials, engineering, and natural phenomena. Written communication of laboratory results is required.

Through participation in the All-University Curriculum and additional elective courses in the humanities and/or social sciences, students are given the opportunity to broaden their perspectives and to take part in the larger learning community of the University. It is imperative that engineers understand and appreciate the special role that technology plays in our society, as well as the interactions among the various components of our society.

The Biomedical Engineering program has two basic tracks: the standard track and one designed for those students who wish to enter medical school. Those students who wish to enter medical school are required to take a full year of organic chemistry prior to their senior year. The requirements of this option are such that if a student wishes to graduate in four years, at least one engineering course must be taken during the summer. All students who are interested in the health professions are required to join the pre-health professions program. The Pre-Health Profession Advisory Committee has developed a 1-credit course for each of the first three undergraduate years to help students prepare for health profession graduate school applications.

**Requirements for Bachelor of Science in Engineering—Biomedical Engineering:**

**128 credits**

**Credits in the major: 64**

**Freshman Year—First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 101 Engineering Freshman Dialogue</td>
<td>1</td>
</tr>
<tr>
<td>ES 143 Engineering and Design</td>
<td>3</td>
</tr>
<tr>
<td>ES 220 Graphic Communication</td>
<td>2</td>
</tr>
<tr>
<td>M 144 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>RPW 110 Rhetoric and Writing I</td>
<td>3</td>
</tr>
<tr>
<td>AUC All-University Curriculum elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>16</strong></td>
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</tbody>
</table>

**Freshman Year—Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 115 Eng. Computer Applications</td>
<td>3</td>
</tr>
<tr>
<td>M 145 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHY 112 Calculus-Based Physics I</td>
<td>4</td>
</tr>
<tr>
<td>AUC All-University Curriculum elective</td>
<td>3</td>
</tr>
<tr>
<td>AUCW 180 Western Heritage</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

**Sophomore Year—First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 281 Biomed. Eng. Seminar I</td>
<td>1</td>
</tr>
<tr>
<td>CH 110 College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ES 110 Statics</td>
<td>3</td>
</tr>
<tr>
<td>M 240 Calculus of Several Variables</td>
<td>4</td>
</tr>
<tr>
<td>PHY 113 Calculus-Based Physics II</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
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</table>

**Sophomore Year—Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 111 College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>ES 211 Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ES 212 Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ES 242 Engineering by Design</td>
<td>3</td>
</tr>
<tr>
<td>AUCS 340 Ethics in the Professions</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
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</table>

**Junior Year—First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 301 Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>BE 381 Biomed. Eng. Seminar II</td>
<td>1</td>
</tr>
<tr>
<td>BIO 212 Anatomy and Physiology I</td>
<td>4</td>
</tr>
<tr>
<td>ECE 210 Intro to Electrical Eng.</td>
<td>3</td>
</tr>
<tr>
<td>ES 320 Thermal-Fluids Engineering</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

See Program Requirement Notes, page 328.
### Junior Year—Second Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 302 Biofluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 213 Anatomy and Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>ECE 360 Circuits and Electronics</td>
<td>4</td>
</tr>
<tr>
<td>ES 342 Engineering Practice</td>
<td>1</td>
</tr>
<tr>
<td>M 242 Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

### Senior Year—First Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 401 Bioinstrumentation</td>
<td>3</td>
</tr>
<tr>
<td>BE 460 Biomed. Eng. Design Project I</td>
<td>3</td>
</tr>
<tr>
<td>BE 480 Biomed. Eng. Practicum</td>
<td>3</td>
</tr>
<tr>
<td>M 344 Advanced Engineering Math</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

### Junior Year—Second Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 461 Biomed. Design Project II</td>
<td>3</td>
</tr>
<tr>
<td>ME 505 Mechatronics System Design or ECE 382 Design I, or equivalent</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective</td>
<td>3</td>
</tr>
<tr>
<td>Professional elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

### Requirements for Bachelor of Science in Engineering—Biomedical Engineering (Pre-Medicine Option): 136 credits^1  

**Credits in the major:** 61^10  

### Freshman Year—First Semester  
<table>
<thead>
<tr>
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<td>RPW 110 Rhetoric and Writing I</td>
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<td>AUC All-University Curriculum elective</td>
<td>3</td>
</tr>
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<td><strong>Total credits for the semester</strong></td>
<td><strong>16</strong></td>
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### Freshman Year—Second Semester  
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ES 115 Eng. Computer Applications</td>
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<td>4</td>
</tr>
<tr>
<td>PHY 112 Calculus-Based Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PPS 100 Premed. Professions Studies I</td>
<td>1</td>
</tr>
<tr>
<td>AUC All-University Curriculum elective</td>
<td>3</td>
</tr>
<tr>
<td>AUCW 180 Western Heritage</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>18</strong></td>
</tr>
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</table>

### Sophomore Year—First Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BE 281 Biomed. Eng. Seminar I</td>
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</tr>
<tr>
<td>CH 110 Chemistry I</td>
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<td>M 240 Calculus of Several Variables</td>
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<td><strong>Total credits for the semester</strong></td>
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</tr>
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### Sophomore Year—Second Semester  
<table>
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<tr>
<th>Course</th>
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<tr>
<td>CH 111 Chemistry II</td>
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<td>ES 212 Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ECE 242 Engineering by Design</td>
<td>3</td>
</tr>
<tr>
<td>PPS 200 Premed. Professions Studies II</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

**Total credits for the semester**

**Minor in Biomedical Engineering**  

The minor in biomedical engineering provides students matriculating into bachelor’s degree programs in other colleges of the University, especially the sciences and the other engineering majors, with an introduction to the discipline of biomedical engineering. The minor in biomedical engineering consists of four required courses in biomedical engineering and three courses from the list below.  

All courses must be taken at the University of Hartford and may not be taken on a Pass/No Pass basis.
Course Requirements for the Biomedical Engineering Minor

All of the following:
BE 281 Biomedical Engineering Seminar I [1]
BE 301 Biomechanics [3]
BE 302 Biofluid Mechanics [3]
BE 401 Bioinstrumentation [3]

Any three of the following:
ES 212 Mechanics of Materials [3]
ES 320 Thermal-Fluids Engineering [4]
or equivalent
BIO 213 Anatomy and Physiology I [4]
BIO 213 Anatomy and Physiology II [4]
ECE 360 Circuits and Electronics [4]
BE 260 Biomedical Engineering Materials and Lab [3] or equivalent
ME 505 Mechatronics System Design [3]
PHY 250 Materials Science [3]

Or with permission:
BE 480 Biomedical Engineering Practicum [3]
BE 485 Biomedical Engineering Practicum [3]

Civil and Environmental Engineering Program

The Bachelor of Science in Civil Engineering (B.S.C.E.) degree prepares students for careers in structural, geotechnical, transportation, environmental, water resources, and construction engineering. Civil engineers will help to solve the critical challenges of the 21st century, such as the rebuilding of our country’s infrastructure; incorporating sustainable, green building technologies into their designs; and helping to provide access to safe water to the almost 900 million people in the world (approximately one in eight people) who now lack that access.

The Civil Engineering program promotes project-based learning. As students learn the fundamentals of science, math, and engineering in their first two years, their courses include hands-on projects in which they use those fundamentals in real-world applications. For example, students in their sophomore engineering design course have worked with our Engineers Without Borders student chapter to develop and implement sustainable water supply solutions for villages in India and Kenya. Students in their surveying course have assisted the University in meeting a requirement of an Army Corps of Engineers permit each year by mapping out important features of a University conservation area. In their final two years, students take courses in the core areas of civil engineering: structural, geotechnical, transportation, water resources, environmental, and construction engineering. The curriculum continues to emphasize project-based learning, such as performing a traffic impact study for a magnet school in the city of Hartford or growing algae as a potential source of biofuel. The civil engineering curriculum culminates with a senior capstone design project. Students select a project in their area of interest and work as part of a design team mentored by a practicing engineer. The experience gained by our students working as junior engineers for their mentors has been extremely successful in helping our graduates make the transition from college to their professional careers.

The Civil Engineering program also provides students with opportunities to work on international interdisciplinary projects. Students have traveled to India and Kenya to work on water and energy projects and are involved in an industrial archaeology project in St. Vincent. In addition, we have a group of students collaborating with Indian students to develop a sustainable business solution or social enterprise to provide potable water to those who are too poor now to purchase clean water. We also work with students so that they can study abroad for one or two semesters. For example, our students have studied in Australia and Scotland.

Outside the classroom, students have the opportunity to participate in many different engineering clubs and work on projects like the design and construction of a steel bridge. Our affiliation with the Construction Institute on campus provides students with numerous opportunities to visit construction sites around Greater Hartford. With our emphasis on undergraduate education, there are also many opportunities for undergraduate students to earn money by assisting faculty with their funded research. With the strong support of our alumni, there is a solid network available to help our students with paid internships during the school year and summer.

Candidates for the B.S.C.E. may elect the environmental concentration by taking elective courses that are related to the environment to supplement their broad-based civil engineering education. These courses are labeled in the course descriptions with the designation (ENV) following the number of credits.

See Program Requirement Notes, page 328.
Center for Integrated Design
Architecture, Engineering, Business, and Visual Communication Design Solutions for the Community

The Center for Integrated Design (CID) provides Hartford and the surrounding communities with resources and solutions that address architectural, engineering, business, and visual communication design issues. It is committed to establishing interdisciplinary and educational dialogues between the community, the University’s faculty, and its students. The CID works on projects that intersect four disciplines: architecture, engineering, business, and visual communication design. Students and faculty work collaboratively with clients, providing direct interaction and experience for students. A project may include all four disciplines, any combination of the disciplines, or only one of them. Governments, public entities, private entities, public K–12 schools, private K–12 schools, nonprofits, and other organizations submit projects for consideration. The projects have clearly defined goals and are typically completed during the academic year, allowing continuity of student involvement and experiential learning.

Educational Objectives

The undergraduate Civil Engineering program seeks to prepare qualified students for entry-level professional practice in civil engineering and for entrance into appropriate graduate programs. During their careers, our alumni

1. will be successful practicing engineers in the areas of design, analysis, and realization of design in one or more of the major areas of civil engineering, including environmental, geotechnical, structural, transportation, and water resources; and

2. will successfully apply the fundamentals of engineering analysis and engineering design to the formulation and solution of emerging technical problems as contributing members of multidisciplinary engineering teams.

The engineering design experience is distributed over the entire engineering curriculum. Engineering design continues through the senior capstone design project. The majority of the design work is incorporated into the junior and senior years to ensure that the students have taken sufficient preparatory engineering science courses.

Basic concepts of physics, chemistry, and mathematics are the foundation on which all engineering education is built. Basic tools of engineering, such as graphic communication and computer usage and programming, are also required knowledge. The engineering sciences, such as solid and fluid mechanics and thermodynamics, complete the introductory phase of the program.

Civil engineering is generally considered to consist of several branches:

Construction  Environment
Structures  Water Resources
Transportation  Geotechnical

All Civil Engineering program graduates are required to complete at least one course in each of the branches except construction. Additional elective courses are available in each of the branches. Through choice of electives, a student may become specialized in one of the branches or remain a generalist.

Extensive laboratory experience enhances the course work. There are several required laboratory courses in the sciences, materials, engineering, and natural phenomena. Written communication of laboratory results is required.

Through participation in the All-University Curriculum and in additional elective courses in the humanities and/or social sciences, students are given the opportunity to broaden their perspectives and to take part in the larger learning community of the University. It is imperative that engineers understand and appreciate the special role that technology plays in our society and the interactions between and among the various components of our society.

Requirements for Bachelor of Science in Civil Engineering: 131 credits

Credits in the major: 75

Freshman Year—First Semester  Credits
ES 101 Engineering Freshman Dialogue  1
ES 143 Engineering and Design  3
ES 220 Graphic Communication  2
M 144 Calculus I  4
RPW 110 Rhetoric and Writing I  3
AUC All-University Curriculum elective  3
Total credits for the semester  16

Freshman Year—Second Semester  Credits
ES 115 Eng. Computer Applications  3
M 145 Calculus II  4
PHY 112 Calculus-Based Physics I  4
AUC All-University Curriculum elective  3
AUCW 180 Western Heritage  3
Total credits for the semester  17

See Program Requirement Notes, page 328.
### Sophomore Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 250 Intro to Geomatics</td>
<td>3</td>
</tr>
<tr>
<td>ES 110 Statics</td>
<td>3</td>
</tr>
<tr>
<td>M 240 Calculus of Several Variables</td>
<td>4</td>
</tr>
<tr>
<td>PHY 113 Calculus-Based Physics II</td>
<td>4</td>
</tr>
<tr>
<td>Science elective (BIO 110, BIO 122, or SCI 140)</td>
<td>4</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 18

### Sophomore Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 260W Civil Engineering Materials Lab</td>
<td>3</td>
</tr>
<tr>
<td>ES 211 Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ES 212 Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ES 242 Engineering by Design</td>
<td>3</td>
</tr>
<tr>
<td>M 246 Appl. Math with Diff. Eq. for CEs</td>
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**Total credits for the semester** 16

### Junior Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 310 Elem. Structural Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CE 330 Geotechnical Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>CH 110 College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ES 320 Thermal-Fluids Engineering</td>
<td>4</td>
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</table>

**Total credits for the semester** 15

### Junior Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 300 Engineering Economics</td>
<td>3</td>
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<tr>
<td>CE 312 Structural Steel Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 320 Water Resources Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CH 111 College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>ES 342 Engineering Practice</td>
<td>1</td>
</tr>
<tr>
<td>AUCS 340 Ethics in the Professions</td>
<td>3</td>
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</table>

**Total credits for the semester** 18

### Senior Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 410 Reinforced Concrete Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 420 Water Quality Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>CE 452 Transportation Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>CH 211 Water Chemistry Lab</td>
<td>1</td>
</tr>
<tr>
<td>ECE 210 Intro to Electrical Engineering</td>
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</table>

**Total credits for the semester** 15

### Senior Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CE 460 CE Design Project</td>
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<tr>
<td>Professional elective^a</td>
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</tr>
<tr>
<td>Professional elective^a</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective^a</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective^a</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 18

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See Program Requirement Notes, page 328.
Senior Year—First Semester

<table>
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<td>ECE 210 Intro to Electrical Engineering</td>
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<td><strong>Total credits for the semester</strong></td>
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</tbody>
</table>

Senior Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 460 CE Design Project¹²</td>
<td>4</td>
</tr>
<tr>
<td>Professional elective¹¹</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective⁹</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective⁹</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Minor in Civil Engineering

Six courses (at least 18 credits) from the following constitute a civil engineering minor.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 212 Mechanics of Materials</td>
<td></td>
</tr>
<tr>
<td>CE 260W Civil Engineering Materials Lab</td>
<td></td>
</tr>
<tr>
<td>or equivalent</td>
<td></td>
</tr>
<tr>
<td>CE 310 Elem. Structural Analysis</td>
<td></td>
</tr>
<tr>
<td>CE 312 Structural Steel Design</td>
<td></td>
</tr>
<tr>
<td>CE 320 Water Resources Engineering</td>
<td></td>
</tr>
<tr>
<td>CE 330 Geotechnical Engineering I</td>
<td></td>
</tr>
<tr>
<td>CE 340 Construction Management</td>
<td></td>
</tr>
<tr>
<td>CE 410 Reinforced Concrete Design</td>
<td></td>
</tr>
<tr>
<td>CE 420 Water Quality Engineering I</td>
<td></td>
</tr>
<tr>
<td>CE 442 Construction Planning and Scheduling</td>
<td></td>
</tr>
<tr>
<td>CE 451 Surveying II</td>
<td></td>
</tr>
<tr>
<td>CE 452 Transportation Engineering</td>
<td></td>
</tr>
<tr>
<td>CE 453 Transportation Engineering II</td>
<td></td>
</tr>
<tr>
<td>CE 500 Advanced Mechanics of Materials</td>
<td></td>
</tr>
<tr>
<td>CE 501 Advanced Structural Design</td>
<td></td>
</tr>
<tr>
<td>CE 502 Groundwater Hydrology</td>
<td></td>
</tr>
<tr>
<td><strong>Transportation Systems</strong></td>
<td></td>
</tr>
<tr>
<td>CE 512 Traffic Flow Theory and Analysis</td>
<td></td>
</tr>
<tr>
<td>CE 514 Urban Transportation Planning</td>
<td></td>
</tr>
<tr>
<td>CE 523 Engineering Hydrology CE</td>
<td></td>
</tr>
<tr>
<td>524 Solid Waste Management ES</td>
<td></td>
</tr>
<tr>
<td>320 Thermal-Fluids Engineering</td>
<td></td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Interdisciplinary Programs

Interdisciplinary Engineering Program

The first area of specialization must be an existing engineering major (biomedical, civil, electrical, computer, or mechanical). The second area of specialization may be any existing University of Hartford major. A third area of specialization is not allowed. A study plan of courses must be submitted and approved by the dean of CETA before a change of major form is processed.

Requirements for Bachelor of Science in Engineering—Interdisciplinary Engineering Studies: 128 credits

Credits in the major plus first area of specialization: at least 65

Plus at least 15 credits in the second specialization

Freshman Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 101 Engineering Freshman Dialogue</td>
<td>1</td>
</tr>
<tr>
<td>ES 143 Engineering and Design</td>
<td>3</td>
</tr>
<tr>
<td>ES 220 Graphic Communication</td>
<td>2</td>
</tr>
<tr>
<td>M 144 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>RPW 110 Rhetoric and Writing I</td>
<td>3</td>
</tr>
<tr>
<td>AUC All-University Curriculum elective³</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Freshman Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 115 Eng. Computer Applications</td>
<td>3</td>
</tr>
<tr>
<td>M 145 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHY 112 Calculus-Based Physics I</td>
<td>4</td>
</tr>
<tr>
<td>AUC All-University Curriculum elective³</td>
<td>3</td>
</tr>
<tr>
<td>AUCW 180 Western Heritage</td>
<td>3</td>
</tr>
</tbody>
</table>

Sophomore Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 110 College Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ES 216 Engineering Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>M 240 Calculus of Several Variables</td>
<td>4</td>
</tr>
<tr>
<td>PHY 113 Calculus-Based Physics II</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>13</strong></td>
</tr>
</tbody>
</table>

Sophomore Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 212 Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ES 242 Engineering by Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 236 Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>M 242 Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>AUCS 340 Ethics in the Profession</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

See Program Requirement Notes, page 328.
Junior Year—First Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 210 Intro to Electrical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—second area of specialization</td>
<td>3</td>
</tr>
</tbody>
</table>

Total credits for the semester: 15

Junior Year—Second Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 360 Circuits and Electronics</td>
<td>4</td>
</tr>
<tr>
<td>ES 342 Engineering Practice</td>
<td>1</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—second area of specialization</td>
<td>3</td>
</tr>
</tbody>
</table>

Total credits for the semester: 17

Senior Year—First Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities/social science elective</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—second area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—second area of specialization</td>
<td>3</td>
</tr>
</tbody>
</table>

Total credits for the semester: 15

Senior Year—Second Semester  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—first area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Elective—second area of specialization</td>
<td>3</td>
</tr>
<tr>
<td>Professional elective</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective</td>
<td>3</td>
</tr>
</tbody>
</table>

Total credits for the semester: 15

Contract Major in Engineering Technology  

Students having educational and/or career goals and objectives that are not met specifically by one of the school’s traditional majors may pursue a contract major. Such a major may involve educational experiences in more than one school or college of the University. Contracts that involve advanced or specialized courses from more than one college are considered cross-college contract programs and must have the explicit approval of both schools or colleges.

A contract major is designed by the dean of CETA (or the designee of the dean), the student, and such faculty as may be needed to ensure the creation of a program of study leading to learning outcomes consistent with the mission of both the college and the University of Hartford. The agreement, or contract, is documented in written form, approved by the dean (and the dean of any other college as described above), and accepted by the student. In addition to the listing of required and elective courses, the contract includes a delineation of the expectations for student progress (e.g., grade point average, major standards, course completion rates, etc.).

Contract majors must conform to all University-level requirements, including but not limited to

1. Minimum 120 credits for the baccalaureate degree
2. The final 30 credits in residence
3. Minimum of 40 credits of general education, including 12 credits in the All-University Curriculum (one course from four different areas), 6 credits of English composition, with the remaining credits representing the humanities, social sciences, natural sciences, the arts, and mathematics
4. A minimum cumulative grade point average of 2.0

Students pursuing a contract major in technology receive the degree of Bachelor of Science (B.S.). The major appearing on the student’s transcript is engineering technology.

See Program Requirement Notes, page 328.
Department of Electrical and Computer Engineering

Professors Alnajjar, Ilumoka-Nwabuzor, Shertukde
Associate Professors Abu-aisheh, Eppes, Hill, Moslehpour (Chair), Nagurney
Assistant Professors Britt, Mellodge, Shuman, Yu

Degrees offered:
Engineering:
Bachelor of Science (Engineering)
  • Computer Engineering (B.S.Comp.E.)
  • Electrical Engineering (B.S.E.E.)
Technology:
Associate in Science
  • Computer Engineering Technology
  • Electronic Engineering Technology
Bachelor of Science
  • Audio Engineering Technology
  • Computer Engineering Technology
  • Electronic Engineering Technology

Computer Engineering Program
Program Director: Nagurney

Educational Objectives
During their careers, computer engineering graduates will
  • become successful practicing engineers or pursue another career that makes use of engineering principles and professional skills;
  • become contributing members of multidisciplinary teams and successfully apply the fundamentals of their educational background; and
  • pursue professional development, including continuing or advanced education, relevant to their career path.

To achieve these objectives students are given a rigorous foundation in mathematics, physics, chemistry, mechanics, programming, and circuit theory. Then they are immersed in a sequence of required courses in digital systems, field programmable gate array (FPGA), microprocessors, electronics, computer architecture, design practice, advance computer programming, and data structures. In the senior year, students are given the choice to pursue their own areas of interest in computer engineering and computer science through the selection of several courses in addition to Design II (senior project). Both the required courses and the senior-year courses are designed to achieve breadth and depth in the curriculum. The engineering design experience is distributed throughout the entire curriculum. The design experience begins in the first year and continues throughout the curriculum culminating with the senior capstone project.

Students must complete a 4-credit lecture and laboratory course in general chemistry. Students also must complete two 4-credit lectures courses in calculus-based physics (including laboratory components), thus meeting the depth requirement. After taking Calculus I and II, students also take M 242 Differential Equations and ECE 320 Probability and Statistics for Computer Engineers. Students should have several computer engineering courses that integrate mathematical skills and should have these courses as co- or prerequisites.

The ability to work professionally on computer systems later, including the design and realization of such systems, is demonstrated by the progression of courses from introductory to comprehensive, including design components. Our senior capstone projects increasingly are becoming industry sponsored. The integrated design experience is obtained in the senior capstone project (ECE 483 Design II).

Through participation in the All-University Curriculum and in additional elective courses in the humanities and/or social sciences, students are given the opportunity to broaden their perspectives and to take part in the larger learning community of the University.

Extensive laboratory work supplements the theoretical course work through suitable hands-on experience. In addition to the laboratories in the sciences, there are several required laboratory courses in engineering: Circuits I and II, Electronics I and II, Digital Logic, FPGA, microprocessors, and digital devices.

Students exercise their verbal and technical writing skills in a required writing course and in many engineering courses. Also, written and oral communication of laboratory results is required.
### Requirements for Bachelor of Science in Computer Engineering: 131 credits

Credits in the major: 86

#### Freshman Year—First Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 101 Engineering Freshman Dialogue</td>
<td>1</td>
</tr>
<tr>
<td>ES 143 Engineering and Design</td>
<td>3</td>
</tr>
<tr>
<td>ES 220 Graphic Communication</td>
<td>2</td>
</tr>
<tr>
<td>M 144 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>RPW 110 Rhetoric and Writing I</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 16

#### Freshman Year—Second Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 115 Eng. Computer Applications</td>
<td>3</td>
</tr>
<tr>
<td>M 145 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 112 Calculus-Based Physics I</td>
<td>4</td>
</tr>
<tr>
<td>AUCW 180 Western Heritage</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 17

#### Sophomore Year—First Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 213 Electric Circuit Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>ECE 215 Circuits Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>ECE 231 Digital System Logic</td>
<td>3</td>
</tr>
<tr>
<td>ECE 232 Digital Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>M 242 Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>PHY 113 Calculus-Based Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 15

#### Sophomore Year—Second Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 114 Computer Programming I</td>
<td>4</td>
</tr>
<tr>
<td>ECE 214 Electric Circuit Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>ECE 216 Circuits Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>ECE 234 Digital Design Using CPLDs</td>
<td>3</td>
</tr>
<tr>
<td>ES 242 Engineering by Design</td>
<td>3</td>
</tr>
<tr>
<td>AUCS 340 Ethics in the Professions</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 17

#### Junior Year—First Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 115 Computer Programming II</td>
<td>4</td>
</tr>
<tr>
<td>ECE 332 Microprocessor Applications</td>
<td>4</td>
</tr>
<tr>
<td>ECE 335 Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ECE 361 Electronics Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ECE 363 Electronics Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>ES 216 Engineering Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 18

#### Junior Year—Second Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 220 Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>ECE 336 Comp. Sys. Lab</td>
<td>3</td>
</tr>
<tr>
<td>ECE 362 Electronic Circuits</td>
<td>3</td>
</tr>
<tr>
<td>ECE 364 Electronics Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>ECE 382 Design I Professional Practice</td>
<td>3</td>
</tr>
<tr>
<td>ES 342 Engineering Practice</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 17

See Program Requirement Notes, page 328.

### Senior Year—First Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 110 College Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CS elective</td>
<td>3</td>
</tr>
<tr>
<td>ECE or CS elective</td>
<td>3</td>
</tr>
<tr>
<td>ECE elective</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 16

#### Senior Year—Second Semester

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS elective</td>
<td>3</td>
</tr>
<tr>
<td>ECE 483 Design II</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credits for the semester** 15

### Minor in Computer Engineering

This minor provides both students matriculating into bachelor’s degree programs in other colleges of the University, particularly the sciences, and the other engineering majors with an introduction to the discipline of computer engineering. The minor consists of six courses chosen from the list provided and is not available to Department of Engineering students majoring in electrical engineering.

All courses must be taken at the University of Hartford and may not be taken on a Pass/No Pass basis. A grade point average of 2.33 (C+) must be achieved in the minor.

#### Course Requirements for the Minor in Computer Engineering

1. **Students must take six courses from the following list:**
   - ECE 231 Digital System Logic [3]
   - ECE 232 Digital Laboratory [1], taken concurrently
   - ECE 234 Digital Design Using CPLDs [3]
   - ECE 332 Microprocessor Applications [4]
   - ECE 335 Computer Architecture [3]
   - ECE 336 Computer Systems Laboratory [3]
   - ECE 341 Discrete and Continuous Systems [3]
   - ECE 435 System Simulation [3]
   - ECE 440 Digital Signal Processing [3]
   - ECE 481 Digital Signal Processing Laboratory [1],
     and Digital Signal Processing Laboratory [1],

2. **Students must satisfy all course prerequisites for courses taken in the minor or obtain written permission from the instructor.**
Electrical Engineering
Program Director: Nagurney

Educational Objectives
During their careers, computer engineering graduates will
• become successful practicing engineers or pursue another career that makes use of engineering principles and professional skills;
• become contributing members of multidisciplinary teams and successfully apply the fundamentals of their educational background; and
• pursue professional development, including continuing or advanced education, relevant to their career path.

To achieve these objectives students are given a rigorous foundation in mathematics, physics, chemistry, mechanics, programming, digital systems, and circuit theory. They are then immersed in a sequence of required courses in microprocessors, electronics, electromagnetics, signals and systems, and design practice. In the senior year, Digital Signal Processing, Random Signals and Noise, and Design II (senior project) are required courses. In addition, students choose a sequence of courses in one of the following areas: communications and signal processing, computer systems, control systems, electric power, and microelectronics.

Students must complete a 4-credit lecture and laboratory course in general chemistry. Students also must complete two 4-credit lecture courses in calculus-based physics (including laboratory components), thus meeting the depth requirement. Students also take M 242 Differential Equations (3 cr.), M 240 Calculus of Several Variables (4 cr.), and M 220 Linear Algebra (3 cr.). Students should have several electrical engineering courses that integrate mathematical skills and should have these courses as co- or prerequisites. Electrical engineering students also take a stand-alone probability and statistics course, ECE 420 Random Signals and Noise.

The ability to work professionally on electrical systems later, including the design and realization of such systems, is demonstrated by the progression of courses from introductory to comprehensive, including design components. It also includes some technical elective courses students may choose in each stem. These are not all offered at the same time, but there are selections from each stem available in each semester of the senior year. In addition, the final capstone sequence contains projects that usually involve material from each area.

Our senior capstone projects increasingly are becoming industry sponsored. Traditionally, instruction in the design of electrical systems is provided in a sequence of courses: VLSI in ECE 565 and ECE 567, controls in ECE 442 and ECE 543, communications in ECE 423, ECE 424, ECE 521, and ECE 540. Both the required courses and the sequences are designed to achieve breadth and depth in the curriculum. The integrated design experience is obtained in the senior capstone project (ECE 483 Design II).

Through participation in the All-University Curriculum and in additional elective courses in the humanities and/or social sciences, students are given the opportunity to broaden their knowledge base and to take part in the larger learning community of the University.

Extensive laboratory work supplements the theoretical course work through hands-on experience. In addition to the laboratories in the sciences, there are several required laboratory courses in engineering: Circuits I and II, Electronics I and II, Digital Logic, Microprocessors, and Digital Signal Processing.

Students exercise their verbal and technical writing skills in a required writing course as well as in many engineering courses. Also, written and oral communication of laboratory results is required.

The engineering design experience is distributed throughout the entire curriculum. The design experience begins in the first year and continues throughout the curriculum, culminating with the senior capstone project.

Requirements for Bachelor of Science in Electrical Engineering: 126 credits

Credits in the major: 74\(^{10}\)

**Freshman Year—First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 101 Engineering Freshman Dialogue</td>
<td>1</td>
</tr>
<tr>
<td>ES 143 Engineering and Design</td>
<td>3</td>
</tr>
<tr>
<td>ES 220 Graphic Communication</td>
<td>2</td>
</tr>
<tr>
<td>M 144 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>RPW 110 Rhetoric and Writing I</td>
<td>3</td>
</tr>
<tr>
<td>AUC All-University Curriculum elective(^5)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td>16</td>
</tr>
</tbody>
</table>

**Freshman Year—Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 115 Eng. Computer Applications</td>
<td>3</td>
</tr>
<tr>
<td>M 145 Calculus II</td>
<td>4</td>
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<tr>
<td>PHY 112 Calculus-Based Physics I</td>
<td>4</td>
</tr>
<tr>
<td>AUC All-University Curriculum elective(^5)</td>
<td>3</td>
</tr>
<tr>
<td>AUCW 180 Western Heritage</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td>17</td>
</tr>
</tbody>
</table>

See Program Requirement Notes, page 328.
Sophomore Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 213 Electric Circuit Analysis I</td>
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<tr>
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<td>ECE 232 Digital Laboratory</td>
<td>1</td>
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<tr>
<td>M 242 Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>PHY 113 Calculus-Based Physics II</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

Sophomore Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 110 College Chemistry</td>
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<tr>
<td>ECE 214 Electric Circuit Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>ECE 216 Circuits Laboratory II</td>
<td>1</td>
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<tr>
<td>ES 242 Engineering by Design</td>
<td>3</td>
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<tr>
<td>M 240 Calculus of Several Variables</td>
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</tr>
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<td>AUCS 340 Ethics in the Professions</td>
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<tr>
<td><strong>Total credits for the semester</strong></td>
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</tr>
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</table>

Junior Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>ECE 332 Microprocessor Applications</td>
<td>4</td>
</tr>
<tr>
<td>ECE 341 Discrete and Continuous Systems</td>
<td>3</td>
</tr>
<tr>
<td>ECE 361 Electronics Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ECE 363 Electronics Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>ES 216 Engineering Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>M 220 Linear Algebra</td>
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<tr>
<td><strong>Total credits for the semester</strong></td>
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Junior Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ECE 351 Electromagnetic Field Theory</td>
<td>4</td>
</tr>
<tr>
<td>ECE 362 Electronic Circuits</td>
<td>3</td>
</tr>
<tr>
<td>ECE 364 Electronics Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>ECE 382 Design I Professional Practice</td>
<td>3</td>
</tr>
<tr>
<td>ES 342 Engineering Practice</td>
<td>1</td>
</tr>
<tr>
<td>Humanities/social science elective</td>
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<tr>
<td><strong>Total credits for the semester</strong></td>
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</tbody>
</table>

Senior Year—First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 420 Random Signals and Noise</td>
<td>3</td>
</tr>
<tr>
<td>ECE 440 Digital Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECE 441 Digital Signal Processing Lab</td>
<td>1</td>
</tr>
<tr>
<td>Electrical Engineering Sequence I</td>
<td>3</td>
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<tr>
<td>ECE elective</td>
<td>3</td>
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<tr>
<td>Humanities/social science elective</td>
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<tr>
<td><strong>Total credits for the semester</strong></td>
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Senior Year—Second Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ECE 483 Design II</td>
<td>3</td>
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<tr>
<td>Electrical Engineering Sequence II</td>
<td>3</td>
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<tr>
<td>ECE elective</td>
<td>3</td>
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<tr>
<td>ECE elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

Minor in Electrical Engineering

The minor in electrical engineering is designed to provide students matriculating in bachelor’s degree programs in other colleges of the University, particularly the sciences and the other engineering majors, with an introduction to the discipline of electrical engineering. The minor consists of six courses in electrical engineering. It is not open to students majoring in computer engineering.

All courses must be taken at the University of Hartford and may not be taken on a Pass/No Pass basis. A grade point average of 2.33 (C+) must be achieved in the minor.

Course Requirements for the E.E. Minor

**Circuits:**

ECE 210 Intro to Electrical Engineering [3]

or ECE 213 Electric Circuit Analysis I [3]

and ECE 215 Circuits Laboratory I [1]

Any two of the following courses:

ECE 231 Digital System Logic [3]

and ECE 232 Digital Laboratory [1]

ECE 332 Microprocessor Applications [4]

ECE 360 Circuits and Electronics [4]

or ECE 361 Electronic Fundamentals [3]

and ECE 363 Electronics Laboratory I [1]

Any three additional courses chosen from electrical engineering courses (ECE prefix, 3 or 4 credits each)

Students taking both ECE 210 and the ECE 213/215 combination receive credit in the minor only for one of these choices.

Students taking both ECE 360 and the ECE 361/363 combination receive credit in the minor only for one of these choices.

Students taking both ECE 470 and the ECE 471/473 combination receive credit in the minor only for one of these choices.

Students must satisfy all course prerequisites for courses taken in the minor or obtain written permission from the instructor.

Minor in Mechatronics

Mechatronics is the synergistic combination of mechanical and electrical engineering, computer science, and information technology, which includes control systems as well as numerical methods used to design products with built-in intelligence. This minor is designed with the above in mind and geared toward mechanical, biomedical, and civil engineering majors. The minor consists of six courses in electrical, computer and mechanical engineering. It is not open to students majoring in electrical or computer engineering.

All courses must be taken at the University of Hartford and may not be taken on a Pass/No Pass basis. A grade point average of 2.33 (C+) must be achieved in the minor.

See Program Requirement Notes, page 328.
Course Requirements for the Minor in Mechatronics
ECE 231 Digital System Logic  
and ECE 232 Digital Laboratory
ECE 210 Introduction to Electrical Engineering  
or ECE 213 Electric Circuit Analysis I  
and ECE 215 Circuits Laboratory I
ECE 360 Circuits and Electronics  
or ECE 361 Electronics Fundamentals  
and ECE 363 Electronics Laboratory I
ECE 382 Design I Professional Practice

Two of the following courses:
ES 440 Automatic Control System Analysis
ME 505 Mechatronics System Design
ECE 341 Discrete and Continuous Systems
ECE 442 Continuous Control Systems

B.S.E.E. or B.S.Comp.E. with a Subject-Area Major in Audio Engineering Technology

For detailed program requirements, please contact the Electrical and Computer Engineering department chair.

Audio Engineering Technology Program
Program Director: Britt

Educational Objectives
All graduates in the Audio Engineering Technology program will
• be competent for successful long-term professional practice in audio engineering technology and related disciplines (broadcast networks, multimedia firms, etc.); and
• understand the importance of lifelong learning and staying current in the field by participation in professional societies, earning advanced degrees, and receiving additional training or certifications.

Requirements for Bachelor of Science in Audio Engineering Technology:
127 credits

Credits in the major: 60

Freshman Year—First Semester  Credits
AUD 110 Music for Audio Tech. I  2
AUD 122 Recording Principles  2
ECT 111 Intro to Electronics  4
TC 111 English I: Expos. Comm.  3
ET 111 Intro to Engineering Technology  1
MTH 112 College Algebra for Techs  3

Total credits for the semester  15

Freshman Year—Second Semester  Credits
AUD 111 Music for Audio Techs II  2
AUD 161 Modern Recording  3
ECT 121 DC and AC Electrical Fundamentals  4
MTH 122 Precalculus for Techs  3
Humanities/social science elective  3

Total credits for the semester  15

Sophomore Year—First Semester
AUD 266 Art of Mixing  3
ECT 122 Intro to Digital Devices  4
ECT 231 AC and Solid-State Fundamentals  4
MTH 232 Calculus I for Techs  3

All-University Curriculum  3

Total credits for the semester  17

Sophomore Year—Second Semester
ECT 241 Analog Devices and Circuits  4
MPT 451 Sound Technology II  3
MTH 241 Calculus II for Techs  3
PHY 120 Algebra-Based Physics  4

Total credits for the semester  14

Junior Year—First Semester
AUD 362 Audio System Integration  4
ECT 352 RF Communications  4
TC 241 English II: Technical Communication  3
PHY 121 Algebra-Based Physics II  4

All-University Curriculum  3

Total credits for the semester  18

Junior Year—Second Semester
AUD 382 Principles of Magnetic Recording  3
ECT 365 Object-Oriented Programming  3
Lab science elective\(^b\)  4
Professional elective\(^d\)  3

AUD 384 Digital Audio Systems  3

Total credits for the semester  16

Senior Year—First Semester
ES 262 Intro to Music and Arch. Acoustics  3
Professional elective\(^d\)  3

Technical specialty\(^{20}\)  4
Unrestricted elective\(^c\)  3

All-University Curriculum  3

Total credits for the semester  16

Senior Year—Second Semester
Professional elective\(^d\)  3

Technical specialty (3 or 4 cr.)\(^{20}\)  3–4
Technical specialty (4 cr.)\(^{20}\)  4

All-University Curriculum  3

Total credits for the semester  16–17

See Program Requirement Notes, page 328.
Minor in Audio Engineering Technology

This minor is intended to ensure minimum baseline knowledge in audio analog/digital circuits, systems, production, and software applications.

19 credits required, typically six courses, including

1. One circuits/electronics course from the following list (3 or 4 credits):
ECT 111 Intro to Electronics [4]
or ECT 245 Elec./Electron. Fundamentals [4]
or ECE 213/215 Electric Circuit Analysis I /
Circuits Laboratory I [3/1]
or ECE 210 Intro to Electrical

2. Two required courses:
AUD 110 Music for Audio Technology [2]
and AUD 122 Recording Principles [2]

3. At least 12 credits from the following list of courses, including one from each of the four categories:

A. AUD (any course)
B. ECT 122 Intro to Digital Devices [4]
or ECE 231/232 Digital System Logic/
Digital Laboratory [3/1]
or ECE 360 Circuits and Electronics [4]
or ECE 361/363 Electrons
Fundamentals/Electronics
Laboratory I [3/1]
or ECT 353 Comp. Arch. [4]
or ECT 355 Indus. Electron. and

or ECT 363 Comp. Interfacing [4]
or ECT 364 Indus. Instrument. and
Sensors [4]

C. MPT 451 Sound Technology II [3]
D. ES 262 Intro to Music and Arch.
Acoustics [3]

Computer Engineering Technology Program

Educational Objectives
Graduates will

• be competent for successful long-term professional practice in computer engineering technology; and

• understand the importance of lifelong learning and staying current in the field by participation in professional societies, earning advanced degrees, and receiving additional training or certifications.

Requirements for Associate in Science
Computer Engineering Technology

Programming Concentration

Total credits for the A.S. program: 64
Credits in the major: 33

Freshman Year—First Semester
ECT 111 Intro to Electronics 4
ECT 113 Personal Computer Lab 2
TC 111 English I: Expos. Comm. 3
ES 115 Eng. Computer Apps. 3
ET 111 Intro to Engineering Tech. 1
MTH 112 College Algebra for Techs 3
Total credits for the semester 16

Freshman Year—Second Semester
ECT 121 DC and AC Elec. Fundamentals 4
MTH 122 Precalculus for Techs 3
PHY 120 Algebra-Based Phys. I 4
Total credits for the semester 15

Sophomore Year—First Semester
ECT 231 AC and Solid-State Fundamentals 4
ECT 232 Digital Circuits II 4
MTH 232 Calculus I for Techs 3
PHY 121 Algebra-Based Phys. II 4
Total credits for the semester 15

Sophomore Year—Second Semester
CS 114 Computer Programming I 4
ECT 241 Analog Devices and Circuits 4
ECT 242 Microprocessor Arch. and Prog. 4
TC 241 English II: Technical Comm. 3
MTH 241 Calculus II for Techs 3
Total credits for the semester 18

Additional Requirements for B.S. in
Computer Engineering Technology

Programming Concentration

Total credits for the B.S. program: 131
Credits in the major: 69

Junior Year—First Semester
CS 115 Computer Programming II 4
ECT 353 Computer Architecture 4
MTH 352 Diff. Equations for Techs 3
Basic science (lab) 4
All-University Curriculum 3
Total credits for the semester 18

Junior Year—Second Semester
CS 220 Data Structures 3
ECT 363 Computer Interfacing 4
ECT 365 Object-Oriented Programming 3
Humanities/social science elective 3
All-University Curriculum 3
Total credits for the semester 16

See Program Requirement Notes, page 328.
Senior Year—First Semester  Credits
ECT 471 Senior Project Design I  3
ECT 472 Computer Networking  4
ECT 474 Digital Signal Processing  4
All-University Curriculum  3
Total credits for the semester  17

Senior Year—Second Semester
ECT 481 Senior Project Design II  3
Professional elective  3
Technical specialty (3 cr.)  3
Technical specialty (4 cr.)  4
All-University Curriculum  3
Total credits for the semester  16

Minor in Computer Engineering Technology
This minor is intended to ensure minimum baseline knowledge in circuits and digital/microprocessors. This minor is allowed only for students not enrolled in other majors within the Electrical and Computer Engineering department.
18–20 credits required, typically five to six courses, including:
1. One electronics course:
   ECT 111 Intro to Electronics [4]
   or ECT 245 Elec./Electron. Fund. [4]
2. Four remaining courses from the following list:
   ECT 353 Computer Architecture [4]
   ECT 363 Computer Interfacing [4]
   ECT 365 Object-Oriented Programming [3]
   ECT 472 Computer Networking [4]
   ECT 474 Digital Signal Processing [4]
   ECT 483 Data Acquisition Systems [4]
   ET 480 Independent Studies [3–4]

Electronic Engineering Technology Program
Educational Objectives
Graduates will
• be competent for successful long-term professional practice in electronic engineering technology; and
• convey the importance of lifelong learning and staying current in the field by participation in professional societies, earning advanced degrees, and receiving additional training or certifications.

Requirements for Associate in Science
Electronic Engineering Technology
Networking/Communications Concentration
Total credits for the A.S. program: 64
Credits in the major: 34

Freshman Year—First Semester  Credits
ECT 111 Intro to Electronics  4
ECT 113 Personal Computer Lab  2
TC 111 English I: Expos. Comm.  3
ES 115 Engineering Computer Applications  3
ET 111 Intro to Engineer Tech.  1
MTH 112 College Algebra for Techs  3
Total credits for the semester  16

Freshman Year—Second Semester
ECT 121 DC and AC Elec. Fundamentals  4
ECT 122 Intro to Digital Devices  4
MTH 122 Precalculus for Techs  3
PHY 120 Algebra-Based Phys. I  4
Total credits for the semester  15

Sophomore Year—First Semester
ECT 231 AC and Solid-State Fundamentals  4
ECT 232 Digital Circuits II  4
MTH 232 Calculus I for Techs  3
PHY 121 Algebra-Based Phys. II  4
Total credits for the semester  15

Sophomore Year—Second Semester
ECT 241 Analog Devices and Circuits  4
ECT 242 Microprocessor Arch. and Prog.  4
ECT 351 Prac. Issues in Electron. Tech.  4
TC 241 English II: Technical Comm.  3
MTH 241 Calculus II for Techs  3
Total credits for the semester  18

Additional Requirements for B.S. Electronic Engineering Technology
Networking/Communications Concentration
Total credits for the B.S. program: 131
Credits in the major: 77

Junior Year—First Semester
ECT 352 RF Communications  4
ECT 354 Linear Integrated Circuits  4
MTH 352 Diff. Equations for Techs  3
Basic science (lab)  4
All-University Curriculum  3
Total credits for the semester  18

Junior Year—Second Semester
ECT 361 Data Communications  3
ECT 362 Advanced RF Communications  4
ECT 365 Object-Oriented Programming  3
Humanities/social science elective  3
All-University Curriculum  3
Total credits for the semester  16

See Program Requirement Notes, page 328.
Senior Year—First Semester  | Credits
--- | ---
ECT 471 Senior Design Project I | 3
ECT 472 Computer Networking | 4
ECT 474 Digital Signal Processing | 4
All-University Curriculum$^3$ | 3
**Total credits for the semester** | 17

Senior Year—Second Semester
ECT 481 Senior Project Design II | 3
Professional elective$^1$ | 3
Technical specialty (3 cr.$^{16}$) | 3
Technical specialty (4 cr.$^{16}$) | 4
All-University Curriculum$^3$ | 3
**Total credits for the semester** | 16

Requirements for Associate in Science
Electronic Engineering Technology
Mechatronics Concentration
**Total credits for the A.S. program:** 64
**Credits in the major:** 34$^{18}$

Freshman Year—First Semester
ECT 111 Intro to Electronics | 4
ECT 113 Personal Computer Lab | 2
TC 111 English I: Expos. Comm. | 3
ES 115 Engineering Computer Applications | 3
ET 111 Intro to Engineer Tech. | 1
MTH 112 College Algebra for Techs | 3
**Total credits for the semester** | 16

Freshman Year—Second Semester
ECT 121 DC and AC Elec. Fundamentals | 4
ECT 122 Intro to Digital Devices | 4
MTH 122 Precalculus for Techs | 3
PHY 120 Algebra-Based Physics I | 4
**Total credits for the semester** | 15

Sophomore Year—First Semester
ECT 231 AC and Solid-State Fundamentals | 4
ECT 232 Digital Circuits II | 4
MTH 232 Calculus I for Techs | 3
PHY 121 Algebra-Based Physics II | 4
**Total credits for the semester** | 15

Sophomore Year—Second Semester
ECT 241 Analog Devices and Circuits | 4
ECT 242 Microprocessor Arch. and Prog. | 4
ECT 351 Prac. Issues in Electron. Tech. | 4
TC 241 English II: Technical Comm. | 3
MTH 241 Calculus II for Techs | 3
**Total credits for the semester** | 18

Additional Requirements for B.S. in Electronic Engineering Technology
Mechatronics Concentration
**Total credits for the B.S. program:** 131$^{1}$
**Credits in the major:** 77$^{1}$

Junior Year—First Semester  | Credits
--- | ---
ECT 354 Linear Integrated Circuits | 4
ECT 355 Indus. Electronics and Actuators | 4
MET 236 Statics | 3
MTH 352 Diff. Equations for Techs | 3
All-University Curriculum$^5$ | 3
**Total credits for the semester** | 17

Junior Year—Second Semester
ECT 364 Indus. Instrument. and Sensors | 4
ECT 365 Object-Oriented Programming | 3
MET 243 Mechanics of Materials for Tech. | 4
Humanities/social science elective | 3
All-University Curriculum | 3
**Total credits for the semester** | 17

Senior Year—First Semester
ECT 471 Senior Design Project I | 3
MET 475 Kinematics and Dynamics | 4
Basic science (lab)$^9$ | 4
All-University Curriculum$^5$ | 3
**Total credits for the semester** | 17

Senior Year—Second Semester
ECT 481 Senior Project Design II | 3
Professional elective$^7$ | 3
Technical specialty (3 cr.$^{16}$) | 3
Technical specialty (4 cr.$^{16}$) | 4
All-University Curriculum$^5$ | 3
**Total credits for the semester** | 16

See Program Requirement Notes, page 328.
B.S. in Computer or Electronics Technology with an Audio Engineering Technology Double Major

For detailed program requirements, contact the Electrical and Computer Engineering department chair.

Minor in Electronic Engineering Technology

This minor is intended to ensure minimum baseline knowledge in circuits, electronics, and digital/microprocessors. It is allowed only for students not enrolled in other majors within the Electrical and Computer Engineering department.

21 credits required, typically five to six courses, including the following:

1. One electronics course:
   ECT 111 Intro. to Electronics [4]

2. Two remaining courses from the following list:
   ECT 121 DC and AC Elec. Fundamentals [4]
   ECT 231 AC and Solid-State Fundamentals [4]
   ECT 241 Analog Dev. and Circ. [4]
   or ECT 122 Digital Devices [4]
   ECT 232 Digital Circ. II [4]
   ECT 242 Micro Arch. and Prog. [4]

3. Three additional courses (ECT 200, 300, or 400 level)

Department of Mechanical Engineering

Professors Celmer, Filburn, Manzione, Sahay, Shetty
Associate Professors Canistraro, Milanovic, Yavuzturk (Chair)
Assistant Professors Ghosh, Vigean
Instructor Norwood

Degrees offered:

Engineering:
- Bachelor of Science (Engineering)
  - Acoustical Engineering and Music (B.S.E.)
  - Mechanical Engineering (B.S.M.E.)
    - Acoustics (B.S.M.E.)
    - Energy and Sustainability (B.S.M.E.)
    - Manufacturing (B.S.M.E.)

Technology:
- Bachelor of Science
  - Mechanical Engineering Technology

Mechanical Engineering Department Mission

Our mission is to educate and graduate mechanical engineering students and mechanical engineering technology students who are proficient in the principles of science and engineering. We strive to fulfill the technological needs of our society through teaching, research, and outreach programs. A close collaboration among disciplines and with industry is integral to strengthening our academic programs.

Acoustical Engineering and Music Program Mission

The mission of the Acoustical Engineering and Music program is to provide an excellent educational experience for students, with an emphasis on preparing graduates for professional practice in engineering and/or graduate school.

Educational Objectives

The Acoustical Engineering and Music program seeks to prepare men and women for productive, rewarding careers in the engineering profession. During their careers our alumni:

1. will become successful practicing engineers in a wide range of acoustical engineering fields and will advance professionally by accepting responsibilities and, potentially, pursuing leadership roles;

2. will advance their knowledge of engineering, both formally and informally, by engaging in lifelong learning experiences; and
3. will, as contributing members of multidisciplinary engineering teams, successfully apply the fundamentals of engineering analysis and design to the formulation and solution of emerging technical problems.

Program Director: Celmer

This program was instituted in 1976 by Professor Emeritus Conrad Hemond Jr. of the School of Engineering's Acoustics Laboratory, and Professor Emeritus William Willett of The Hart School. Those who pursue the field of engineering to study acoustics have many career areas from which to choose. These include audio engineering (high-fidelity sound system design), architectural acoustics (design of concert halls, recording studios, and music rooms), musical acoustics (design of musical instruments), noise control and sound quality (of machinery, jet engines, automobiles, and environmental regulations), and bioacoustics (design of hearing aids, replacement parts for the ear, hearing test equipment). To be accepted into this curriculum, applicants must have the math and science background required of all engineering students and must successfully pass the entrance requirements of The Hart School, including an audition.

Although the curriculum is scheduled to be completed within four years, it is one of the most rigorous undergraduate programs at the University, requiring at least 142 credits for completion. Acoustical engineering and music students bring a special perspective to their studies because of their individual pursuits.

Requirements for Bachelor of Science in Engineering—Acoustical Engineering and Music:

142–145 credits

Credits in the major: 52 [55] plus at least 46 in music

Freshman Year—First Semester Credits
ES 101 Engineering Freshman Dialogue 1
ES 143 Engineering and Design 3
M 144 Calculus I 4
RPW 110 Rhetoric and Writing I 3
TH 111 Diatonic Harmony 2
TH 120 Elementary Ear Training I 2
Private music instruction 2
Performing organization 1

Total credits for the semester 18

Freshman Year—Second Semester Credits
ES 115 Eng. Computer Applications 3
M 145 Calculus II 4
PHY 112 Calculus-Based Physics I 4
TH 112 Chromatic Harmony 2
TH 121 Elementary Ear Training II 2
Private music instruction 2
Performing organization 1

Total credits for the semester 18

Sophomore Year—First Semester Credits
ES 110 Statics 3
M 240 Calculus of Several Variables 4
ME 265 Fund. of Arch./Musical Acoustics 3
PHY 113 Calculus-Based Physics II 4
TH 220 Intermediate Ear Training I or AFR 342 2
Private music instruction 2
Performing organization 1

Total credits for the semester 19

Sophomore Year—Second Semester Credits
ES 211 Dynamics 3
ES 212 Mechanics of Materials 3
ES 242 Engineering by Design 3
M 242 Differential Equations 3
TH 210 Tonal Form 2
Private music instruction 2
AUCS 340 Ethics in the Professions 3

Total credits for the semester 19

Junior Year—First Semester Credits
CH 110 College Chemistry I 4
ECE 210 Intro to Electrical Engineering 3
ES 220 Graphic Communication 2
ME 213W Mech. Eng. Mats. and Lab 3
MPT 450 Sound Technology I 3
Private music instruction 2
Performance organization 1

Total credits for the semester 18

Junior Year—Second Semester Credits
ECE 360 Circuits and Electronics [ES 221 Adv. CAD] [3]
ME 350 Vibrations I with Applications 3
MPT 451 Sound Technology II 3
PHY 260 Optics 4
Private music instruction 2

Total credits for the semester 16 [19]

Senior Year—First Semester Credits
AFR 131 African American Music 3
ES 320 Thermal-Fluids Engineering 4
ME 460 Engineering and Envir. Acoustics 3
Private music instruction 2
Performing organization 1
AUCW 180 Western Heritage 3

Total credits for the semester 19

See Program Requirement Notes, page 328.
Senior Year—Second Semester  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 493 Eng. Research</td>
<td>3</td>
</tr>
<tr>
<td>or ME 450/550 Vibrations II</td>
<td>3</td>
</tr>
<tr>
<td>HLM 200 World Music Survey</td>
<td>3</td>
</tr>
<tr>
<td>ME 461/561 Acoustics Capstone Design</td>
<td>3</td>
</tr>
<tr>
<td>Professional elective</td>
<td>3</td>
</tr>
<tr>
<td>Private music instruction</td>
<td>2</td>
</tr>
<tr>
<td>Performing organization</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

Mechanical Engineering Program

Mission

The mission of the Mechanical Engineering program is to provide excellent educational experience for its students, with an emphasis on preparing graduates for professional practice in engineering and/or graduate school.

Educational Objectives

The Mechanical Engineering program seeks to prepare men and women for productive, rewarding careers in the engineering profession. During their careers our alumni

1. will become successful practicing engineers in a wide range of mechanical engineering fields and will advance professionally by accepting responsibilities and, potentially, pursuing leadership roles;

2. will advance their knowledge of engineering, both formally and informally, by engaging in lifelong learning experiences; and

3. will, as contributing members of multidisciplinary engineering teams, successfully apply the fundamentals of engineering analysis and engineering design to the formulation and solution of emerging technical problems.

The engineering design experience is distributed over the entire engineering curriculum. The curricular sequence ensures that there is one-half year of credits devoted to design content, which begins in the first-year course Engineering and Design and continues through the senior year’s Capstone Design Project. The majority of the design work is incorporated into the junior and senior years to ensure that the students have taken sufficient preparatory engineering science courses.

Basic concepts of physics, chemistry, and mathematics create the foundation on which all engineering education is built. Basic tools of engineering practice, such as graphic communication, computer-aided drafting/design, and computer programming and applications, are also required knowledge. The basic engineering sciences, such as statics, dynamics, mechanics of materials, material science, thermodynamics, fluid mechanics, electrical circuits, design of machine elements, and control theory, complete the introductory phase of the program.

Mechanical engineering is generally considered to consist of a number of engineering subject areas, such as

- Energy Conversion
- Fluid Flow
- Heat Transfer
- Heating, Ventilating, and Air-Conditioning
- Instrumentation Machine Design
- Manufacturing/Industrial Engineering
- Materials
- Mechanics of Solids
- Mechanisms
- Noise Control
- Refrigeration
- System Control

All mechanical engineering students have the opportunity to take elective courses in any of the above subject areas. Through proper choice of electives, a student may become specialized in one or two of these areas. The Mechanical Engineering department has formalized three of the areas (acoustics, energy and sustainability, and manufacturing) as designated concentrations, with a separate curriculum listing.

Extensive laboratory experience enhances the theoretical course work. There are several required laboratory courses in the sciences and engineering. Written and oral communication of laboratory results is required.

Oral presentation by the students is introduced in the first year and continues through to the capstone design course, as well as in several other required advanced and elective courses.

Through participation in the All-University Curriculum and in additional elective courses in the humanities and/or social sciences, students are given the opportunity to broaden their perspectives and to take part in the larger learning community of the University. It is imperative that engineers understand and appreciate the special role that technology plays in our society and the interactions between and among the various components of our society.

Course Registration

Students should be aware that all prerequisite requirements for a course must be met prior to starting the course.

See Program Requirement Notes, page 328.
### Requirements for Bachelor of Science in

#### Credits in the major: 79

**Freshman Year—First Semester**  
Credits  
ES 101 Engineering Freshman Dialogue 1  
ES 143 Engineering and Design 3  
ES 220 Graphic Communication 2  
M 144 Calculus I 4  
RPW 110 Rhetoric and Writing I 3  
AUC All-University Curriculum elective 3  
**Total credits for the semester** 76

**Freshman Year—Second Semester**  
Credits  
ES 115 Eng. Computer Applications 3  
M 145 Calculus II 4  
PHY 112 Calculus-Based Physics I 4  
AUC All-University Curriculum elective 3  
AUCW 180 Western Heritage 3  
**Total credits for the semester** 17

**Sophomore Year—First Semester**  
Credits  
CH 110 College Chemistry 4  
M 240 Calculus of Several Variables 4  
PHY 113 Calculus-Based Physics II 4  
**Total credits for the semester** 13

**Sophomore Year—Second Semester**  
Credits  
ES 211 Dynamics 3  
ES 212 Mechanics of Materials 3  
ES 242 Engineering by Design 3  
ME 236 Thermodynamics I 3  
M 242 Differential Equations 3  
AUCS 340 Ethics in the Professions 3  
**Total credits for the semester** 18

**Junior Year—First Semester**  
Credits  
ME 213W Mech. Eng. Mats. and Lab 3  
ME 337 Thermodynamics II 3  
ME 340 Fluid Mechanics 3  
ME 370 Elements of Mech. Design 3  
M 344 Advanced Engineering Math 3  
**Total credits for the semester** 15

**Junior Year—Second Semester**  
Credits  
ECE 210 Intro to Electrical Engineering 3  
ES 342 Engineering Practice 1  
ME 341 Heat Transfer 3  
ME 342W Fluid Mechanics and Heat Lab 3  
ME 350 Vibrations I 3  
ME 470 Mech. Systems and Processes 3  
**Total credits for the semester** 16

**Senior Year—First Semester**  
Credits  
ECE 360 Circuits and Electronics 4  
ES 440 Automatic Control Sys. Anal. 3  
ME 460 Engineering and Envir. Acoustics 3  
ME 472 Capstone Design Project 3  
Professional elective 3  
**Total credits for the semester** 16

**Senior Year—Second Semester**  
Credits  
ME 405/505 Mechatronics System Design 3  
Humanities/social science elective 3  
Math/science elective 3  
Professional elective 3  
**Total credits for the semester** 18

### Requirements for Bachelor of Science in Mechanical Engineering with Acoustics Concentration: 132 [138] credits

**Credits in the major:** 76 [82] credits  
The ABET-accredited Bachelor of Science in Mechanical Engineering (B.S.M.E.) degree program with a concentration in acoustics allows mechanical engineers to have a vital impact on designing and building devices or processes that promote high acoustic fidelity and are free of disturbing and excessive noise. The students in this program take the same core curriculum as the traditional B.S.M.E. students; their upper-level program on acoustical courses, such as Noise Control Design, Vibrations II, Optics, Engineering Research Project, and Music Audio Production.

**Freshman Year—First Semester**  
Credits  
ES 101 Engineering Freshman Dialogue 1  
ES 143 Engineering and Design 3  
ES 220 Graphic Communication 2  
M 144 Calculus I 4  
RPW 110 Rhetoric and Writing I 3  
AUC All-University Curriculum elective 3  
**Total credits for the semester** 16

**Freshman Year—Second Semester**  
Credits  
ES 115 Eng. Computer Applications 3  
M 145 Calculus II 4  
PHY 112 Calculus-Based Physics I 4  
AUC All-University Curriculum elective 3  
AUCW 180 Western Heritage 3  
**Total credits for the semester** 17

**Sophomore Year—First Semester**  
Credits  
CH 110 College Chemistry 4  
[ES 262 Intro Musical/Arch. Acoustics] 3  
M 240 Calculus of Several Variables 4  
PHY 113 Calculus-Based Physics II 4  
**Total credits for the semester** 15[18]

See Program Requirement Notes, page 328.
Sophomore Year—Second Semester Credits
- ES 211 Dynamics 3
- ES 212 Mechanics of Materials 3
- ES 242 Engineering by Design 3
- M 242 Differential Equations 3
- ME 236 Thermodynamics I 3
- AUCS 340 Ethics in the Professions 3

Total credits for the semester 18

Junior Year—First Semester
- ECE 210 Intro to Electrical Engineering 3
- ME 337 Thermodynamics II 3
- ME 340 Fluid Mechanics 3
- ME 370 Elements of Mech. Design 3
- M 344 Advanced Engineering Math 3

Total credits for the semester 18

Junior Year—Second Semester
- PHY 260 Optics 4
- ES 342 Engineering Practice 1
- ME 341 Heat Transfer 3
- ME 342W Fluid Mechanics and Heat Lab 3
- ME 350 Vibrations I 3
- ME 470 Mech. Syst. and Process 3

Total credits for the semester 17

Senior Year—First Semester
- ECE 360 Circuits and Electronics 4
- ES 440 Automatic Control Syst. Anal. 3
- ME 460 Engineering and Envir. Acoustics 3
- ME 472 Capstone Design Project [3]
- [MPT 450 Sound Technology I] [3]
- Humanities/social science elective 3

Total credits for the semester 16 [19]

Senior Year—Second Semester
- ME 440 Thermal and Mech. Sys. Design 3
- ME 461/561 Acoustics Capstone Design 3
- ME 450/550 Vibrations II or ES 493 Eng. Research 3
- ME 405/505 Mechatronics System Design 3
- [MPT 451 Sound Technology II] [3]
- Humanities/social science elective 3

Total credits for the semester 15 [18]

Requirements for the Bachelor of Science in Mechanical Engineering with the Energy and Sustainability Concentration: 131 credits
Credits in the major: 79

Freshman Year—First Semester Credits
- ES 101 Engineering Freshman Dialogue 1
- ES 143 Engineering and Design 3
- ES 220 Graphic Communication 2
- M 144 Calculus I 4
- RPW 110 Rhetoric and Writing I 3
- AUCC All-University Curriculum elective 3

Total credits for the semester 16

Freshman Year—Second Semester
- ES 115 Eng. Computer Applications 3
- M 145 Calculus II 4
- PHY 112 Calculus-Based Physics I 4
- AUCC All-University Curriculum elective 3
- AUCW 180 Western Heritage 3

Total credits for the semester 17

Sophomore Year—First Semester
- CH 110 College Chemistry 4
- ES 110 Statics 3
- M 240 Calculus of Several Variables 4
- PHY 113 Calculus-Based Physics II 4

Total credits for the semester 15

Sophomore Year—Second Semester
- ES 211 Dynamics 3
- ES 212 Mechanics of Materials 3
- ES 242 Engineering by Design 3
- ME 236 Thermodynamics I 3
- M 242 Differential Equations 3
- AUCS 340 Ethics in the Professions 3

Total credits for the semester 15

Junior Year—First Semester
- ME 337 Thermodynamics II 3
- ME 340 Fluid Mechanics 3
- ME 370 Elements of Mech. Design 3
- M 344 Advanced Engineering Math 3

Total credits for the semester 15

Junior Year—Second Semester
- ECE 210 Intro to Electrical Engineering 3
- ES 342 Engineering Practice 1
- ME 341 Heat Transfer 3
- ME 342W Fluid Mechanics and Heat Lab 3
- ME 350 Vibrations I 3
- ME 470 Mech. Systems and Processes 3

Total credits for the semester 16

See Program Requirement Notes, page 328.
Senior Year—First Semester

ECE 360 Circuits and Electronics 4
ES 440 Automatic Control Sys. Anal. 3
ME 460 Engineering and Envir. Acoustics 3
ME 472 Capstone Design Project 3
Professional elective\(^5\) 3
Total credits for the semester 16

Senior Year—Second Semester

ME 440 Thermal and Mech. Sys. Design 3
ME 405/505 Mechatronics System Design 3
Humanities/social science elective\(^9\) 3
Math/science elective\(^3\) 3
Professional elective\(^6\) 3
Professional elective\(^6\) 3
Total credits for the semester 18

Bachelor of Science in Mechanical Engineering with Manufacturing Concentration: 131 credits\(^1\)

Credits in the major: 79\(^9\)
The ABET-accredited Bachelor of Science in Mechanical Engineering (B.S.M.E.) degree program with a concentration in manufacturing provides education in design, planning, control, implementation, and improvement of manufacturing processes in the context of global supply chains, principles of design for manufacture, as well as cost-effective manufacturing and continuous optimization.

Freshman Year—First Semester

ES 101 Engineering Freshman Dialogue 1
ES 143 Engineering and Design 3
ES 220 Graphic Communication 2
M 144 Calculus I 4
RPW 110 Rhetoric and Writing I 3
AUC All-University Curriculum elective\(^5\) 3
Total credits for the semester 16

Freshman Year—Second Semester

ES 115 Eng. Computer Applications 3
M 145 Calculus II 4
PHY 112 Calculus-Based Physics I 4
AUC All-University Curriculum elective\(^5\) 3
AUCW 180 Western Heritage 3
Total credits for the semester 17

Sophomore Year—First Semester

CH 110 College Chemistry 4
ES 110 Statics 3
M 240 Calculus of Several Variables 4
PHY 113 Calculus-Based Physics II 4
Total credits for the semester 15

Sophomore Year—Second Semester

ES 211 Dynamics 3
ES 212 Mechanics of Materials 3
ES 242 Engineering by Design 3
ME 236 Thermodynamics I 3
M 242 Differential Equations 3
AUCS 340 Ethics in the Professions 3
Total credits for the semester 18

Junior Year—First Semester

ME 213W Mech. Eng. Mats. and Lab 3
ME 337 Thermodynamics II 3
ME 340 Fluid Mechanics 3
ME 370 Elements of Mech. Design 3
M 344 Advanced Engineering Math 3
Total credits for the semester 15

Junior Year—Second Semester

ECE 210 Intro to Electrical Engineering 3
ES 342 Engineering Practice 1
ME 341 Heat Transfer 3
ME 342W Fluid Mech. and Heat Lab 3
ME 350 Vibrations I 3
ME 470 Mech. Sys. and Processes 3
Total credits for the semester 16

Senior Year—First Semester

ME 440 Thermal and Mech. Sys. Design 3
ME 472 Capstone Design Project 3
ME 381 Statistical Quality Control 3
ME 383 Mfg. Control and Planning 3
Total credits for the semester 16

Senior Year—Second Semester

ME 440 Thermal and Mech. Sys. Design 3
ME 476 Computer-Aided Design 3
ME 480 Modern Mfg. Processes 3
ME 405/505 Mechatronics System Design 3
Humanities/social science elective\(^5\) 3
Math/science elective\(^3\) 3
Total credits for the semester 18

Minor in Mechanical Engineering

The minor in mechanical engineering (ME) consists of six courses (18 credits) from the following list or any additional ME courses approved by the ME department chair.

ES 212 Mechanics of Materials
ME 236 Thermodynamics I
ME 337 Thermodynamics II
ME 280 Manufacturing Processes
ME 340 Fluid Mechanics
ME 341 Heat Transfer
ME 352 Kinematic Design for Engineering
ME 370 Elements of Mechanical Design
ME 470 Mechanical Systems and Processes

See Program Requirement Notes, page 328.
ME 350 Vibrations I with Applications
ME 405/505 Mechatronics System Design
ME 430 Heating, Air-Conditioning, and Refrigeration
ME 432 Energy Conversion System Design
ME 433 Solar Energy Design
ME 450/550 Vibrations II
ME 460 Engineering and Envir. Acoustics
ME 461/561 Acoustics Capstone Design
ME 476 Computer-Aided Design
ME 501 Kinematic Linkage Design
ME 504 Dynamics of Machines

Courses are selected with advice from a mechanical engineering faculty member to ensure that they are taken in the necessary sequence.

**Mechanical Engineering Technology Program**

**Program Director:** Orelup

**Mechanical Engineering Technology Program Mission**

The mission of the Mechanical Engineering Technology (MET) program is to provide a student-centered learning environment where students master the mathematical skills, scientific principles, and electro-mechanical engineering technology topics needed to earn a bachelor’s degree in preparation for a successful career in engineering technology as well as in a wide variety of related fields.

**Educational Objectives**

The Mechanical Engineering Technology program prepares men and women for productive, rewarding technical careers in the engineering profession as well as for a wide range of other career paths, such as business, management, and education. During their careers our alumni

1. will become successful practicing engineering technologists in a wide range of technical fields and will advance professionally by accepting responsibilities and, potentially, pursuing leadership roles;
2. will advance their technical knowledge, both formally and informally, by engaging in lifelong learning experiences;
3. will, as contributing members of multidisciplinary teams, successfully apply the fundamentals of mathematics, science, and the latest engineering technology practice to the testing, production, and design implementation of technical devices and systems, as well as to the development of emerging technologies;
4. will carry out their work with due regard for the professional, ethical, and social responsibilities inherent in the practice of engineering technology; and
5. will successfully integrate theory and practical applications.

**Requirements for Bachelor of Science Mechanical Engineering Technology: 129 credits**

**Credits in the major: 57**

**Freshman Year—First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC 111 English I: Expos. Comm.</td>
<td>3</td>
</tr>
<tr>
<td>ET 111 Intro to Eng. Technology</td>
<td>1</td>
</tr>
<tr>
<td>MET 116 Manufacturing Processes</td>
<td>4</td>
</tr>
<tr>
<td>MTH 112 College Algebra for Techs</td>
<td>3</td>
</tr>
<tr>
<td>All-University Curriculum</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

**Freshman Year—Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET 123 Mat. Sci. for Eng. Techs</td>
<td>3</td>
</tr>
<tr>
<td>MTH 122 Precalculus for Techs</td>
<td>3</td>
</tr>
<tr>
<td>ECT 365 Object-Oriented Programming</td>
<td>3</td>
</tr>
<tr>
<td>PHY 120 Algebra-Based Physics I</td>
<td>4</td>
</tr>
<tr>
<td>All-University Curriculum</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

**Sophomore Year—First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 110 College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>MET 236 Statics</td>
<td>3</td>
</tr>
<tr>
<td>MTH 232 Calculus I for Techs</td>
<td>3</td>
</tr>
<tr>
<td>PHY 121 Algebra-Based Physics II</td>
<td>4</td>
</tr>
<tr>
<td>All-University Curriculum</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

**Sophomore Year—Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC 241 English II: Technical Comm.</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/social science elective</td>
<td>3</td>
</tr>
<tr>
<td>MET 243 Mech. of Mat. for Tech.</td>
<td>4</td>
</tr>
<tr>
<td>MTH 241 Calculus II for Techs</td>
<td>3</td>
</tr>
<tr>
<td>All-University Curriculum</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

**Junior Year—First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECT 245 Elec./Electron. Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>ES 220 Graphic Communication</td>
<td>2</td>
</tr>
<tr>
<td>MET 363 Machine Design I</td>
<td>4</td>
</tr>
<tr>
<td>MET 365 Fluid Mechanics I</td>
<td>4</td>
</tr>
<tr>
<td>MTH 352 Diff. Equations for Techs</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credits for the semester</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

**Junior Year—Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECT 355 Indust. Elec. and Actuators</td>
<td>4</td>
</tr>
<tr>
<td>ES 221 Adv. Graphic Comm.</td>
<td>3</td>
</tr>
<tr>
<td>MET 470 Thermo I for Engr. Tech.</td>
<td>4</td>
</tr>
<tr>
<td>Technical specialty</td>
<td>4</td>
</tr>
</tbody>
</table>
| **Total credits for the semester** | **15**

See Program Requirement Notes, page 328.
Senior Year—First Semester
ECT 364 Indust. Instr. and Sensors 4
MET 475 Kinematics and Dynamics 4
Professional elective 3
Professional elective 3
Total credits for the semester 17

Senior Year—Second Semester
MET 482 Senior Design Project 3
MET 484 Automation Systems 4
Professional elective 3
Professional elective 3
Technical specialty 2
Total credits for the semester 17

Minor in Mechanical Engineering Technology
The requirements for a minor in mechanical engineering technology are governed by the Bulletin in effect when the application for the addition of the minor is approved.

The requirements for students matriculated in CETA are listed below.

A minor in mechanical engineering technology is available for students in programs other than MET and ME who have interests and abilities in mechanical engineering technology. Students must announce their intention to minor in mechanical engineering technology any time prior to the end of their junior year. Students interested in this minor must be accepted by the Department of Mechanical Engineering and complete the following courses.

Required Course Work
ES 220 Graphic Communication
ES 221 Advanced Graphic Communication
Using AutoCAD
MET 116 Manufacturing Processes
MET 236 Statics for Engineering Technology
MET 363 Machine Design I
MET 470 Thermodynamics I for Engineering Technology
Total: 6 courses

Students attending other colleges within the University of Hartford may pursue a minor in mechanical engineering technology by taking the six courses listed above. Additional course work may be required in order to meet prerequisite requirements. An overall GPA of 2.0 is required for all the courses. All classes must be taken for a letter grade.

Please check the college website at www.hartford.edu/ceta for updates to the lists of acceptable technical and professional specialties.

See Program Requirement Notes, page 328.
Program Requirement Notes

1. Students are encouraged to supplement their program of study by taking unrestricted electives from any of the colleges in the University.
2. Architecture ET major includes all AET courses.
3. A grade of C or better will be required to advance through the architectural design class sequence: AET 123, AET 233, AET 244, AET 352, and AET 367.
5. The All-University Curriculum (AUC) requires 12 credits, one in each of the following categories:
   • AUCA Living Responsively to the Arts
   • AUCC Living in a Cultural Context: Other Cultures
   • AUCL Living in a Social Context
   • AUCW Living in a Cultural Context Western Heritage
7. Lab science electives include any 4-credit science with a lab (BIO, CH, PHY, and SCI).
8. Technology professional electives are courses that contribute to a student’s career goals and objectives, including courses in architecture, engineering technology, science, mathematics, business, computer science, technology, fine arts, music, and education. Courses from other areas may be taken if approved using a substitution waiver form.
9. Professional electives include courses in engineering, physics, chemistry, biology, and mathematics. Generally, professional electives should be at the 200 level or above.
10. Humanities electives normally include history, art history, music history, cinema, communications (other than applied courses), drama, English and English literature, foreign and modern languages, and philosophy. The social science electives are anthropology, economics, languages, politics and government, psychology, and sociology.
11. Includes all ES, BE, CE, ME, and ECE courses; and CS courses for the computer engineering degree. See page 142 for computer science course descriptions.
12. Environmental professional electives must be selected from the following list:
   • CE 502 Groundwater Hydrology [3]
   • CE 503 Geographic Information Systems in Practice [3]
   • CE 504 Comm. Environmental Regulations and Policy [3]
   • CE 509 Pollution Prevention [3]
   • CE 523 Engineering Hydrology [3]
   • CE 524 Solid Waste Management [3]
   • CH 519 Applied Environmental Chemistry
   • CH 539 Organic Chemistry for Environmental Engineers
   • CE 591 Special Topics in Civil Engineering
13. Senior design project must be an environmental engineering-related subject.
14. ECE electives are ECE 234, 335, 336, or any 400- or 500-level courses. Electrical engineering sequences provide greater depth and understanding of a field or specialty. Typical sequences are given below. Other sequences may be approved by the chair.
15. Controls: ECE 442 and ECE 543
16. Electric Power (ECE 471 and ECE 473), and ECE 572 or ECE 573
17. Communications: ECE 423 and one of the following: ECE 521 or ECE 540
18. Computer Systems: ECE 335 and ECE 336
19. System Simulation: ECE 334 and ECE 335
20. VLSI Design: ECE 565 and ECE 567
21. Computer science elective: Any 300- or 400-level course from the following list:
   • CS 351 Introduction to Artificial Intelligence [3]
   • CS 355 Computer Networks [3]
   • CS 360 Software Development [3]
   • CS 362 UNIX Internals [3]
   • CS 365 Principles of Database Systems [3]
   • CS 371 Computer Graphics [3]
   • CS 375 Internet Programming Concept [3]
   • CS 451 Computer Operating Systems [3]
22. Electronics ET major includes MET 484 and all ECT courses.
23. Technical specialties are upper-level courses in the major. Acceptable specialties for Networking/Communications concentration are ECT 300- or 400-level courses, ET 380 and 480. Acceptable specialties for mechatronics concentration are ECT 300- or 400-level courses, ET 380, 480, and MET 484.
24. Computer ET major includes CS and ECT courses.
25. Technical specialties are upper-level courses in the major. Acceptable specialties are CS 320, 330, 331, 340, 351, 355, 360, 362, 365, 371, 375, 451, ET 380, 480, ECT 300- or 400-level courses.
26. Audio ET major includes AUD, COM, ECT, ES, MET, MPT, and TH courses.
27. Technical specialties are upper-level CETA and Hart School courses in the major. Acceptable specialties are AUD 462, 463, 466, 467, 471, COM 462, 463, 466, 467, CS 220, 320, 330, 331, 340, 351, 355, 360, 362, 365, 371, 375, ET 380, 480, ECT 323, 242, 300- or 400-level courses; MET 300- or 400-level courses; TH 210, 211, 245, 330, 410, 420, 421, 422, 435, 455.
28. Six optional credits in recording studio techniques.
29. Mechanical ET major includes ECT, ES, ME, and MET courses.
30. Technical specialties are upper-level courses in the major. Acceptable specialties are ME 505, MET 364, 472, 473, 474, 481, and 483.
31. This figure could increase to 21, depending on choice of electives.
32. This elective must be chosen from courses at the 200 level or above.
33. Acceptable courses in the energy engineering and sustainable design concentration (only one course is acceptable outside ME program courses as valid toward the concentration):
   • ME 430 Heating, Air-Conditioning, and Refrigeration
   • ME 432 Energy Conversion System Design
   • ME 433 Solar Energy Design
   • ME 461/561 Acoustics Capstone Design
   • ME 500 Convective Heat and Momentum Transfer I
   • ME 506 Principles of Combustion
   • ME 509/ME 409/CE 509 Pollution Prevention
   • ME 530 Gas Dynamics
   • ME 531 Gas Turbine Analysis
   • CE 300 Engineering Economics
   • CE 420 Water Quality Engineering I
   • CE 502 Groundwater Hydrology
   • CE 504 Connecticut Environmental Regulations and Policy
   • CE 524 Solid Waste Management
   • ECE 470 Electromechanical Energy Conversion
34. Must be any 200-level or above engineering course (BE, CE, ECE, ES, ME).
35. Must be courses at the 200 level or above in engineering or related majors as outlined in approved program of study.
Course Descriptions
The course numbering system is described on page 67.

Not all courses listed in this Bulletin are offered each year. Offerings for each semester and the summer sessions are listed in class schedules that are available from the Office of the Dean and the Office of the Registrar during each registration period.

Certain courses will require a minimum grade in courses listed as prerequisites, usually a C-. Students are urged to check course descriptions carefully to determine where this requirement applies to their programs.

In addition to the courses listed below, the college regularly develops and offers special topics courses (STW and ES 591) in areas of particular interest. Special topics courses to be offered in a subsequent semester are announced prior to registration in the preceding semester.

Courses at the 500 level are open to students with senior status who meet the course prerequisites.

AET 110 Introduction to Architectural Graphics [4] This course focuses on integrating lectures and studio classes to help students understand the methods, media, and materials used in the communication of design. Students practice graphic and verbal presentation techniques. Construction techniques in relation to construction documents—plans, elevations, sections, details, and specifications—are presented. Two lecture hours, six lab hours. Laboratory fee.

AET 123 Architectural Design I [4] An introductory course with an emphasis on the architectural responses to people’s basic needs for shelter. At the fundamental level, these needs, physical, psychological, sensual, intellectual, cultural, and aesthetic are met through physical design. Emphasis is placed on problem solving through studio activity and relating architectural theory and criticism to the studio. Two lecture hours, six lab hours. Prerequisite: AET 110 or permission of instructor or chair. Laboratory fee.

AET 155 Ancient through Renaissance Architecture [4] This course examines the roots of the Western architectural tradition, starting with the prehistoric and primitive developments in Europe and the ancient Near East and continuing through Egypt, Greece, Rome, Byzantium, and Western Europe through the Renaissance period. An understanding of Ancient, Classical, Medieval, and Renaissance styles is developed through lectures, slides, videos, and sketching. Four lecture hours.

AET 156 19th- and 20th-Century Architecture [4] This course examines the roots of the contemporary Western architectural tradition, starting with the early 19th century through the late 20th century. An understanding of Neo-Classical, Industrial, Arts and Crafts, Art Nouveau, Art Deco, Modern, Post-Modern, and Neo-Modern styles is developed through lectures, slides, videos, and sketching. Four lecture hours. Prerequisite: AET 155 or permission of instructor or chair.

AET 232 Materials and Methods of Construction and Documentation [4] Using multimedia lecture formats as well as construction-site observation, materials and methods of construction will be studied in depth. The consequences, costs, and technology of construction materials from concrete through masonry, steel, and finishes will be explored. Professional office organization and the integration of other disciplines are studied. The further development of CAD skills and techniques is included. Two lecture hours, six lab hours. Prerequisites: AET 110 and AET 123. Laboratory fee.

AET 233 Architectural Design II [4] This course focuses on the design of small buildings with emphasis on schematic and presentation drawings and model building. The course will explore the analysis and synthesis of architectural form generated by program requirements, physical systems, spatial organization, available technologies, and review of historic precedents and aesthetics. Two lecture hours, six lab hours. Prerequisites: AET 110 and AET 123, or permission of instructor or chair. Laboratory fee.

AET 237 Architectural Design Vertical Studio I [4] This design studio explores architectural processes, concepts, theories, analysis, and precedence for architecture students entering the second or third year. Using a series of design exercises, sketching, model building and visual representation, students explore architectural design and develop their individual design and presentation skills. This studio satisfies the requirements of AET 123 Architectural Design I, AET 233 Architectural Design II, or AET 244 Architectural Design III through appropriate content and assignments specific to the level of each student. Prerequisites: AET 110, AET 155, and AET 156; or permission of instructor. Laboratory fee.
AET 241 Principles of Mechanical, Electrical, and Plumbing Systems [4] This course focuses on the integration of environmental control systems in architecture. The course explores factors affecting comfort, health, and safety. The fundamentals of heating, ventilation, air conditioning, electrical systems, lighting, water supply, plumbing, drainage, and acoustics are studied. Applicable code requirements and energy conservation measures are included. Four lecture hours. Prerequisites: MTH 112 and PHY 121, or permission of instructor or chair.

AET 242 Construction Documents [4] Emphasizing the use of graphics as a problem solving tool, with particular focus on computer documentation, students develop an outline set of construction documents for a steel and concrete project. Students will prepare documents for one major project through the intermediate development of sketch exercises. Supplementary lectures on building codes, legislation, construction techniques, detailing, and the integration of other disciplines are given. Site visits to local construction projects and professional offices provide a connection between lecture/lab and real-world applications. Two lecture hours, six lab hours. Prerequisite: AET 232 or permission of instructor or chair. Laboratory fee.

AET 243 Introduction to Architectural Theory [3] This course presents the philosophical underpinnings and major themes of architectural theory along with their historical context. An interdisciplinary look at the people, ideas, and events that shaped contemporary architecture culture. A survey of the debates that have had, and continue to have, a profound influence on our understanding of aesthetics as applied to space. A conversation about the basic human values that shape our interaction with the places in which we dwell, work, learn, and socialize. Topics range from the study of specific philosophical periods or schools of thought regarding design to the diverse trends in current architectural thinking. Three lecture hours. Prerequisite: AET 233 or permission of instructor or chair.

AET 244 Architectural Design III [4] An architectural studio course that will focus on the preliminary design, schematic design, and design development of an institutional building. Emphasis will be placed on developing the student’s ability to research, analyze, and evaluate information as the design evolves. Students will prepare a major institutional project for review by visiting professionals and faculty. Two lecture hours, six lab hours. Prerequisite: AET 233 or permission of instructor or chair.

AET 248 Introduction to Architectural Model Building [3] An introduction to the theory and craft of model-making. Topics include modeling techniques as applied to a variety of materials. Different model types used throughout the design process are identified, investigated, and implemented in an illustrative project. Two lecture hours, two studio hours. Prerequisites: AET 123 and AET 233.

AET 250/CE 250 Introduction to Geomatics [3] Theory and practice of plane surveying, units, errors in observations, leveling, distance and angle measurements, traverse computations, mapping, field projects. Defining GIS, spatial data modeling and analysis, ArcGIS lab exercises and project. Prerequisite: General knowledge of geometry and trigonometry. Laboratory fee.

AET 300/CE 300 Engineering Economics [3] The study of the time-money relationship; the evaluation of alternate architectural/engineering projects based on equivalent annual cash flow, rate of return, and present-worth criteria; incremental analysis in selection of alternate architectural/engineering projects; depreciation; critical path analysis; estimating; use of spreadsheets. Prerequisite: Junior standing or permission of instructor.

AET 340/CE 340 Construction Management [3] Relationships between owner, designer, and contractor; forms of contracts and methods of payment; construction bonds and insurance; construction costs and accounts; applicable laws and union regulations; overview of the construction industry.

AET 343 Principles of Landscape Architecture [4] The built environment is composed of both the buildings and the land around them. Landscape architecture focuses on the design of exterior places that affect our everyday experiences. Based on design principles for architecture, this course introduces the student to how these principles are used beyond the building facade. Two lecture hours, six studio hours. Prerequisite: AET 233 or permission of instructor.

AET 352 Architectural Design IV [4] An architectural studio course with a focus on the design of buildings with an increased complexity and scale in a contextual setting. A systematic site and environmental analysis and design of a preliminary master plan will be followed by an
architectural project exploring the formal and functional fundamentals of design. Two lecture hours, six lab hours. Prerequisite: AET 244 or permission of instructor or chair. Laboratory fee.

AET 353 Site Planning and Development [4] This course introduces the concepts used in determining the appropriate use of building sites, including site surveys, topography, drainage, site utilities, zoning, wetlands, land-use issues and massing of buildings, roads, parking, and open spaces. Includes introduction to soil analysis, plantings, and landscaping. Students are required to conduct field investigation and site visits as part of their laboratory work. Three lecture hours, three lab hours. Prerequisites: AET 241, AET 242, and AET 244; or permission of instructor or chair. Laboratory fee.

AET 355 Engineering Mechanics for Engineering Technology [4] Theory and application of engineering mechanics are studied. The use of free-body diagrams and static equilibrium of forces is emphasized. Included are moment of force, resultant of forces, couple systems, and transmissibility of forces. The relation between externally applied loads and induced internal forces within structural members is investigated. Analysis of statically determinate structures, such as trusses and beams, is studied. Axial, shear, and bending-moment diagrams and their relationship are introduced. Three lecture hours, three lab hours. Prerequisites: MTH 112, MTH 122 and PHY 120, or permission of instructor or chair. Laboratory fee.

AET 356 Introduction to Chinese and Japanese Architecture [4] This course is an introduction to the traditional architectural history and culture of China and Japan through lectures, readings, and films. Building types for both cultures are investigated and compared on a historical level as they relate to political, social, and economic changes. In addition to vernacular types, outside influences and their impact on these building types are explored. City planning for both cultures is studied in terms of organization and transformation into the modern cities that exist today. Four lecture hours. Prerequisite: AET 110 or permission of instructor, director, or chair. Laboratory fee.

AET 358 Architectural Computer Modeling and Rendering [4] This course will take the student from initial architectural computer 3-D modeling theory and techniques through “walk-throughs,” “fly-bys,” and animation. The focus will be on creating presentations that represent project goals. The goals include space representation, materials selection and representation, lighting, visualization and presentation image hierarchy. These goals will be accomplished with a series of short exercises and culminate in a final project. The final project will bring all the course material together in a single presentation. Students will have the option of recording their final project on videotape for portfolio enrichment. The overriding focus will be on using computers in presenting architectural projects in the real world. Two lecture hours, four lab hours. Prerequisites: AET 233 and AET 242, or permission of instructor or chair. Laboratory fee.

AET 359 Advanced Construction Documents [4] This course explores the relationship between an architect’s design intention and the types of drawings and other documents an architect must produce to realize that intention through the construction of the building. Students develop a full set of construction documents for a small project. While the documents include site plan, floor plans, elevations, and building sections, other drawing types, including extensive details, are explored and developed. Prerequisite: AET 242 or equivalent.

AET 362 Advanced Computer Applications in Architecture [4] Using software currently used in professional offices, students will understand the application of the software and how the software can be interlaced; students will develop their own applications. Laboratory exercises will parallel lecture material. A culminating project will be expected, showing a major application interlacing the various software. Software includes CAD, spreadsheets, database, scheduling, graphics, and Web. Two lecture hours, six lab hours. Prerequisites: AET 242 and MTH 241.

AET 364 Strength of Materials and the Design of Wood Structures for Engineering Technology [4] This course is a continuation of AET 355 with the additional application of the design of wood structures. Discussed are stress-and-strain distributions over the critical cross-section of structural members subjected to axial forces, bending moments, and/or torsion. The stress-strain relationship for an axially loaded member is investigated experimentally and analytically. Interrelation between normal stress and shear stress is also analytically and graphically studied. Analysis of statically indeterminate structures using deformation compatibility is introduced. Shear and moment diagrams are
reviewed in depth as a continuation from AET 355. Beam-deflection calculation methods are discussed, with emphasis on using the moment-area method. Use of computers through spreadsheet programming is required. Three lecture hours, three lab hours. Prerequisites: AET 355, MTH 112, MTH 122, MTH 232, and PHY 120; or permission of instructor or chair. Laboratory fee.

**AET 366 Sustainable Design** [4] This course presents sustainable design and construction goals, processes, and strategies with a focus on larger commercial and institutional buildings. Two lecture hours and four studio hours. Prerequisites: AET 232 and AET 242, or permission of instructor.

**AET 371 Architectural Design V** [4] An architectural studio course with a focus on the analysis of the urban condition. Students work in groups to analyze a city, a neighborhood, and a specific site. The final project incorporates the findings from this analysis and transforms the designated site into a large-scale, mixed-use facility. Through a coherent mix of urban design readings, architectural theory, and precedents, students examine the historical overview of the growth of cities coupled with studio projects in the design of urban environments. The analysis of an urban condition reveals connections between living and working in a contemporary city. Two lecture hours, six studio hours. Prerequisite: AET 352. Laboratory fee.

**AET 373 Interior Architecture** [4] This course explores the fundamentals of interior design. It discusses the relationships between architecture and its component interior environment. Topics include interior planning concepts, lighting, materials, furniture selection, mechanical systems, and the conceptual integration of interior and exterior architecture. Two lecture hours, six studio hours. Prerequisite: AET 244.

**AET 384 Issues in Preservation** [4] This course offers an introduction to the basic issues in preservation theory, technology, and practice through a combination of lectures in the history of building and through an examination of local and regional architecture. Four lecture hours. Prerequisites: AET 244 and upper-level elective, or permission of instructor.

**AET 442/CE 442 Construction Planning and Scheduling** [3] Network of events and activities; CPM calculations; Gantt chart; scheduling calculations, resource leveling, resource allocation, and time-cost trade-offs; cash flow of projects and corporations; optimization of cost, profit, or product; computer application of cost control. Prerequisite: Upperclass standing.

**AET 470 Architectural Programming** [3] Client requirements, user needs, types of use, space needs, performance criteria, budget, site analysis, and prototypes will be assessed in the context of an architectural program. The resultant document will become a working tool for the Senior Design Thesis. Three lecture hours. Prerequisite: Senior-level semester prior to thesis, or permission of instructor or chair.

**AET 471 Independent Studies** [4] Theoretical research on a specific topic identified by the student and accepted by the department faculty and chair. Topics may include structural systems, mechanical systems, architectural design methodologies, a specific style of architecture, and other areas as applicable. Prerequisite: AET 352.

**AET 472 Architectural Design VI** [4] An advanced architectural design studio with an emphasis on the principles and practices of sustainable design, including LEED criteria and process. The integration of sustainable design strategies, materials, assemblies, and technology is discussed. Issues engaging the building site/context are researched and addressed in the studio through a selected range of project types and scales. Prerequisites: AET 241, AET 242, and AET 371. Two lecture hours, six lab hours. Laboratory fee.

**AET 473 Architectural Rendering and Portfolio Development** [4] This course is concerned with the mechanics of presentation drawing and portfolio preparation. The students are required to organize a comprehensive assemblage of architectural work through the intensive study of graphic principles and representation techniques. Two lecture hours, four lab hours. Prerequisite: AET 233 or permission of instructor or chair. Laboratory fee.

**AET 474 Design of Steel Structures for Engineering Technology** [4] Behavior and design of steel structural members and connections using Load and Resistance Factor Design (LRFD) method are studied. Structural design of tension members and beams is discussed. Analysis and design of columns, including slenderness effects, are studied. Members under combined forces also are discussed. Member stability and structural stability issues are investigated using effective length factors. Design of bolted, riveted, and welded connections are studied. General details of steel buildings are discussed. Laboratory includes design sessions as well as experi
ments with steel components. Three lecture hours, three lab hours. Prerequisites: AET 355, AET 364, MTH 112, MTH 122, MTH 232, MTH 241, and PHY 120; or permission of instructor or chair. Laboratory fee.

AET 481 Professional Practice [4] This course is an introduction to contemporary American professional architecture practice. The course focuses on the design and construction process, the architecture firm, the markets for architectural services, the work of architecture firms, and the professional context of the architect. Four lecture hours. Prerequisite: Upper-level standing or permission of instructor or chair.

AET 484 Design of Concrete Structures for Engineering Technology [4] Theory and application of design concepts of reinforced concrete structures are studied. Flexural analysis and design of rectangular beams and T-beams, including serviceability requirements, are thoroughly studied. Behavior and design of one-way slabs are investigated and related to those of rectangular beams. Bond stresses, development lengths, and splicing requirements are also studied. Slenderness effects on the analysis and design of columns are investigated. Isolated spread footings as well as retaining walls are introduced. Laboratory includes design sessions as well as experiments. Three lecture hours, three lab hours. Prerequisites: AET 355, AET 364, MTH 112, MTH 122, MTH 232, MTH 241, and PHY 120. Laboratory fee.

AET 485 Seminar on Architectural Topics [3] Discussion of the historical roots of contemporary architectural thought and the possible future directions of the profession. Critical analysis of architectural movements. Prerequisite: Upper-level standing or permission of instructor or chair. Three seminar hours.

AET 486 Architectural Monuments [3] This is a study-abroad course that focuses on a sampling of the most significant structures in the history of architecture. The course is designed for students who wish to study examples of architectural history in direct contact with the historic structures. Students are required to sketch, diagram, photograph, and understand these structures while documenting their work with an architectural portfolio project and a research paper. Students travel to and tour these historic structures with the instructor. Prerequisite: AET 155 and AET 156, and permission of instructor.

AET 489 Senior Capstone Project [4] Senior Capstone Project is the culmination of a student’s career in all tracks of the AET major. Following approval by the faculty, students work on a project of their choice. Depending on the student’s goals, the project could be focused on design, construction management, a research paper, or some other capstone-level project. One lecture hour, seven studio/lab hours. Prerequisite: Senior standing, second semester. Laboratory fee.

AUD 110 Music for Audio Engineering Technology I [2] This course covers basic music theory as needed by audio engineering technologists. The emphasis is on development of listening skills as well as basic performance skills. Besides music theory, students will gain an appreciation of classical and contemporary music and their underlying structure, learn to sight-sing simple musical pieces, and learn to use computer software to manipulate music electronically. Three contact hours.

AUD 111 Music for Audio Engineering Technology II [2] This course continues the coverage of basic music theory as needed by audio engineering technologists. The emphasis is on development of listening skills as well as basic performance skills. Besides music theory, students gain an appreciation of classical and contemporary music and their underlying structure, learn to sight-sing simple musical pieces, and learn to use computer software to manipulate music electronically. Three contact hours.

AUD 122 Audio Recording Principles for Engineering Technology [2] This course introduces first-year students to the use, operation, and maintenance of a modern recording studio. Fundamental concepts found in audio recording are presented, along with several projects that are based in the CETA recording studio. Microphone usage, mixing board operation, digital tape recording, and the digital audio workstation are investigated.


AUD 266 The Art of the Audio Mix for Engineering Technology [3] The third in the series of courses that extensively uses the CETA audio recording studio. Students continue to work with the hardware mixing consoles and audio processing devices. Additionally, students
learn mixing and processing techniques using software-based digital audio workstation technologies, such as Nuendo, Pro-Tools, or their equivalent. These technologies are used to explore techniques aimed at refining and perfecting the audio mix. Practical, hands-on experience is gained through the completion of several studio-based projects. Prerequisites: AUD 161 and ECT 111.

AUD 362 Audio System Integration for Engineering Technology [4] Introduction to the integration and maintenance of all electronic systems, including recording facilities and live sound systems. Extensive hands-on experience with studio/sound system hardware test equipment is stressed. Corequisite: ECT 352. Prerequisite: AUD 161 or permission of instructor.

AUD 382 Principles of Magnetic Recording for Engineering Technology [3] This course stresses the use, maintenance, and design of magnetic recording devices and media. Tape and diskette-based storage is studied, as well as the operation and repair of tape recorders and disk drives. Magnetic field theory, tape and disk transport mechanisms, tape head design, and servo control are investigated. Prerequisites: AUD 362, MTH 241, ECT 241, and ECT 122; or permission of instructor.

AUD 384 Digital Audio Systems [3] This course covers the underlying concepts of modern digital audio systems. Topics such as sampling, dithering, aliasing, filtering, quantization, and granular synthesis are discussed as they apply to digital audio systems. Application of these concepts, using both hardware and software tools in a production environment, is emphasized. Students enrolling for this course are expected to have a working knowledge of sound production, audio systems, music theory, and computer programming. Prerequisites: AUD 362 and AUD 382 (corequisite).

AUD 462 Advanced Audio Production [3] The course covers topics such as broadcast audio and recording techniques, the use and detailed knowledge of the capabilities of the modern DAW platforms, digital recording consoles, and advance techniques for digital audio workstations. Prerequisite: Permission of instructor.

AUD 471 Senior Project [3] This course gives audio engineering technology students experience in implementing a design into a product/system that could be used in the music/sound production setting. Projects may be hardware or software intensive and are chosen by students in consultation with a faculty member. A written presentation and an oral presentation are required. Prerequisite: Senior standing.

BE 260W Biomedical Engineering Materials [3] Materials analysis as related to biomedical engineering. Structural properties of materials, current practices, and laboratory experiments to determine the properties of materials used in biomedical engineering. Materials examined include metals, plastics, and biological materials. Topics include the molecular structures of these materials and mechanical properties, such as tensile, compressive, torsional, and fatigue, as well as other properties. Statistical methods are presented. The course consists of one lecture and one lecture/laboratory per week. Student groups meet with instructor each week outside of class to review laboratory journal-style report drafts. This is a writing intensive course. Pre- or corequisite: ES 212. Laboratory fee.

BE 281 Biomedical Engineering Seminar I [1] A survey of current knowledge and techniques in related areas, such as artificial organs, biomaterials, research techniques, etc. Presentations by guest lecturers. Prerequisite: Sophomore standing.

BE 301 Biomechanics [3] The study of forces acting in the extremities and axial skeleton; stress strain behavior of bone, tendons, ligaments, and cartilage; lubrication of joints; mechanics of fracture fixation; mechanics of bone-prosthesis interaction; and prosthesis design. Prerequisites: ES 211, ES 212, and M 240.


BE 381 Biomedical Engineering Seminar II [1] A continued survey of current knowledge and techniques in related areas, such as artificial organs, biomaterials, research techniques, etc. Presentations by guest lecturers. This course combines with BE 281 to present a two-year sequence of topics. Prerequisite: BE 281.

BE 401 Bioinstrumentation [3] Modeling, analysis, and operation of transducers, sensors, and electrodes for physiological systems; operational and instrumentation amplifiers for bioelectric event signal processing and interface; A/D converters, hardware and software princi
samples related to sampling, processing, and display of biosignals and digital computers. Prerequisite: ECE 360. Laboratory fee.

BE 460, 461 Biomedical Engineering Design Project I, II [3, 3] Senior-level design project, two-semester sequence. Over the course of two terms, students work on projects of biomedical engineering design originated by faculty or external mentors. Students develop a proposal, then design (or redesign) and construct a biomedical device, process, or system. A formal, written presentation of the project is expected, along with an oral presentation of the completed project. This is a major design experience based on the knowledge and skills acquired in earlier course work, and incorporating engineering standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturing, ethical, health and safety, social, and political. Course lecture component includes design methodology (including probability and statistics), cost estimation, and safety. Prerequisite: Senior standing in biomedical engineering. Laboratory fee.

BE 480 Biomedical Engineering Practicum [3] Senior-level practicum. Students are placed in medical research laboratories to learn the requirements of off-campus biomedical engineering research (such as research laboratories, clinical engineering facilities, or biomedical device industries). Involvement with daily activities under the direction of a faculty member and external mentor is expected. Students are expected to keep a daily log of activities and write a final report on their efforts. Prerequisite: Senior standing or permission of instructor. Required of all undergraduate biomedical engineering students.

BE 485 Biomedical Engineering Research [3] Senior-level research. Students are placed in medical research laboratories to achieve a research goal under the co-direction of the faculty advisor and the director of the research laboratory. The specific research project will be determined during consultation of the student with the faculty and research advisor. Students are expected to keep a daily log of activities and write a final report on their efforts. The final report will be of a style suitable for journal publication. Prerequisite: Senior standing or permission of instructor. Required of all biomedical engineering students.

CE 250/AET 250 Introduction to Geomatics [3] Theory and practice of plane surveying, units, errors in observations, leveling, distance and angle measurements, traverse computations, mapping, field projects. Defining GIS, spatial data modeling and analysis, ArcGIS lab exercises and project. Prerequisite: General knowledge of geometry and trigonometry. Laboratory fee.

CE 260W Civil Engineering Materials Laboratory [3] A course required for students in civil engineering. Structural properties of materials, current practices and laboratory experiments to determine the properties and behavior of metals and concrete. Topics include the molecular structures of the materials and mechanical properties, such as tension compression, torsion, and fatigue, as well as other properties. The course consists of one lecture and one laboratory per week. Student groups meet with instructor each week outside of class to review laboratory journal-style report drafts. This is a writing intensive course. Pre- or corequisite: ES 212. Laboratory fee.

CE 300/AET 300 Engineering Economics [3] The study of the time-money relationship; the evaluation of alternate engineering projects based on equivalent annual cash flow, rate of return, and present-worth criteria; incremental analysis in selection of alternate engineering projects; depreciation; critical path analysis; estimating; use of spreadsheets. Required of civil engineering students. Prerequisite: Junior standing or permission of instructor.

CE 310 Elementary Structural Analysis [3] Reactions and analysis of beams, trusses, and frames; shear and moment diagrams; influence lines; deflections. Prerequisites: ES 212 and M 145. Laboratory fee.


CE 312 Structural Steel Design for Engineers [3] Analysis and design of structural steel beams, girders, columns and connections, emphasis on bridge and building applications; elastic and plastic design methods. Prerequisite: CE 310. Laboratory fee.
CE 320 Water Resources Engineering [4] (ENV) Review of fundamentals of fluid mechanics, descriptive and quantitative hydrology, groundwater, pressure conduits, open-channel flow, hydraulic machinery, river engineering, flood frequency and control. Laboratory work, written and oral presentation of results included. Prerequisite: ES 320. Laboratory fee.

CE 330 Geotechnical Engineering I [4] Fundamentals of soil behavior, subsurface exploration, distribution of stress in soils, flow nets, consolidation, strength and stability characteristics of soils, lateral earth pressure. Laboratory work, written and oral presentation of results included. Prerequisite: ES 212. Laboratory fee.

CE 340/AET 340 Construction Management [3] Relationships between owner, designer, and contractor; forms of contracts and methods of payment; construction bonds and insurance; construction costs and accounts; applicable laws and union regulations; overview of the construction industry.

CE 410 Reinforced Concrete Design [3] Analysis and design of reinforced concrete beams, columns, and slabs using the ultimate strength design method. Written and oral presentations of results included. Prerequisite: CE 310. Laboratory fee.

CE 420 Water Quality Engineering I [4] (ENV) Physical, chemical, and biological theories of water treatment and wastewater treatment and disposal; operational principles of various treatment plant components; state and federal regulatory standards. Laboratory work, written and oral presentations of results included. Prerequisites: ES 320 and CH 110-111. Laboratory fee.

CE 442/AET 442 Construction Planning and Scheduling [3] Network of events and activities; CPM calculation; Gantt chart; scheduling calculations, resource leveling, resource allocation, and time-cost trade-offs; cash flow of projects and corporations; optimization of cost, profit, or product; computer application of cost control. Prerequisite: Upperclass standing.

CE 452 Transportation Engineering I [4] Planning of urban and rural transportation systems, analysis of highway capacity and alignments, design of the horizontal and vertical alignments of roads and highways. Design and analysis of traffic control systems. Airport design. Issues in transportation safety and freight transportation. Laboratory applications of specialized computer software; design and analysis projects. Prerequisite: CE 250. Laboratory fee.

CE 460 Civil Engineering Design Project [4] Team approach to the solution of a civil engineering problem posed by local engineering practitioners; proposal, design, written and oral presentations of the completed project; design function to include alternative solutions, cost estimates, and feasibility. Prerequisite: Senior standing. Laboratory fee.

CE 500/ME 510 Advanced Mechanics of Materials [3] Relationships between stress and strain at a point; introduction to theory of elasticity; yield and fatigue failure theories; stress concentrations; unsymmetrical bending; shear center; torsion of hollow, thin-walled sections; introduction to finite elements. Required for civil engineering option in the Master of Engineering degree program. May be taken as a professional elective by civil and mechanical engineering undergraduates. Prerequisites: ES 212 and M 242, or equivalent.

CE 501 Advanced Structural Design [3] Design of prestressed concrete structural members. Plate girder design. Plastic design of steel beams and frames using the Load and Resistance Factor design method. Computer applications. Required for civil engineering option in the Master of Engineering degree program. May be taken as a professional elective by civil engineering undergraduates. Prerequisites: CE 312 and CE 410, or equivalent; and senior or graduate standing. Laboratory fee.

CE 502 Groundwater Hydrology [3] (ENV) An applied course dealing with groundwater hydrology and its interrelation with surface water; well hydraulics, pumping tests and safe yield of aquifers, and some modeling of groundwater flow. Elective for the environmental option in the Master of Engineering program. May be taken as a professional elective by civil engineering undergraduates. Prerequisites: ES 320 or ME 340 or equivalent; and senior or graduate standing. Laboratory fee.

CE 503 Geographic Information Systems in Practice [3] (ENV) Fundamentals of the ArcView GIS System; spatial data acquisition and manipulation, database creation and management, raster vs. vector GIS, integration of the Global Positioning System (GPS) technology into GIS practices, network analysis, GIS applied to solve engineering problems. Prerequisite: Senior or graduate standing in engineering, or permission of instructor. Laboratory fee.
CE 504 Connecticut Environmental Regulations and Policy [3] (ENV) Examination of federal and Connecticut state laws, state policies, and state statutes that industry must observe to be in compliance with the DEP’s permitting and enforcement programs. The Clean Water Act and the Resource Conservation and Recovery Act are examined and assessed for their strengths and weaknesses, as is Connecticut state statute 22a-454. Prerequisite: Senior or graduate standing in engineering, or permission of instructor.

CE 507/ME 507 Finite Element Analysis [3] Principles and applications of finite element method. The principle of virtual work is used to develop finite element equations for the representation and analysis of engineering structures. Hand calculations and computer modeling are used to analyze two- and three-dimensional constructs. May be taken as a professional elective by senior civil and mechanical engineering undergraduates. Prerequisite: Senior or graduate standing in civil or mechanical engineering, or permission of instructor. Laboratory fee.

CE 509/ME 509 Pollution Prevention [3] (ENV) Assessment of pollution prevention technologies and lean manufacturing techniques used in industry to reduce waste generation. Understanding of how to implement pollution prevention into daily operations and analysis of capital investments to minimize waste. Prerequisite: Senior or graduate standing in engineering, or permission of instructor.

CE 510 Simulation and Modeling of Transportation Systems [3] Principles and applications of traffic simulation models for planning, designing, and operating of transportation systems. Topics include the development, calibration, and validation of simulation models; the use of simulation models for traffic control and optimization strategies; the statistical design and analysis of simulation experiments; and the use of simulation models for performance measures analysis. May be taken as a professional elective by undergraduate civil engineering students. Prerequisites: Graduate or senior standing with CE 452, or permission of the instructor. Laboratory fee.

CE 512 Traffic Flow Theory and Analysis [3] Fundamentals of traffic flow theory are developed. Topics are the characteristics of macroscopic and microscopic traffic flow, the statistical distribution of traffic flow parameters, traffic stream models, car-following and continuum-flow models, shock wave analysis, queueing analysis, and traffic signal control and optimization. May be taken as a professional elective for senior civil engineering undergraduates. Prerequisites: Graduate or senior standing with CE 452, or permission of the instructor.

CE 514 Urban Transportation Planning [3] Methodologies for planning multimodal transportation systems, trip generation, trip distribution, mode choice, traffic assignment, travel demand and network modeling, interrelationship of transportation and urban environment, data sources and collection, transport legislation and financing. Introduction to travel-demand software and the use of geographic information systems. May be taken as a professional elective for senior civil engineering undergraduates. Prerequisites: Graduate or senior standing with CE 452, or permission of the instructor. Laboratory fee.

CE 523 Engineering Hydrology [3] (ENV) The hydrologic cycle, Reynolds Transport Theorem, precipitation, stream flow, introduction to groundwater, hydraulic and hydrologic routing, data collection and analysis statistical considerations. Primary emphasis is on surface water. Elective for the environmental option in the Master of Engineering program. May be taken as a professional elective by civil engineering undergraduates. Prerequisite: ES 320 or equivalent. Laboratory fee.

CE 524 Solid Waste Management [3] (ENV) Systems approach to solid waste management; re-use, recycling, resource recovery, transportation, storage, and disposal of solid waste. Prerequisite: Graduate standing in engineering or permission of instructor.

CE 530 Geotechnical Engineering II [3] The application of the principles of soil mechanics to the design of footings, retaining walls, pile foundations, caissons, and sheet piles; foundations on difficult soils and problems dealing with foundation settlement will be investigated. Prerequisites: CE 330 and senior or graduate standing in engineering, or permission of instructor.

CE 591 Special Topics in Civil/Environmental Engineering [1–6] Selected topics in civil/environmental engineering at the graduate level. Significant topics in the field will be chosen on the basis of student and faculty needs and interests. Prerequisite: Graduate standing or permission of instructor.
ECE 210 Introduction to Electrical Engineering [3] The nature of resistance, inductance, and capacitance; Ohm’s and Kirchhoff’s laws; DC circuit analysis using nodal, mesh, and loop analysis; Thevenin’s and Norton’s theorems, and superposition; steady-state analysis of single-phase AC circuits; binary number system; Boolean algebra; and combinational logic circuits. Analysis, design and minimization. No credit given to electrical or computer engineering students. Prerequisites: ES 115, M 145, and PHY 113.

ECE 213 Electric Circuit Analysis [3] Introduction to DC circuit analysis; Ohm’s law; Thevenin, Norton, and superposition theorems; loop and nodal analysis; transient behavior of RC, RL, and RLC circuits; steady-state AC behavior of RLC circuits. Prerequisites: ES 115, M 145, PHY 113, and M 242 (may be taken concurrently).

ECE 214 Electric Circuit Analysis II [3] Introduction to computer-based circuit analysis, AC nodal and mesh analysis, network theorems, filters, mutual inductance, multiphase circuits, transformers, two-port networks, Fourier series. Prerequisites: ECE 213 (minimum grade of C–) and M 242.

ECE 215 Circuits Laboratory I [1] An introduction to DC circuits laboratory. Experiments include Ohm’s law, Kirchhoff’s law, Thevenin’s and Norton’s theorems, transient behavior of RC circuits. An introduction to computer-aided circuit analysis and design. Must be taken concurrently with ECE 213. Laboratory fee.

ECE 216 Circuits Laboratory II [1] An introduction to AC circuits laboratory. Experiments include RC transient response, second-order circuits, active filters, and magnetic circuits. An introduction to computer-aided circuit analysis and design of AC circuits. Must be taken concurrently with ECE 214. Laboratory fee.

ECE 231 Digital System Logic [3] Elementary number systems and codes, Boolean algebra, circuit minimization, combinational and sequential circuit analysis and synthesis, medium-scale integrated circuits, state machine tables and charts, hazards. Prerequisite: Sophomore standing.

ECE 232 Digital Laboratory [1] An introduction to digital circuits laboratory. Experiments include truth tables, logic minimizations, Karnaugh maps, flip-flops, sequential circuits, counters. Must be taken concurrently with ECE 231. Laboratory fee.

ECE 234 Digital Design Using CPLDs [3] An introduction to complex programmable logic devices (CPLD). Course teaches digital design, capture, simulation, and verification of complex programmable logic devices. Devices covered will consist of programmable and generic array logic (PAL, GAL) and field programmable gate arrays (FPGA). This course focuses on the design of digital systems and implements them by functional operational modules. The intent of the course is to emphasize the software tools required to achieve desired goals and to prepare students for even higher levels of sophisticated design using hardware development languages, such as VHDL. Prerequisites: ECE 231 and ECE 232. Laboratory fee.

ECE 320 Probabilistic Topics for Computer Engineering [3] Probability, random variables, distribution and density functions, statistics of random variables, sampling and estimation, random processes, Markov processes, correlation functions. Probabilistic methodologies are applied extensively to electrical, electronic, and digital engineering problems; computer programming of probabilistic concepts. Extensive computer assignments are distributed throughout the semester. No credit given to electrical engineering students. Prerequisite: ECE 361.

ECE 332 Microprocessor Applications [4] A lecture course with studio and projects. A typical 8/16 bit microcontroller is used to introduce assembly language and simple hardware interfacing. Development tools include assembler and debugger software, flowcharts, and execution history. Topics include internal organization, memory types, memory maps, and peripherals; may include a universal asynchronous receiver transmitter (UART), analog to digital converter (ADC), timer, stepper motor, LED array, speaker. Super-loop software structure and interrupts are introduced. Studio is instructor led, combining lecture, cooperative learning, and independent action. Students work in small groups. Completion of at least two significant projects outside of scheduled lab and studio time is required. Prerequisite: ECE 231 or familiarity with basic logic circuits. Laboratory fee.

ECE 334 Digital Computing [3] Design of computer programs from problem analysis and numerical methods in engineering and science using digital computer facilities and languages. Topics include structured programming algorithmic processes, interpolation, Monte Carlo, interactive methods, graphical displays, matrix
operations, and differential equations. These
techniques are applied to problems selected
from students’ fields of interest. The computer
language to be used will be published in the
Schedule of Classes. Prerequisites: M 242 and at
least one 2-credit course with a compiled com-
puter language.

computer architecture, including data represen-
tation, instruction formats, data/instruction
transfer, storage, digital arithmetic, control
functions, and input-output facilities; compar-
ison between microcomputers and large-scale
computers; features required for multipro-
cessing, parallel processing, time-sharing, virtu-
al machine, virtual memory, and real-time
systems. Prerequisite: ECE 231 (minimum
grade of C–). Corequisite: ECE 332. Laboratory
fee.

ECE 336 Computer Systems Laboratory [3]
Focuses on the design of a stand-alone, embed-
ded computer system. Introduces advanced con-
cepts in computer architecture; timing, memory
devices, peripheral devices, interrupts and poll-
ing, embedded system software, and design is-
ues (Design for Manufacture [DFM] and
Design for Test [DFT]). Students design, im-
plement, and program a complete embedded
computer system having real-time requirements.
Requisite project reports and demonstrations.
Prerequisite: ECE 332.

ECE 341 Discrete and Continuous Systems
[3] Modeling and analysis of discrete and con-
tinuous linear systems; transfer function models;
discrete and continuous signals; solutions of lin-
ear systems using classical, convolution, and
Laplace/z-transform methods; Fourier series and
Fourier transforms; spectral analysis of continu-
ous, deterministic energy and power signals.
Prerequisites: ECE 214 (minimum grade of C–)
and M 242.

ECE 351 Electromagnetic Field Theory [4]
Introduction to electromagnetic fields; vector
analysis; development of Maxwell’s equations;
Poisson’s and Laplace’s equations; experimental
laws of Coulomb, Gauss, Ampere, and Faraday;
time-varying fields. Prerequisites: ECE 214
(minimum grade of C–), ECE 216 (minimum
grade of C–), and M 240.

ECE 360 Circuits and Electronics [4] Theory,
analysis, and application of diodes, transistors,
and four-terminal devices; circuit models and
mathematical analysis of electronic devices,
including operational amplifiers. Laboratory
included, requiring written reports and oral
presentations. Prerequisites: ECE 210 and
M 242 (may be taken concurrently). Laboratory
fee.

ECE 361 Electronics Fundamentals [3] Semi-
conductor physics, junction diode, bipolar tran-
sistor, and field effect transistor characteristics
and models. Analysis and design of bias circuits
and the basic configurations, such as common
emitter, common base, and the follower circuits.
Emphasis on design practice. Prerequisite: ECE
214 (minimum grade of C–).

ECE 362 Electronic Circuits [3] Continuation
of ECE 361. In-depth study of the analysis and
design of power amplifiers, multistage amplifi-
cers, differential and operational amplifiers,
feedback amplifiers, active loads, and oscilla-
tors. Emphasis on design practice. Prerequisite:
ECE 361 (minimum grade of C–).

ECE 363 Electronics Laboratory I [1] An
introduction to electronics laboratory. Experi-
ments include diode and transistor charac-
teristics, voltage rectification, biasing, single
and multistage amplifiers, h-parameters. Com-
puter-aided electronic circuit analysis and
design are used. Must be taken concurrently
with ECE 361. Laboratory fee.

ECE 364 Electronics Laboratory II [1] An
electronics circuits laboratory course. Experi-
ments include JFET characteristics and amplifi-
ces, operational amplifier characteristics and
use, functional circuits, and power supply de-
design. Computer-aided electronic circuit analysis
and design are used. Must be taken concurrently
with ECE 362. Laboratory fee.

ECE 382 Design I Professional Practice [3]
An introduction to electronic instrumentation
and measurements and how they relate to de-
sign and manufacturing. Course will be project
based. Prerequisites: ECE 332 or ECE 351 or
ECE 361, and junior standing. Laboratory fee.

ECE 420 Random Signals and Noise [3]
Probability, random variables, distribution and
density functions, statistics of random variables,
sampling and estimation, random processes,
correlation functions, spectral density functions,
noise characteristics, random input response of
linear systems, matched filters. Prerequisite:
ECE 341 (minimum grade of C–).

introduction to communication engineering;
study of spectrum of baseband signals; study of
analog pulse modulation; study of bandpass
modulation techniques, including AM, FM,
phase modulation, FSK, BPSK. Laboratory ap-
Applications are an integral part of the course structure. Prerequisite: ECE 362 (minimum grade of C–).

**ECE 435 System Simulation** [3] Digital techniques for dynamic simulation of continuous and discrete systems; stability and accuracy problems; introduction to queuing theory. Software includes MATLAB and VisSim and/or Simulink. Prerequisite: ECE 334 (minimum grade of C–).

**ECE 440 Digital Signal Processing** [3] Introduction: discrete-time systems and signals, z-transform, discrete-time Fourier transform, FIR filter design, IIR filter design, discrete Fourier transform, fast Fourier transform. Must be taken concurrently with ECE 441. Prerequisite: ECE 341 (minimum grade of C–).

**ECE 441 Digital Signal Processing Laboratory** [1] Seven laboratory experiments on digital signal processing will be performed with laboratory notebook write-ups, written reports, and oral presentations. Prerequisite: ECE 341. Must be taken concurrently with ECE 440. Laboratory fee.

**ECE 442 Continuous Control Systems** [3] Continuous-system state-space models; the modeling, analysis, and design of continuous control systems; control components; block diagrams; steady-state and transient analysis; stability criteria; the root locus; frequency response; Nyquist criterion; gain, lead, and lag compensator design. Prerequisites: ECE 341 (minimum grade of C–) and M 220.

**ECE 471 Electrical Engineering Machinery** [3] Principles of energy conversion, phasor diagrams, typical three-phase circuit configurations, equivalent circuit analysis of electrical machines, single and three-phase transformers, electromechanical energy conversion in rotating machines (AC and DC). Prerequisite: ECE 351 (minimum grade of C–).

**ECE 473 Electrical Engineering Machinery Laboratory** [1] Eight laboratory experiments will be performed with laboratory notebook write-ups and required written reports and oral presentations. Corequisite: ECE 471. Laboratory fee.

**ECE 481 Electrical Engineering Special Problems** [1–6] Special investigative projects involving research, design, fabrication, and testing by an individual or a group; written report and oral presentation required for 3 or more credits; credits established in consultation with faculty after submission of project proposal.

Prerequisites: Acceptance of project proposal by a faculty member and permission of department chair.

**ECE 483 Design II for Engineering** [3] A project course for senior electrical engineering majors in which a single significant engineering problem is treated, involving design and development, operation, data reduction, and analysis. Requires a final written report and oral presentation of results. Prerequisites: Senior standing and ECE 382, or permission of instructor.

**ECE 493 Special Topics in Electrical and Computer Engineering** [1–3] A detailed study of a topic of current interest chosen by a faculty member. This course may include lectures, projects, and/or laboratory work. Prerequisite: Permission of instructor. Laboratory fee. (Note: This course is not a substitute for ECE 483 Design II. Topic and instructor will be announced in advance by the department.)

**ECE 521 Communications Theory** [3] Review of signals and networks. Fourier series and transforms, probability, random variables and random processes, base pulse and digital signaling, bandpass signaling techniques and components, performance of communication systems corrupted by noise, signal-space methods in digital data transmission. Prerequisites: Graduate or senior ECE standing with ECE 420.

**ECE 525 Fiber Optics Communications** [3] This is a graduate course that focuses on fiber optic link analysis and design. It covers properties of light, light propagation in optical fibers, optical sources and transmitters, laser and LEDs, detectors/receivers, signal degradation in optical fibers, and fiber optic passive components. Students gain a basic understanding of optics and fiber optics, the concept of signal degradation in fiber, the working theory of sources and detectors, and fiber optic communication system design. Prerequisite: Graduate or senior ECE standing.

**ECE 530 System Design and Implementation** [3] This course focuses on the current usage of EDA (Electronic Design Automation) software design tools used in electronic and computer engineering. Students design, simulate, and implement a complete electronic/computer board system. Students are expected to design a PCB (printed circuit board). Prerequisite: Graduate or senior ECE standing, or permission of instructor; familiarity with analog and digital electronics. Laboratory fee.
ECE 532 Embedded Microprocessor [3] This course involves topics related to embedded, real-time microprocessor systems. It is project oriented, giving students the further opportunity to investigate topics discussed in the course. Projects use a microcontroller. Students are expected to be familiar with the Motorola 68HC11 assembly language and C language programming and with assembly language. Prerequisites: Graduate or senior ECE standing and familiarity with assembly and C languages. Laboratory fee.

ECE 534 VHDL and Applications [3] This class uses VHDL for design, synthesis, simulation, and modeling. Students will learn how to write VHDL models that can be automatically synthesized into integrated circuits, such as FPGA. The use of software and hardware is an essential part of the course. Prerequisite: Graduate or senior ECE standing. Laboratory fee.

ECE 540 Digital Signal Processing (DSP) Hardware [3] Architecture and programming of digital signal processing chips. Application of DSP chips to sampling, digital filters, FFTs, etc. Professional elective in the B.S.E.E. program. Prerequisites: Graduate or senior ECE standing with ECE 440/441. Laboratory fee.

ECE 542 State-Variable Continuous Control Systems [3] Continuous-system state-space models with emphasis on state variable methods; the modeling, analysis, and design of linear time-invariant continuous control systems; control components; state-variable methodology diagrams; steady-state and transient analysis; stability criteria; the root locus; frequency response; Nyquist criterion; gain, lead, and lag compensator design; feedback control, output control, controllability, observability criteria. Prerequisites: ECE 341 (minimum grade C–) and M220; or graduate standing.

ECE 543 Digital Control Systems [3] The modeling, analysis, and design of linear discrete control systems; z- and modified z-transforms; sampling and data reconstruction; open- and closed-loop transfer function and state-space models; steady-state and transient response analysis; root locus; frequency response plots; digital controller design using Bode plots; microcomputer implementation of digital controllers. Prerequisites: Graduate or senior ECE standing with ECE 442 (minimum grade of C–).

ECE 544 State Variable Control Systems [3] State-space models for continuous and discrete control systems; controllability and observability; canonical forms; pole placement, observers, reduced-order observers, observers in-the-loop, and optimal controllers for SISO continuous and discrete control system; Lyapunov stability and bang-bang controllers. Prerequisite: ECE 543 (minimum grade of C–).


ECE 565 Digital VLSI Design I [3] Techniques for CMOS digital integrated circuit design at circuit, subsystem, and system levels. CAD tools for design from schematic capture to physical layout. Design methodologies: programmable logic, standard cell, full custom CMOS fabrication technology. Design issues: speed, power, reliability, testability. CMOS design case studies. Laboratory project. Prerequisites: Graduate or senior ECE standing with ECE 362 and ECE 364 (minimum grade of C–). Laboratory fee.

ECE 567 Analog VLSI Design [3] Techniques for CMOS analog integrated circuit design at circuit, subsystem, and system levels. Analog circuit building blocks, CAD tools for design from schematic capture to physical layout. Design case studies, structured laboratory, and laboratory project. Design economics, quality, and reliability issues. VLSI performance optimization: objectives, constraints, designable parameters, algorithms. Introduction to neural networks for modeling and optimization. Prerequisites: ECE 565 (minimum grade of C–) and senior or graduate standing. Laboratory fee.

ECE 571 Generalized Machine Theory [3] Principles of energy conversion; phasor diagrams; typical three-phase circuit configurations; equivalent circuit analysis of electrical machines; single, three-phase transformers; electromechanical energy conversion in rotating machines (AC and DC); and small-power electrodynamics. Graduate students choose a project from the
above topics and perform a theoretical or practical study of the intended practice. Prerequisites: Graduate or senior ECE standing with ECE 351 (minimum grade of C–).

**ECE 572 Power Systems Analysis** [3] Introduction to circuit modeling of electrical power systems and their components. Topics include symmetrical components, per-unit analysis, three-phase and DC transmission lines, transient analysis, lightning effects, corona, short-circuit fault analysis, power system protection devices and relaying schemes. Professional elective in the B.S.E.E. program. Prerequisites: Graduate or senior ECE standing with ECE 471. Laboratory fee.

**ECE 573 Power Electronics** [3] Theory and operation of power diodes, power transistors, silicon-controlled rectifiers, diacs, triacs, and unijunction transistors. Design of phase-controlled rectifiers and DC-DC converters and inverters. Professional elective in the B.S.E.E. program. Prerequisites: Graduate or senior ECE standing with ECE 362/364 (minimum grade of C–). Laboratory fee.

**ECE 591 Special Topics in Electrical Engineering** [1–6] Selected topics in electrical engineering at the graduate level. Significant topics in the field are chosen on the basis of student and faculty needs and interests. Prerequisites: Graduate or senior ECE standing and permission of instructor. Laboratory fee.

**ECT 111 Introduction to Electricity and Electronics for Engineering Technology** [4] Topics include an introduction to the origins of mankind’s awareness of electricity and the development of scientific understanding of it in the 19th and 20th centuries; static vs. dynamic, DC vs. AC; power generation/distribution and uses, costs, electrical safety and hazards; common electrical circuits, elementary use of Ohm’s law, power and cost considerations; electronics from a block diagram approach: power supplies, amplifiers, oscillators, RF devices, and systems, including radio, television, satellite communication, cellular phone technology, and GPS. Three lecture hours, three lab hours. Prerequisite: MTH 112 (or concurrent). Laboratory fee.

**ECT 113 Personal Computer Laboratory for Engineering Technology** [2] Familiarization with the personal computer as tool for generating effective written communications and for analysis and presentation of data taken in the laboratory. An introduction to the use of appropriate technical software in the discipline of electronic engineering technology. Two hours of combined lecture/laboratory. Prerequisite: ECT 111 (or concurrent). Laboratory fee.

**ECT 121 DC and AC Electrical Fundamentals for Engineering Technology** [4] Topics include review of DC circuits; phasors; sinusoids applied to R, L, C series and parallel circuits; DC and AC source conversions and circuit theorems, mesh and nodal analysis; transformers. Three lecture hours, three lab hours. Prerequisite: ECT 111 or ECT 245 (minimum grade of C–). Laboratory fee.

**ECT 122 Introduction to Digital Devices for Engineering Technology** [4] This course covers digital logic concepts, including number systems and codes, basic logic gates, programmable logic devices, Boolean algebra and reduction techniques, arithmetic operations and circuits, code converters, multiplexing and demultiplexing, flip flops and registers, and HDL programming. Laboratory experience includes prototyping, computer simulation, and implementing programmable devices. Three lecture hours, three lab hours. Prerequisite: ECT 111 or ECT 245. Laboratory fee.

**ECT 231 AC and Solid-State Fundamentals for Engineering Technology** [4] Topics include resonance and passive filters; semiconductor theory; diodes and bipolar junction transistors; BJT circuit configurations; biasing considerations. Three lecture hours, three lab hours. Prerequisites: ECT 121 (minimum grade of C–) and MTH 122. Laboratory fee.

**ECT 232 Digital Circuits II for Engineering Technology** [4] This course covers advanced digital logic concepts, including Programmable Logic Devices: CPLDs and FPGAs with VHDL design; logic families and their characteristics; practical considerations for digital designs; state machines, multivibrators, and timers; interfacing to the analog world; semiconductor, magnetic, and optical memory; and microprocessor fundamentals. Three lecture hours, three lab hours. Prerequisite: ECT 122. Laboratory fee.

**ECT 241 Analog Devices and Circuits for Engineering Technology** [4] Topics include field-effect transistor theory and applications, AC models for amplifiers, amplifier parameters, operational amplifiers as linear amplifiers, RC oscillators. Three lecture hours, three lab hours. Prerequisites: ECT 231 (minimum grade of C–) and MTH 122. Laboratory fee.

**ECT 242 Microprocessor Architecture and Programming for Engineering Technology** [4] This course covers the basic elements of
computer hardware and software, data representations, instruction formats and addressing modes, assembly language instructions, programming techniques in assembly language, introduction to functions of operating systems. Three lecture hours, three lab hours. Prerequisites: ECT 232 and ES 115. Laboratory fee.

ECT 245 Electrical and Electronic Fundamentals for Engineering Technology [4] The study of DC and AC circuit characteristics with resistive, capacitive, and inductive components. An introduction to the characteristics of diodes, transistors, transformers, and motors, as well as the theory and application of operational amplifiers as filters, amplifiers, and signal conditioning devices. Digital devices, including basic gates, counters, flip-flops, and A/D and D/A converters, are also covered. Three lecture hours, three lab hours. Prerequisites: MTH 122 and PHY 121. Laboratory fee.

ECT 351 Practical Issues in Electronic Technology [4] Topics include ethics of the profession, professional societies, social impact, design for reliability, fault analysis and failure prediction, process control, cost analysis including life-cycle planning, project schedules, design for test, noise, grounds, shielding, system design, op-amps, filters, oscillators, voltage regulators, counters, and shift registers. Three lecture hours, three lab hours. Prerequisites (or concurrent): ECT 241 and MTH 241.

ECT 352 RF Communications for Engineering Technology [4] Topics include decibels, spectrum analysis, RF amplifiers, noise, oscillators, frequency conversion, AM generation and reception, phase-locked loops, angle modulation, frequency spectra. Three lecture hours, three lab hours. Prerequisites: ECT 241 (minimum grade of C–) and MTH 241 (or concurrent). Laboratory fee.

ECT 353 Computer Architecture for Engineering Technology [4] This course covers logic computer architecture hardware concepts, including control logic, addressing, registers, instructions, memory units, arithmetic elements, interrupts, and input-output structures. Three lecture hours, three lab hours. Prerequisite: ECT 242. Laboratory fee.


ECT 355 Industrial Electronics and Actuators for Engineering Technology [4] This course covers the application of solid-state devices used for industrial control and automation systems. Industrial actuators, such as motors, valves, solenoids, and relays, and their application in a process control setting, are discussed. Programmable logic controllers and ladder logic programming are used in the laboratory portion of the course. Three lecture hours, three lab hours. Prerequisite: ECT 241 or 245. Laboratory fee.

ECT 361 Data Communications for Engineering Technology [3] Digital communications fundamentals, including a variety of modulations schemes and encoding formats, such as pulse code modulation (PCM), frequency shift keying (FSK), and phase shift keying (PSK). The course covers a number of PCM line codes, including RZ, NRZ, and Manchester. Three lecture hours. Prerequisites: ECT 351 and MTH 241.

ECT 362 Advanced RF Communications for Engineering Technology [4] Topics include RF amplifiers, transmission lines, microstrip and microwave techniques, antennas, and propagation, and communication satellites. Three lecture hours, three lab hours. Prerequisites: ECT 352 (minimum grade of C–) and MTH 241 (or concurrent). Laboratory fee.

ECT 363 Computer Interfacing for Engineering Technology [4] Lectures and assignments are given covering techniques for interfacing the microcomputer to peripherals and memory. Both advance hardware and software aspects of interfacing are covered. Three lecture hours, three lab hours. Prerequisite: ECT 353. Laboratory fee.

ECT 364 Industrial Instrumentation and Sensors for Engineering Technology [4] This course covers the application of sensors and signal conditioning circuitry and devices used for industrial control and automation systems. Industrial sensors, such as thermistors, thermocouples, photocells, and motion sensors and their application in a process control setting are discussed. Design of signal condition techniques using operational amplifier circuitry.
ECT 365 Object-Oriented Programming for Engineering Technology [3] This course uses the department-approved programming language (variable). The course focuses on problem solving using structured computer programming functions, such as loops, variables, arrays, and subroutines. Programming assignments are completed both in and outside of class. Two lecture hours, two lab hours. Laboratory fee.

ECT 471 Senior Design Project I for Engineering Technology [3] The first of two senior project design courses aimed at giving the student experience in engineering design, fabrication, testing, and maintenance of electronic projects. This course focuses on the functional requirements and design phases of the project. Use of supply source manuals, current publications, and library reference materials is encouraged. A written project report and an oral presentation are required at the end of the course. Prerequisite: Senior status. Laboratory fee.

ECT 472 Computer Networking for Engineering Technology [4] Theory and understanding networking fundamentals, including the physical, data link, network, and transport layers. Common local-area network (LAN) and wide-area network (WAN) protocols are covered. Networking hardware, such as hubs, bridges, switches, and routers, are included. Three lecture hours, three lab hours. Prerequisite: ECT 122. Laboratory fee.

ECT 474 Digital Signal Processing for Engineering Technology [4] This course is an introduction to Digital Signal Processing (DSP) and its fundamentals, including synthesis, analysis, filtering, and modulation of signals in DSP applications, spectral analysis, hardware, and programming digital signal processors and the design of practical DSP circuits. Three lecture hours, three lab hours. Prerequisites: ECT 232, ECT 242, and ES 115. Laboratory fee.

ECT 481 Senior Design Project II for Engineering Technology [3] The second of two senior project design courses aimed at giving the student experience in engineering design, fabrication, testing, and maintenance of electronic projects. This course focuses on the fabrication, testing, and maintenance phases of the project. Use of supply source manuals, current publications, and library reference materials is encouraged. A written project report and an oral presentation are required at the end of the course. Prerequisite: ECT 471. Laboratory fee.

ECT 483 Data Acquisition Systems for Engineering Technology [4] This course covers the application of hardware and software signal conditioning devices used for data acquisition systems. System architecture and communication protocols are discussed for data collection control interfaces. Hardware and software tools are used in this course and focus on National Instruments LabVIEW as a data acquisition platform. Three lecture hours, three lab hours. Prerequisite: ECT 364. Laboratory fee.

ECT 487 Fiber Optics for Engineering Technology [4] History of optical communications systems, review of optics, types of fiber and methods of manufacture and testing; light sources, and detectors and couplers. Study of existing fiber systems, design of analog and digital communication systems, industrial and medical applications of fiber optics. Three lecture hours, one hour of combined lecture/laboratory. Prerequisite: ECT 241. Laboratory fee.

ES 101 Engineering Freshman Dialogue [1] Engineering students will meet as a unit weekly throughout the fall semester, students will be introduced to many of the campus resources, academic issues and special programs available to them. Guest speakers will discuss engineering careers and opportunities. Required of all first-year engineering students. (Grading: P/NP)

ES 110 Statics [3] Introduction to engineering mechanics via vector approach to static forces and their resolution. Prerequisites: PHY 112 and M 145 (may be taken concurrently), or permission of instructor.


ES 116, 117 Engineering Freshman Honors Seminar [1, 1] A special seminar for selected engineering first-year students who have demonstrated a superior record of achievement during their secondary school preparation. Students meet weekly with faculty and staff of the school during the fall and spring semesters for informal discussions of contemporary technology innovations, issues, and perspectives, based on various assigned readings. Field trips to research, manufacturing, or other engineering-related installations may be included. Active
student participation in discussions is expected. Written and oral presentations of student-selected topics are required. Prerequisite: Selection to Engineering Freshman Honors Group.

ES 143 Engineering and Design [3] Introduction to the fundamentals of engineering, the engineering profession and engineering design with emphasis on guided design and problem-solving methodologies. Students will undertake practice-oriented group design projects. Formal written reports and oral presentations will be required. Required of all first-year engineering students. Lab fee.

ES 191, 192, 293, 294, 395, 396, 497, 498 Engineering Open Studies [1–6] A special topics course, which may be elected when a field of interest to the student is not covered in the curriculum, or when departure from the traditional arrangement of classroom and course structure seems appropriate; varying from year to year in accordance with the needs of the students, the contents of this course are to be determined under the close supervision of a faculty member with the approval of the department chair.

ES 210 Construction Issues [1] A seminar course that consists of construction-site visits and lectures from owners, designers, and contractors who are leaders in the Connecticut construction industry. Students learn about the diverse range of issues facing the successful completion of a project and see firsthand the application of the concepts they are learning in their architecture and engineering courses.

ES 211 Dynamics [3] Engineering applications of Newtonian mechanics to dynamic forces; translational motion, rotational motion, work, impulse, and momentum, Required of all engineering students. Prerequisites: ES 110 (minimum grade of C–) and M 145.

ES 212 Mechanics of Materials [3] Basic principles of mechanics and calculus applied to stresses and strains in deformable +solids; axial, flexural, torsional, and shear stresses; Mohr’s circle; moment diagrams; beams; columns; and pressure vessels. Required for civil and mechanical engineering students. Prerequisites: ES 110 (minimum grade of C–) and M 145.


ES 220 Graphic Communication [2] Fundamental concepts of graphic communication with an objective of attaining the ability to visualize and draw in three dimensions. Using mechanical tools and the computer, students are taught geometric construction, orthographies, sectioning, dimensioning, and isometrics. No drawing ability required. Required of all engineering students. Open to all University students. Laboratory fee.

ES 221 Advanced Graphic Communication Using AutoCAD [3] Advanced concepts from ES 220 will be explored in depth using AutoCAD in Windows environment. Open to all engineering students. Professional elective. Prerequisite: ES 220 or permission of instructor. Laboratory fee.

ES 242 Engineering by Design [3] In-depth study of the design process to include problem solving methodologies, evaluation of alternate solutions, economic analysis, ethical constraints, group dynamics, and presentation techniques. Students undertake design projects specifically chosen to meet the objectives of this course. Formal written reports and oral presentations are required. Required of all sophomore engineering students. Prerequisite: ES 143. Laboratory fee.

ES 262 Introduction to Musical and Architectural Acoustics [3] A special course for acoustics-and-music or non-engineering majors covering the scientific study of each musical instrument family, sound radiation patterns of instruments and the implications for sound recording technology, speech and hearing, and an introduction to architectural acoustics related to band room and auditorium design. No credit given to engineering majors except those in acoustics and music. Prerequisite: M 010 Algebra or equivalent. Laboratory fee.

ES 300, 400 Engineering Internships [all 1–3] A semester work experience in a professional environment that is commensurate with studies completed to date. Position requires approval of director of CETA internship programs and academic advisor. Full-time positions may be substituted for a professional elective. Student must be at least a first-semester junior and, as a minimum, have a 2.5 grade point average. Number of credits are awarded on the basis of the job description and whether the position is full time.
or part time. Registration is limited to a maximum of 6 credits, or two equivalent semesters of full-time employment. A maximum of 3 credits may be applied toward a professional elective requirement. Objectives and evaluation criteria set by a learning contract with the Office of Experiential Education and Student Employment in the Career Center are required. Course grading is Pass/No Pass.

**ES 311 Interdisciplinary Applications of Geographic Information Systems** [3] Introduction to geodetic and cartographic principles underlying the creation of accurate maps. Topics include horizontal and vertical geodetic data, map projections, and coordinate systems. GIS data modeling using vector and raster displays is explored. Both hypothetical and actual case studies of the use of GIS to solve broadly selected problems are discussed. Microcomputer-based GIS software is introduced through laboratory exercises and used in the problem solution process. Prerequisite: General knowledge of geometry, trigonometry, and personal computers. Laboratory fee.


**ES 342 Engineering Practice** [1] A study of the engineering process from conceptual design to the release to manufacturing/construction. Topics include feasibility studies, financial viability, environmental impact, societal concerns, licensing, and satisfying regulators. Multidiscipline teams of students will perform projects requiring oral and written presentations. Required of junior students majoring in civil, electrical, or mechanical engineering. Must be taken concurrently with CE 312 or ECE 382 or ME 470, or permission of instructor.

**ES 440 Automatic Control System Analysis** [3] Control components and systems; block diagrams; modes of control; steady-state analysis; the characteristic function; stability criteria; root locus, frequency-response methods; the Nyquist Criterion. Prerequisites: ME 350 (minimum grade of C–) and M 242.

**ES 441 Automatic Control System Design** [3] Design of control systems to meet specified characteristics; classical methods of design may include root locus design, Bode plot design, Nyquist plot design, and Nichols chart designs; modern design methods may include pole placement design, observer design, Liapunov design, and linear regulator design; other design techniques may be presented at the discretion of the instructor. Design professional elective. Prerequisite: ES 440 or ECE 442.

**ES 491, 492, 493, 494, 495, 496 Engineering Research** [1–6] A senior engineering elective to permit qualified honor students to pursue investigatory projects of a professional nature; the report may constitute an undergraduate thesis. Prerequisite: Acceptance of a project proposal by a faculty member.

**ES 591 Special Topics in Engineering Science** [1–6] Selected topics in engineering sciences at the graduate level. Significant topics in the field will be chosen on the basis of student and faculty needs and interests. Prerequisite: Graduate standing or permission of instructor.

**ET 111 Introduction to Engineering Technology** [1] Introduction to the profession of engineering technology and the skills, attitudes, and techniques needed by engineering technology students. A familiarization with the University and CETA is included, particularly an exploration of available opportunities for enhancing the education of engineering technology students. Required of all full-time technology freshmen. One lecture hour. Pass/No Pass.

**ET 100, 200, 300, 400 Engineering Technology Internships** [all 1–3] Work experience in an engineering technology industry/business setting under the supervision of the director of CETA internship programs and the academic advisor. Objectives and evaluation criteria set by a learning contract with the Office of Experiential Education and Student Employment in the Career Center are required. Prerequisites: Junior standing, except by agreement with the academic advisor, and a minimum of 2.5 GPA. A maximum of 6 credits may be taken as an internship. The number of these credits that may be used as a professional or unrestricted elective, but not as a technical specialty, is to be decided by the academic advisor. Grading is Pass/No Pass.
ET 180, 280, 380, 480 Independent Studies
[1–4] An independent study may be elected when a field of interest to the student is not covered in the curriculum, or when departure from the traditional arrangement of classroom and course structure seems appropriate. The topic varies from semester to semester in accordance with the needs of the student. The contents of this course are to be determined under the close supervision of a faculty member with the approval of the department chair. Prerequisite: Permission of instructor and chair of department in which student is matriculated.

ME 213W Mechanical Engineering Materials and Laboratory [3] A course required for students in mechanical engineering. Structural properties of materials, practices and laboratory experiments to determine the properties of materials used in mechanical engineering. Materials examined will include metals, plastics, and composites. Topics include the molecular structures of these materials and mechanical properties, such as tensile, compressive, torsional, and fatigue, as well as other properties. Statistical methods are presented. The course consists of one lecture and one lecture/laboratory per week. Student groups meet with instructor each week outside of class to review laboratory journal-style report drafts. This is a writing intensive course. Pre- or corequisite: ES 212. Laboratory fee.

ME 236 Thermodynamics I [3] Theoretical and applied classical engineering thermodynamics of nonreacting substances; the first and second laws; the properties of ideal and real substances; gas mixtures; the behavior of closed and open systems for reversible and irreversible processes; thermodynamic cycles. Prerequisites: M 145 and PHY 112.

ME 265 Fundamentals of Architectural and Musical Acoustics [3] This course covers fundamentals of architectural acoustics related to speech and musical room design, along with an introduction to hearing, psychoacoustics, and the scientific study of sound and radiation patterns of each musical instrument family. For acoustical engineering and music B.S.M.E./acoustics engineering majors only. Prerequisite: PHY 112 (minimum grade of C–). Laboratory fee.

ME 280 Manufacturing Processes [3] Identification, selection, limitations, and applications of processes used in industrial production; includes introduction of CAD/CAM and robotics as well as processing analysis. Prerequisites: ES 212 and ME 213.

ME 337 Thermodynamics II [3] A continuation of ME 236 Thermodynamics I. Gas and vapor power cycle analysis, refrigeration and heat pump cycle analysis, nonreacting ideal gas mixtures, psychrometrics, thermodynamics of combustion reactions, chemical equilibrium. Prerequisites: ME 236 (minimum grade of C–) and CH 110.

ME 340 Fluid Mechanics [3] Properties of fluids, fluid statics; equations of continuity, momentum, and energy; dimensional analysis, ideal flow; the boundary layer concept, and laminar flow; flow in pipes. Prerequisites: ES 211, ES 212, ME 236 (minimum grade of C– in each); and M 242.


ME 350 Vibrations I with Applications [3] The analysis and design of one- and two-degrees-of-freedom vibrating systems, both free and excited by transient and steady-state forces; introduction to multi-degree-of-freedom systems analysis techniques; vibration control as a design criterion for quality and reliability. Laboratory/demonstration included. Prerequisites: ES 212, ES 211 (minimum grade of C– in each); and M 242. Laboratory fee.

ME 370 Elements of Mechanical Design [3]
Design including statistical considerations for static and dynamic loading, fatigue. Design of machine elements, such as fasteners and bearings, and lubrication, belt, chain, and gear drive. Prerequisites: ES 211 and ES 212 (minimum grade of C– in each).

ME 381 Statistical Quality Control [3] Concepts of probability and statistics are applied to the field of quality control. Among the topics are process control, acceptance control, quality assurance, design in quality control, quality standards, quality experiments, and economics of quality. Prerequisites: ME 213 and junior standing in engineering.

ME 383 Manufacturing Control and Planning [3] Manufacturing analysis: process capability, operations equipment, and tooling specifications; value analysis; make or buy decisions, cost controls; development of informational systems employing computer methods. Prerequisite: ME 280.

ME 405/505 Mechatronics System Design [3] Principles of transducers and sensors and how to interface them with a process in a computer environment. Discussions about types of transducers and different sensors include operating principles, modeling, design considerations, and applications. Computer interfacing work includes signal conversion, interface components, and real-time application of microcomputer systems to problems in manufacturing. Component integration and design considerations are addressed by case histories presented by the instructor. Student design projects involve problems from industry that require computer interfacing and experimental techniques. Topics include principles of transducers and sensors, modeling and simulation of physical systems, signal processing, and computer interfacing using case studies. Prerequisites: ECE 360 and senior/graduate standing, or permission of instructor. Laboratory fee.

ME 432 Energy Conversion System Design [3] Introduction to methods of energy conversion, including both conventional and renewable methods of energy generation. These include, but are not limited to, co-generation, nuclear, solar, wind, and fuel cells. Each consists of a review of the basic engineering principles of design and operational configurations. Concepts of energy usage based on the Second Law of Thermodynamics are introduced. Invited lecturers present an overview of the technology, with assessments of present and future market potential. Students are required to write and present a term paper related to the course topics. Prerequisites: ME 236, 340, and 341, any of which may be taken concurrently.

ME 433 Solar Energy Design [3] Evaluation and design of solar thermal processes and equipment; availability of solar radiation, flat plate, and focusing collectors, and energy storage systems are treated. Professional design elective. Prerequisite: ME 341 or permission of instructor.

ME 440 Thermal and Mechanical System Design [3] This course will provide a dual track of design practice. The first part of this course will prepare students for design practices associated with energy systems. The second part of this course will concentrate on detailed product design, which will include drawing, tolerancing, and probabilistic methods. The entire course will include the application of computer-aided engineering tools. Prerequisites: ME 341 and ME 470 (minimum grade of C– in each). Laboratory fee.

ME 450/550 Vibrations II for Engineering [3] Vibration analysis of multimass systems and distributed systems, generalized coordinates and Lagrange’s equation, influence coefficients and Dunkerley’s equation, experimental investigations, matrix and computer solutions. Prerequisite: ME 350 (minimum grade of C–). Laboratory fee.

ME 460 Engineering and Environmental Acoustics [3] Engineering applications of wave motion to audible sound, emphasis on instrumentation, environmental noise standards and regulations, sound quality and the auditory system, noise analysis of mechanical systems, passive and active noise control, noise abatement as a design problem. Prerequisites: ME 350 (minimum grade of C–) and M 242, or equivalent. Laboratory fee.
ME 461/561 Acoustics Capstone Design for Engineering [3] Senior-level acoustics design project in one of the following areas: noise control in industry, community, or of a product, design of audio components, architectural acoustics design, hearing loss or psychoacoustics design, or musical instrument or components of an instrument design. Special design project requiring written term paper and an oral presentation. Professional design elective. Prerequisite: ME 460 (minimum grade of C–). Laboratory fee.

ME 470 Mechanical Systems and Processes [3] Theoretical and practical applications of the principles of mechanics to the design of machines. Topics include design for failure modes, robust and quality design, universal product design, identification, selection, limitations, and applications of processes used in industrial production. Prerequisites: ME 213 and ME 370, or BE 260, or CE 260 (minimum grade of C– in each). Laboratory fee.

ME 471 Mechanical Engineering Design [3] Students work independently on projects of advanced engineering design practice; no formal class meetings; periodic consultations with instructor are by arrangement. Professional design elective. Prerequisites: ME 470 and acceptance of a project design proposal by a faculty member.

ME 472 Capstone Design Project [3] The capstone design project course for senior engineering majors, in which a project group treats a single significant engineering problem. Engineering faculty supervises each group with consultation from a business/industrial counterpart. The design project progresses step-by-step from the stages of problem definition, design, analysis, synthesis, fabrication, and tests. Students are required to demonstrate their mastery of oral and written communication skills by presenting their results to an audience of peers, faculty, and business/industry representatives, and by submitting a final written report. These final presentations and reports include sections on the social, political, economic, and cultural dimensions of the completed design projects. Prerequisite: Senior standing or permission of instructor. Laboratory fee.

ME 473 Mechanical Engineering Laboratory Project II [3] A continuation of ME 472 wherein students may continue their projects on an elective basis. Prerequisite: ME 472. Laboratory fee.

ME 476 Computer-Aided Design for Engineering [3] Illustration and application of the use of computers in the design of machines and their elements; development of appropriate data base; use of advanced numerical analysis methods; use of robotics; lecture and laboratory. Professional design elective. Prerequisite: ME 470. Laboratory fee.


ME 500 Convective Heat and Momentum Transfer I [3] Incompressible flow and convective heat transfer theory applied to internal and external laminar flows; conservation principles; analytical and numerical laminar flow calculations; laminar boundary layer analysis; effects of boundary layer suction and blowing. Prerequisites: Senior or graduate standing with ME 341 or equivalent.

ME 501 Kinematic Linkage Design [3] Theory and practice in the selection of kinematic linkages for the generation of desired functions, paths, and motions. Recent developments and current research are reviewed. Professional design elective. Prerequisites: Senior or graduate standing with ES 211 and M 240, or equivalent. Laboratory fee.

ME 504 Dynamics of Machines [3] Static and dynamic force and moment analysis of planar and space mechanisms, dynamics of a rigid body, balancing of machines, cam dynamics. Prerequisite: Senior or graduate standing with ME 350. Laboratory fee.

ME 507/CE 507 Finite Element Analysis [3] Principles and applications of finite element method. The principle of virtual work is used to develop finite element equations for the representation and analysis of engineering structures. Hand calculations and computer modeling are used to analyze two- and three-dimensional constructs. Prerequisite: Senior or graduate standing in civil or mechanical engineering, or permission of instructor. Laboratory fee.
ME 509/CE 509 Pollution Prevention [3] Assessment of pollution prevention technologies and lean manufacturing techniques used in industry to reduce waste generation. Understanding of how to implement pollution prevention into daily operations and analysis of capital investments to minimize waste. Prerequisite: Senior or graduate standing in engineering, or permission of instructor.

ME 510/CE 500 Advanced Mechanics of Materials [3] Relationships between stress and strain at a point; introduction to theory of elasticity; yield and fatigue failure theories; stress concentrations; unsymmetrical bending; shear center; torsion of hollow, thin-walled sections; introduction to finite elements. Required for civil engineering option in the Master of Engineering degree program. May be taken as a professional elective by civil and mechanical engineering undergraduates. Prerequisites: Senior or graduate standing with ES 212 and M 242, or equivalent.

ME 511 Advanced Materials [3] Introduction to properties and processes of production of high strength and/or high modulus of elasticity fibers, ceramics, polymers, and elastomers; survey of design, analysis, fabrication, and testing. Prerequisites: Senior or graduate standing with CH 111.

ME 519 Six Sigma Principles and Applications [3] Principles of Six Sigma. Implementing the design for quality philosophy and methodology. Process-flow diagrams, cause-and-effect diagram, failure-mode effects analysis, gage R&R, capability studies, design of experiments, strategy for organizing quality techniques in industry. Prerequisite: Senior or graduate standing, or permission of instructor.

ME 530 Gasdynamics [3] The dynamics and thermodynamics of compressible fluid flow. Equations of motion for inviscid gas flows, one-dimensional gas flows, oblique shock and expansion waves, quasi-one-dimensional flows, nozzle and diffuser operation, flows with friction, flows with heating and cooling, two-dimensional flows, introduction to numerical methods in gas dynamics. Prerequisites: Senior or graduate standing with ME 337 and ME 340, or equivalent.

ME 531 Gas Turbine Analysis [3] The performance analysis of stationary gas turbine systems and aircraft gas turbine engines. Ideal shaft power gas turbine cycles; cycle losses; the ideal ramjet, turbojet, and turbofan engines; aircraft engine losses; diffusers and nozzles; centrifugal and axial flow compressors; axial flow turbines. Prerequisites: senior or graduate standing with ME 530.


ME 582 Reliability Engineering [3] Concepts of probability and statistics are applied to the field of reliability engineering. Among the topics are redundancy, reliability prediction, designing for reliability, mortality distribution models, failure categories, theory of maintenance, environmental effects, life testing, effectiveness and cost of reliability, factor of safety, and structural reliability. Prerequisites: Senior or graduate standing with ES 212 and M 240.

ME 591 Special Topics in Mechanical Engineering [1–6] Selected topics in mechanical engineering at the graduate level. Significant topics in the field will be chosen on the basis of student and faculty needs and interests. Prerequisite: Graduate standing or permission of instructor.

MET 116 Manufacturing Processes for Engineering Technology [4] This course is designed to provide a broad background in the various manufacturing processes used in industry. Attention is given to various methods by which semifinished products can be conditioned, analyzed, or synthesized, including the economic advantage and disadvantage of each method. Topics include foundry practices, die casting, extruding, forging, stamping, and polymer processing. Three lecture hours, three lab hours. Laboratory fee.
MET 123 Material Science for Engineering Technology Laboratory [3] Reviews the classification and structure of metals, polymers, glasses, and ceramics. The student will investigate the effects of heat treatment on various classes of materials through the use of phase diagrams and time-temperature-transformation curves. Students will gain hands-on experience with computer-based data-acquisition systems and strain-gauge application in conjunction with materials testing. Prerequisites: MET 116 and MTH 112. Laboratory fee.


MET 243 Mechanics of Materials for Engineering Technology [4] A combined course in mechanics and strength of materials. It involves the study of the relationship between externally applied forces and internally induced stress. Topics include analysis of stress/strain and their relationship, stress in axial-loaded members, riveted and welded joints, Mohr’s circle, statically indeterminate members, torsion, shear and moment diagrams, beam deflection, and combined stress. Three lecture hours, three lab hours. Prerequisite: MET 236. Laboratory fee.

MET 363 Machine Design I for Engineering Technology [4] An introduction to the design of machine elements. Topics include stress concentration, failure theory, cyclic loading, shafts, keys, coupling, bending in two planes, screw threads, and welded joints. Three lecture hours, three lab hours. Prerequisite: MET 243. Laboratory fee.

MET 364 Vibrations for Engineering Technology [4] An introduction to the theory of vibrations, including the study of oscillatory motion of machines and structures and the forces that create this motion. Harmonically forced vibrations for single-degree-of-freedom systems, undamped and damped vibrations, and multi-degree-of-freedom systems are studied. Vibration instrumentation is also explored. Three lecture hours, three lab hours. Prerequisites: MET 243 and MTH 352. Laboratory fee.

MET 365 Fluid Mechanics I for Engineering Technology [4] Incompressible and compressible flow using the continuity, general energy, and momentum equations. Topics include properties of fluids, fluid statics, kinematics of fluid flow, energy consideration in steady flow, momentum and forces in fluid flow, and fluid measurement. Three lecture hours, three lab hours. Prerequisite: MTH 241. Laboratory fee.

MET 470 Thermodynamics I for Engineering Technology [4] First and Second Laws of Thermodynamics as applied to open and closed systems. Topics include the theory and significance of pure substances, work, heat, internal energy, entropy, and thermodynamics. Sample and real gas calculations are made, and vapor systems are studied. Three lecture hours, three lab hours. Prerequisite: MTH 352. Laboratory fee.

MET 472 Thermodynamics II for Engineering Technology [4] A continuation of Thermodynamics I with applications. Theory of vapor engines using compression of gasses and vapors; internal combustion engines; steam and gas turbine cycles, compressors, refrigeration, and mixtures of fluids. Three lecture hours, three lab hours. Prerequisite: MET 470. Laboratory fee.

MET 473 Heat Transfer for Engineering Technology [4] Analysis of the transfer of heat by conduction, convection, and radiation in steady and unsteady flow. Topics include steady-state conduction through a plane wall, hollow spheres and cylinders, thermal resistance of insulation, dimensional analysis, convection heat transfer coefficients, and forced convection in circular tubes and flat plates. Three lecture hours, three lab hours. Prerequisite: MTH 241. Laboratory fee.

MET 474 Production Tooling for Engineering Technology [4] A study of the methods used in industry for providing major tooling components for the production of specific products. Topics include: materials used in tooling; applied design requirements for specific manufacturing processes, their cost, type, and applications; development of both assembly and detailed drawings. Three lecture hours, three lab hours. Prerequisite: MET 116. Laboratory fee.
MET 475 Kinematics and Dynamics for Engineering Technology [4] The study of kinematics and the kinetics of particles. Various concepts such as force, mass and acceleration, kinetics of rigid bodies, work and energy, impulse and momentum are explored. Graphic and mathematical solutions are used to explore velocity and acceleration graphs; linkages, instant centers, cams, gear trains, static and inertia forces in machines, flywheels, and balancing of rotating and reciprocating mechanisms. Three lecture hours, three lab hours. Prerequisites: MET 236 and PHY 121. Laboratory fee.

MET 482 Senior Capstone for Engineering Technology [3] A capstone course that gives students an in-depth understanding of how to approach open-ended challenges and learn how to creatively analyze, synthesize, and apply the technical knowledge from prior course work, such as testing, design, and manufacturing of actual electromechanical systems. Teams of students work on either an externally sponsored or an in-house project advised by mechanical engineering faculty and engineers from sponsoring companies. The semester culminates with a public and formal presentation of results evaluated by a professional jury of practitioners. Prerequisite: Senior standing or approval of instructor. Laboratory fee.

MET 483 Machine Design II for Engineering Technology [4] A continuation of Machine Design I. Fatigue, deformation criteria, and failure theories are used to design standard mechanical components. Various machine elements are investigated. Topics include gearing, bearings, belts, clutches, brakes, and power transmission. Three lecture hours, three lab hours. Prerequisite: MET 363. Laboratory fee.

MET 484 Automation Systems for Engineering Technology [4] Pneumatic and electronic instrumentation for process control and automation. ON-OFF, proportional, integral, and derivative closed-loop control systems; related auxiliaries and miniature systems, valves, and electromechanical converters, with lab report required. Three lecture hours, three lab hours. Prerequisite: ECT 364. Laboratory fee.

MTH 112 Precalculus I for Engineering Technology [3] A general review of fundamental algebraic operations, including equations, logarithms, exponential equations, and scientific notation; an introduction to trigonometry, polar and rectangular coordinates, functions, and graphs.

MTH 122 Precalculus II for Engineering Technology [3] A continuation of MTH 112, including graphic and algebraic solutions of equations, exponents and radicals, vectors and oblique triangles, numbers, trigonometric identities, and an introduction to analytical geometry. Prerequisite: MTH 112 (minimum grade of C–) or permission of instructor.

MTH 232 Calculus I for Engineering Technology [3] Analytical geometry and an introduction to differentiation, including limits, derivatives of rational, trigonometric, logarithmic, and exponential functions with technical applications. Prerequisite: MTH 122 (minimum grade of C–) or permission of instructor.

MTH 241 Calculus II for Engineering Technology [3] An introduction to integral calculus, including integrals of rational, trigonometric, logarithmic, and exponential functions, with technical applications; and an introduction to differential equations. Prerequisite: MTH 232 (minimum grade of C–) or permission of instructor.

MTH 352 Differential Equations for Engineering Technology [3] An introduction to differential equations, including solutions of first-order linear separable and exact equations, second-order linear equations with constant coefficients, and Laplace transforms with technical applications. Prerequisite: MTH 241 (minimum grade of C–) or permission of instructor.

STW 190, 290, 390, 490 Special Topics in Engineering Technology [variable] These special topics courses are offered intermittently in areas of particular interest to students in engineering technology based on current trends and special interest areas. Laboratory fee.

TC 111 Technical Communications I: Expository Communication [3] Extensive practice in expository writing, emphasizing objective, clear, concise form, with most readings from nonfiction prose. Provides experience in organizing and presenting individual oral and laboratory reports. Introduces library usage and research techniques. Prepares students for technical writing and oral communication in TC 241 English II.
**TC 241 Technical Communications II: Technical Communication** [3] Introduction to technical communication, including written and oral skills. The course emphasizes basic structures used in recording and reporting technical information, including analysis of audience, language, and purpose; techniques of persuasion; page design and graphics; and technical definition and description. Students also prepare memos, résumés, lab reports, and a documented technical research paper. Oral technical presentations are also required. The interrelationships of technology and society, along with the ethics of technology, are considered. Prerequisite: TC 111 (minimum grade of C–).

**TC 481 Technical Communications III: Advanced Technical Communication** [3] Application of skills learned in previous technical communication courses, with emphasis on practical writing and speaking. Students prepare informal and formal documents, including instructions, proposals, progress reports, and letters. Individual and group oral presentations, as well as group project and ongoing discussion of technology, society, and associated ethical considerations, are required. Prerequisites: TC 241 (minimum grade of C–) and senior status, or permission of instructor.