School of Engineering

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The School of Engineering offers accredited four-year programs leading to the degree of Bachelor of Science in Engineering (B.S.E.) in the fields of Chemical, Civil, Electrical, and Mechanical Engineering and in Computer Science & Engineering. Double major programs are possible and these may include the field of Materials Engineering.

In addition to the programs leading to the Bachelor of Science in Engineering, a Management and Engineering for Manufacturing degree program is offered jointly with the School of Business Administration and is described at the end of this section of the *Catalog*. Minors in Environmental Engineering and in Metallurgy and Materials Engineering are also available.

The Bachelor of Science in Engineering curricula offered in the School of Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET). The program in Computer Science & Engineering is also accredited by the Computer Science Accreditation Commission (CSAC) of the Computing Sciences Accreditation Board (CSAB). The curricula are designed to give sound knowledge of basic principles in mathematics, physics, and chemistry; to offer training in the theory, principles, and practices of engineering; and to present the opportunity to obtain additional instruction and experience in one of the major engineering fields. Throughout the four-year curricula, opportunities are available to study general cultural and scientific topics. Elective credits are available which can be used by those interested in professional schools or management and administration to supplement the required courses listed in the respective curricula.

The engineering laboratories are well designed and equipped. Constant attention is given to the content and organization of laboratory courses and to supplementing the equipment with new and important apparatus so that the student receives instruction using modern equipment.

Admission Requirements. See *Admission to the University*. All students admitted to the School of Engineering are required to take examinations to determine their aptitude and ability in subjects essential as preparation for an engineering curriculum. Students who make unsatisfactory grades in these examinations may be required to take additional preparatory work which may not be counted for credit toward graduation.

Regional Campus Admission. Students may begin lower division (freshman-sophomore) study in the baccalaureate Engineering programs at the regional campuses. Most students will anticipate moving to Storrs for upper division (junior-senior) work after two years at the local campus. However, in some programs they will need to relocate earlier, to accommodate specialized curricular needs better satisfied at Storrs. Alternatively, students will be able to register for specialized courses that are available at another regional campus or at Storrs while finishing the lower division work at the regional campus.

Students who, through discussion with their academic advisor, need to relocate to the Storrs campus for their sophomore year or need to split registration across more than one campus should contact the Office of Student Affairs or the Registrar at their regional campus.

Bachelor's Degree Requirements. Upon recommendation of the faculty the degree of Bachelor of Science in Engineering is awarded by vote of the Board of Trustees to students who have met the following requirements: (1) met all the requirements of the School of Engineering and filed with the registrar an approved plan of study; (2) earned a total of at least 134 credits applicable toward the degree; (3) earned at least a 2.0 grade point average for all calculable Upper Division course work.

The requirements which must be met are stated in detail in the plan of study current at the time of the student's entry into the junior year program or the time of the student's admission or readmission to the School, whichever is later.

Engineering Double Major Programs. Students who wish to concentrate their elective work in a second field within the School of Engineering may elect a double major program. This program requires the completion of all requirements in both majors, except in the case of a combination with Materials Engineering, which requires the completion of 30 credits of work specifically identified with that field. Applicants for this program should consult the Director of Undergraduate Advising of the School of Engineering at the time they elect their major field.

Additional Degree Programs. Students wishing to take a second bachelor's degree in another school or college should consult the Director of Undergraduate Advising of the School of Engineering early in their program.

EUROTECH Program. In collaboration with the College of Liberal Arts and Sciences, the School of Engineering offers EUROTECH, a carefully structured five-year, double-degree program enabling students to earn both a B.S. in Engineering and a B.A. in German. The program includes German language courses specially designed to include engineering content, engineering courses taught partly in German, and a six-month internship in a company in Germany. This program prepares the student to practice engineering globally and is open to all the engineering specialties.

Joint B.S./M.B.A. Program. Early in their sixth semester, engineering students with a total grade point average of at least 3.2 may apply for admission to the School of Business Administration's master's degree program. Students admitted to the M.B.A. program would then take M.B.A. courses during the following summer and as free electives if time is available in their normal senior engineering program. They would complete the M.B.A. in the summer and year following completion of the engineering degree. Students interested in this program should contact the Director of Undergraduate Advising of the School of Engineering by their fifth semester.

Engineering Diversity Program. The Engineering Diversity Program is comprised of a Minority in Engineering Program (MEP) and a Women in Engineering Program (WEP). The program aims to improve the diversity of students entering into the engineering profession by offering a variety of support services, financial aid, and social activities designed to meet the special needs of minority and women students.

Cooperative Education. The University has an extensive cooperative education program. Many students choose to take one or two semesters away from campus to participate in this opportunity for pre-professional employment experience in their engineering fields.

Students participating in this program are strongly encouraged to file a Co-op plan of study early so that course sequencing for the remaining semesters may take into account the fact that some required courses are not offered every semester and appropriate course prerequisites will be completed prior to enrolling in remaining courses.

Study Abroad. The School of Engineering, working with the Office of Study Abroad Programs, has a study abroad program at the University of Essex in England for students majoring in electrical and systems engineering or computer science and engineering and at the Fachhochschule in Regensburg, West Germany, for students majoring in computer science and engineering, electrical and systems engineering, and mechanical engineering.

Selection of the Major Department. With the exceptions noted on the following pages all engineering students take similar programs during the first two years. Students must designate during the second semester of their sophomore year the curriculum which they desire to follow for the remainder of their undergraduate program. During the junior and senior years they follow the curriculum they have elected. Permission of the Director of Undergraduate Advising is required for students to change from one major department to another after they have begun the fifth semester.

Scholastic Standing Requirements – Supplemental Dismissal Standard. The School of Engineering requires a cumulative grade point average of at least 2.0 in all courses in mathematics, physics, chemistry and engineering applicable toward the degree in order for a student to be admitted to the junior year in his/her selected major.

The School of Engineering has adopted a policy on academic honesty, and all students are expected to be familiar with this policy and to adhere to the highest standards of academic honesty.

Course Restrictions. The School of Engineering does not award course credit for work experience. This restriction applies to work on or off campus before or during a student's enrollment. A student who feels that work experience has covered the material in an existing course may apply to earn the course credit by examination.

The following courses may not be counted for credit toward graduation in this School: MATH 112 and 118 and any other mathematics courses numbered below 110; PHYS 101 and 103; CSE 101; STAT 100; and courses labeled "independent study" or "variable topics" (e.g. courses numbered 298 and 299) taken in departments outside of the School of Engineering.

No course taken on a Pass/Fail basis may be counted for credit toward graduation or used to meet any course requirements of the School of Engineering.

Plan of Study. During the first semester of the junior year every student is required to prepare a written preliminary Plan of Study form for approval by the advisor, the department head, and final approval by the Director of Undergraduate Advising of engineering. This form shows the courses which will be presented

to meet all degree requirements. Sample Plan of Study forms, available in each department office, show selections of major and professional requirements for each approved program or area of concentration. All plans of study must satisfy the minimum requirements of EAC/ABET.

Exemption and Substitution. Students who desire to be excused from any of the requirements, or to substitute other courses for those prescribed, should consult the Director of Undergraduate Advising of the School. Such exemptions or substitutions must be approved by the Director of Undergraduate Advising.

Equipment. All students are expected to have a portable calculator of the "scientific" type featuring at least trigonometric and log functions.

Curricula in Engineering

The Bachelor of Science in Engineering curricula offered in the School of Engineering are designed to provide the student with a sound knowledge of basic principles in mathematics, physics, and chemistry; to offer training in the theory, principles, and practices of engineering; to provide studies in the humanities and social sciences serving to meet the objectives of a broad education; and to present the opportunity to obtain additional instruction and experience in one of the major engineering fields. In each of these areas there are both required and elective course work.

I. General Education Requirements

The University Senate has adopted General Education Requirements in a variety of curricular areas which must be satisfied as a part of every baccalaureate program. The course requirements listed below are those pertaining to students in the School of Engineering and also satisfy the University requirements as listed in the Appendix of this *General Catalog*.

Group 1. Foreign Languages

The minimum requirement is met if the student is admitted to the University with three years of a single foreign language in high school, or the equivalent. When the years of study have been split between high school and earlier grades, the requirement is met if the student has successfully completed the third-year high school level course. If a student has not met the minimum requirement through high school course work, a two semester course sequence in a language must be completed at the University. Students for which English is their second language may consult with the Director of Undergraduate Advising about seeking a possible exemption from this requirement.

Group 2. Expository Writing

The following two courses are required of all students:
ENGL 105 — English Composition
ENGL 109 — Literature and Composition
In addition, at least two Writing (W) courses are required of all students. (Note that ENGL 105 is a prerequisite to all W courses.)

Evaluative testing may exempt qualified students from the ENGL 105, 109 requirement. Students completing the Honors course ENGL 250 will also be exempted from the ENGL 105, 109 requirement.

In Engineering, students meet the Writing (W) requirement through required major-specific course work. Most Engineering majors have two Writing (W) courses specified in the curriculum. In some Engineering majors, Partial Writing (P) courses are required, and two or three of these courses may be used to satisfy one Writing (W) course requirement.

Group 3. Mathematics

All students must enter with a competency level equivalent to that obtained in Mathematics 101, as evidenced by a passing grade on the Q-Course Readiness Test, or take MATH 101 as a remedial course without credit toward graduation. In addition to this remedial requirement, all students must take two Quantitative (Q) courses, one being in mathematics or statistics, and one Computer (C) course.

Students in the School of Engineering meet this General Education Group requirement through required course work taken in the first year. Specifically, the following Quantitative (Q) courses are required of all students in the School:
MATH 115Q – Calculus I
MATH 116Q – Calculus II
For those students who, based on the mathematics placement test taken prior to enrolling, do not start in MATH 115Q, the introductory calculus sequence of MATH 112Q, 113Q and 114Q may be used in place of the MATH 115Q-116Q calculus sequence. Students are encouraged to use the summer following the first year to take the third course in this sequence, so that they will be ready to take MATH 210Q in the first semester of the sophomore year. It should be noted that the credits earned by completing MATH 112Q may not be used toward the Engineering degree.

Similarly, one of the following Computer (C) courses is required of all students in the School:
ENGR 150C – Introduction to Engineering I
CSE 110C – Introduction to Numerical Computation
CSE 130C – Fundamentals of Computation

Alternate equivalent course sequences in the departments indicated may be substituted for those above upon approval of the associate dean.

Group 8. Science and Technology

All students must complete two courses in science and technology, at least one of which must include a semester of laboratory.

Students in the School of Engineering meet this General Education Group requirement through required course work in the first two years. Specifically, the following are required of all students in the School:
Either CHEM 127Q-128Q – General Chemistry
or CHEM 129Q - 130Q - General Chemistry (Honors)
and PHYS 151Q – Physics for Engineers I
PHYS 152Q – Physics for Engineers II

For transfer and other students with a non-standard background, various combinations of two or more physic courses may be substituted for the required PHYS 151Q-152Q. Any substitution for the required physics course work needs approval of the associate dean. Only eight credits of any combination of physics at the 100's level may be applied toward the degree.

Humanities and Social Sciences Courses

The General Education requirements covering humanities and social sciences courses are grouped together here to emphasize their importance in an engineering education. The role of engineering, science and mathematics courses in an engineering curriculum is self evident. Studies in the humanities and social sciences serve not only to meet the objectives of a broad education, but also to meet the objectives of the engineering profession. In the interest of making engineers fully aware of their social responsibilities and better able to consider related non-technical factors in the practice of engineering, course work in the humanities and social sciences is an integral part of the engineering program. These educational objectives are best attained with attention to depth as well as breadth in course selection. The courses listed below have been chosen to meet these criteria and because they generally treat a substantial amount of material relating to cultural values.

Group 4. Literature and the Arts

One course must be completed from each of the two categories comprising this group:
Literature — One course from ENGL 205, 206, 210, 212, 216, 219, 230; FREN 270W; GERM 240W, 252, 253, 254, 255; RUSS 231W, 232W.
Arts — One course from ART 135; ARTH 137, 138, 141, 191,256, 285; DRAM 101, 110, 130, 230, 231, 282; GERM 171, 281; MUSI 190, 191, 193, 194, 285; WS 104.

Group 5. Culture and Modern Society

One course must be completed from each of the two categories comprising this group:
Western Culture — HIST 100 or 101.
Non-Western Culture — ANTH 100, 222, 223, 224, 225, 226, 227, 238; ENGL 120, 218; GEOG 160; HIST 106, 108, 205, 222, 223, 281, 282, 285, 288; LAMS 190; PHIL 263, 264; POLS 143, 203, 228, 229, 239; SOCI 226, 227; SPAN 201; WS 124, 203W.

Group 6. Philosophical or Ethical Analysis

All Engineering students must complete the following course: PHIL 104.

Group 7. Social Scientific and Comparative Analysis

One course must be completed from among the following: ANTH 106, 220; COMS 102; ECON 100, 111, 112, 113; GEOG 104, 150, 200; HIST 121; LING 102; POLS 121, 132, 173; PSYC 133; SOCI 107, 115, 125; WS 103.

Humanities and Social Sciences Area of Concentration

To complete the School of Engineering humanities and social sciences course requirements, selection of course work from Groups 4 through 7 above must be such that at least two courses are taken in one of the departments listed, with at least one of these two courses being at the 200-level. This additional requirement allows for achieving depth in a particular area within the humanities and social sciences. Students may also meet this requirement for depth by taking an additional course, beyond the minimum prescribed above, at the 200-level in

one of the departments listed; provided that prior approval is obtained from the Director of Undergraduate Advising. Examples are given below:

ANTH 106 (Group7) and ANTH 226 (Group 5 Non-Western)
ENGL 210 (Group 4 Literaure) and ENGL 218 (Group 5 Non-Western)
PHIL 104 (Group 6) and PHIL 263 (Group 5 Non-Western)
HIST 101 (Group 5 Western) and HIST 281 (Group 5 Non-Western)

II. Engineering Technical Courses

All students in the School of Engineering are required to take courses in mathematics, the sciences and engineering throughout the four year program of study as shown on the following pages. Suggested course sequencing and options for elective technical courses are indicated in the following sections for each Engineering major. Additional information beyond that given below may be found in a *Guide to Course Selection* document obtained in the particular major department.

Major Requirements and Normal Sequences

Students who are unsure about their choice of a major field should consult with their advisors for help in choosing a program which best suits their interests.

The exact sequence of humanities and social sciences courses may be chosen by the student, but the ones shown are recommended.

A student who follows one of the listed curricula should be able to complete the requirements for the Bachelor of Science in Engineering degree in eight semesters. However, many students choose to spread their studies over nine or 10 semesters. Students electing cooperative education will necessarily spend more than four years to earn the degree. Students are advised to follow the recommendations of the department in which they intend to major since course selection may be limited if certain required courses are not taken before the junior year.

Because many of the engineering courses in the junior and senior years are offered only once a year, students should ordinarily be prepared to begin the junior level courses in the fall semester.

I. Normal Sequences for the Freshman Year

One of the following sequences of courses should be taken by freshmen unless by special permission of the faculty advisor another sequence is authorized.

Chemical, Civil, or Mechanical Engineering

Freshman Year First Semester

	Credits
CHEM 127Q or 129Q — General Chemistry	4
MATH 115Q [a] — Calculus I	4
ENGR 150C — Introduction to Engineering I	3
ENGL 105 — English Composition	3
HIST 100 — Roots of the Western Experience *or* HIST 101 — Modern Europe (Group 5)	3

Second Semester

	Credits
CHEM 128Q or 130Q — General Chemistry	4
MATH 116Q [a] — Calculus II	4
Engineering Elective [b]	3
ENGL 109 — Literature & Composition	3
Social Science course (Group 7)	3

Computer Science & Engineering or Electrical Engineering

Freshman Year First Semester

	Credits
CHEM 127Q or 129Q — General Chemistry	4
MATH 115Q [a] – Calculus I	4
CSE 110C – Introduction to Numerical Computation	3
ENGL 105 – English Composition	3
HIST 100 – Roots of the Western Experience	3
or HIST 101 – Modern Europe (Group 5)	3

Freshman Year Second Semester

	Credits
CHEM 128Q or 130Q – General Chemistry	4
MATH 116Q [a] – Calculus II	4
CSE 111 – Introduction to Non-numerical Computation (for CS&E)	2
CSE 111 *or* Elective [c] (for EE)	2 or 3
ENGL 109 – Literature & Composition	3
Social Science Course (Group 7)	3

II. Normal Sequences for the Sophomore Year

One of the following sequences of courses should be taken by sophomores unless by special permission of the faculty advisor another sequence is authorized. Some programs suggest that Upper Division technical courses that are required in the curriculum be taken during the sophomore year. This may be done by postponing humanities and social sciences courses or elective courses shown and taking the technical courses in their places.

Chemical Engineering

Sophomore Year First Semester

	Credits
PHYS 151Q – Physics for Engineers I	4
MATH 210Q _ Multivariable Calculus	4
CHEG 203 _ Introduction to Chemical Engineering	3
CE 211 – Applied Mechanics I	3
Elective [d]	3

Sophomore Year Second Semester

	Credits
PHYS 152Q – Physics for Engineers II	4
MATH 211Q – Elementary Differential Eqns	3
CHEG 211 – Chemical Engineering Thermodynamics	3
PHIL 104 – Philosophy & Ethics (Group 6)	3
Arts course (Group 4) [e]	3

Civil Engineering

Sophomore Year First Semester

	Credits
PHYS 151Q – Physics for Engineers I	4
MATH 210Q – Multivariable Calculus	4
CE 211 – Applied Mechanics I	3
CE 271 - Elementary Surveying [e]	4
PHIL 104 – Philosophy & Ethics (Group 6)	3

Sophomore Year Second Semester

	Credits
PHYS 152Q – Physics for Engineers II	4
MATH 211Q – Elementary Differential Eqns	3
CE 212 – Applied Mechanics II	3
CE 254 - Transportation Facilities Design [e]	3
Arts course (Group 4)	3

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[a] Those students who are not eligible to enroll in MATH 115Q in their first semester, as a result of their performance on the mathematics placement test, may complete the introductory calculus sequence MATH 112Q, 113Q, 114Q in place of the required calculus sequence indicated. Students should use the summer following the first year to take the third course in this sequence, so that they will be ready to take MATH 210Q in the first semester of the sophomore year.

[b] ENGR 151 is usually taken and is recommended as the Engineering Elective. However, other Engineering courses may be used; e.g., CSE 110C, to meet this requirement. Civil Engineering students may choose between ENGR 151 and GEOL 102.

[c] For EE majors, it is recommended that CSE 111 be taken if additional CS&E course work will follow in later semesters. Other recommendations for this elective include ENGR 150C or BIOL 107, for students interested in biomedical engineering within the EE program.

[d] Students may wish to take the Organic Chemistry courses listed in the junior year by postponing the General Education Requirement and elective courses to a later semester.

[e] Students at the regional campuses who do not wish to change campuses to Storrs prior to the junior year may interchange CE 271 with the Elective in the first semester of the junior year and CE 254 with the Group 4 Literature course in the second semester of the junior year.

Computer Science & Engineering or Electrical Engineering

Sophomore Year First Semester

	Credits
PHYS 151Q – Physics for Engineers I	4
MATH 210Q – Multivariable Calculus	4
CSE 207 – Computer Science	3
CSE 208W – Logic Design Laboratory	2
CE 211 – Applied Mechanics I	3

Sophomore Year Second Semester

	Credits
PHYSICS 152Q – Physics for Engineers II	4
MATH 211Q – Elementary Differential Equations	3
EE 201 – Fundamentals of Circuit Analysis	3
EE 209W – Analog Design Laboratory	2
PHIL 104 – Philosophy & Ethics (Group 6)	3
Arts course (Group 4)	3

Mechanical Engineering

Sophomore Year First Semester

	Credits
PHYS 151Q – Physics for Engineers I	4
MATH 210Q – Multivariable Calculus	4
ME 205 – Introduction to Mechanical Engineering	3
CE 211 – Applied Mechanics I	3
PHIL 104 – Philosophy & Ethics (Group 6)	3

Sophomore Year Second Semester

	Credits
PHYS 152Q – Physics for Engineers II	4
MATH 211Q – Elementary Differential Equations	3
ME 233 – Thermodynamic Principles	3
CE 212 – Applied Mechanics II	3
Arts course (Group 4)	3

III. Normal Sequences for the Junior and Senior Years

The courses listed in the following curricula for the junior and senior year are required for graduation. Departmental and Professional requirements may also be specified on the plan of study.

Although the order in which courses are taken is subject to minor variations for individual students the indicated sequences are recommended. Because of prerequisite requirements and scheduling conflicts, indiscriminate changes in course sequences are likely to result in failure to complete graduation requirements at the desired time.

Professional Requirements. All curricula specify Professional Requirements. These must be technical courses numbered 200 or higher listed in the departments in Engineering, Mathematics, Statistics, or Physical and Life Sciences. If they are not specified on the Plan of Study, they are to be selected subject to department approval to complement the listed required courses in meeting professional objectives and to help the student prepare for a career in his/her major field.

Chemical Engineering

Chemical engineering is concerned with the creation and operation of processes that involve the conversion of basic chemical or mineral raw materials into useful products. The profession is, therefore, very broad and has traditionally provided the technology for production of fuels for the world energy supply; creation of synthetic materials, such as plastics or fertilizers; refining of minerals and ores; and manufacture of pharmaceuticals and a wide range of chemicals for use by society. Opportunities for creative and satisfying careers can be found in the conception, research, development, design, control, or management of processes involving chemical change, thereby resulting in several career choices for the Chemical Engineering graduate.

The goal of the Chemical Engineering undergraduate program is to prepare men and women to enter the challenging fields spanning the spectrum of activities that require the talents of chemical engineers. The overall program objectives are to help students attain fundamental knowledge, acquire an appreciation for life-long learning, and develop skills in analysis and design, teamwork, and oral and written communication necessary for a successful career. The classroom and laboratory experiences in the curriculum enable the Chemical Engineering graduate to pursue successful engineering careers characterized by continued professional growth and advancement in industry or government either directly or after continuing on to graduate school.

The first two years of the curriculum (emphasizing mathematics, basic sciences, and engineering topics) are similar for all branches of engineering. The student must obtain a broad foundation in chemistry, mathematics, physics, communication skills, and the humanities and social sciences. Engineering topics in the Lower Division serve to introduce the students to applications of science and mathematics and, via open-ended problems, nurture student creativity and problem-solving skills. In the last two years, courses in chemical engineering science and design along with professional electives allow students to build on their knowledge of underlying chemical engineering principles, increase their understanding of the design and operation of chemical processes, reinforce their problem-solving skills, and develop an appreciation of relevant safety, environmental, social, and economic issues.

Engineering science and design are integrated throughout the curriculum, as are appropriate computer applications. In their last year, students take two senior capstone design courses that draw significantly from previous course work and focus their attention on future professional practice. Flexibility is provided in the curriculum by allowing students to select two chemical engineering and three professional requirement courses during their last two years. Selection of these technical electives must include at least some courses containing design work to ensure sufficient attention to this area of the curriculum.

Chemical Engineering

Junior Year First Semester

	Credits
CHEG 212 – Chemical Engineering Thermodynamics	3
CHEG 223 – Transfer Operations	3
CHEM 243 – Organic Chemistry [f]	3
CHEM 240 – Organic Chemistry Lab [f]	1
CHEM 263Q – Physical Chemistry	4
Non-Western course (Group 5)	3

Junior Year Second Semester

	Credits
CHEG 224 – Transfer Operations	3
CHEG 251 – Process Kinetics	3
CHEM 244 – Organic Chemistry [f]	3
CHEM 256 – Physical Chemistry Lab	1
CHEM 264Q – Physical Chemistry [g]	4
Professional Requirement [h]	3

Senior Year First Semester

	Credits
CHEG 237W – Chemical Engineering Lab	3
CHEG 241 – Process Design & Economics	3
CHEG 247 – Process Dynamics & Control	3
CHEG Requirement [h]	3
Literature course (Group 4)	3
Elective	3

Senior Year Second Semester

	Credits
CHEG 239W – Chemical Engineering Lab	3
CHEG 242 – Process Design	3
CHEG Requirement [h]	3
Professional Requirement [h]	3
Professional Requirement [h]	3

[f] These couses may be taken in the Sophomore year by postponing electives.
[g] Students may select CHEM 232Q (Analytical Chemistry, 4 credits), MCB 203 (Introduction to Biochemistry, 4 credits), MCB 204 (Biochemistry, 5 credits), or MCB 229 (Fundamentals of Microbiology, 4 credits) as a replacement for CHEM 264Q, if they would prefer to take one of these other courses.
[h] Selection of these technical electives must include at least some courses containing engineering design work to ensure sufficient attention to this area of the curriculum. At least three credits of Professional Requirements must be outside of Chemical Engineering.

Civil Engineering

Civil and environmental engineers design, analyze, construct, and operate the public and private infrastructure necessary for the quality of life of contemporary society. The mission of the Department of Civil and Environmental Engineering is to educate the future leaders of the profession. The Department advances the profession through state-of-the-art research and scholarship and serves as an intellectual resource to the state, national, and international communities.

Our academic programs emphasize fundamental scientific concepts, critical thinking, communication skills, and professional development. The undergraduate program provides the mathematical and scientific background and design experience for graduates to enter professional practice or to pursue advanced professional degrees. Our objective as a department is to graduate students who are

- proficient in the fundamentals of mathematics, science, and in the various areas of civil and environmental engineering
- able to design and conduct experiments and to critically analyze and interpret data
- knowledgeable of the professional, societal, and global factors that govern engineering practice and design
- effective communicators to both general and professional audiences, and
- able to synthesize fundamental concepts, past practices, and emerging ideas in engineering design while accounting for societal and environmental constraints.

The curriculum in civil engineering is designed to give a student thorough grounding in fundamental engineering principles and their application to the various branches of civil engineering, including environmental engineering. During the first two years, students majoring in civil engineering follow the common engineering program. CE 211 and CE 212 are required courses in this curriculum and are normally taken in the third and fourth semesters. In the third year civil engineering students take at least one basic course in the areas of structures, fluid mechanics, materials, surveying, soil mechanics, transportation, and environmental engineering. Students have the option of choosing between two courses in the second semester of the third year. Those interested in Environmental and Water Resources Engineering should take CE 260 and CE 262. Those interested in Structural Engineering should take CE 222 and CE 234. During the fourth year, advanced engineering courses, including the Civil Engineering Projects course (CE 280), are required. Students must pass, with a grade of satisfactory, two semesters of CE 291 (Civil & Environmental Engineering Professional Issues Seminar).

This program contains a minimum of sixteen (16) credits of design work. Eleven of these credits are in required courses. The rest are included in professional requirements. The theoretical work in the classroom is supplemented by experimental work in the hydraulic, materials testing, concrete, soils, structural, geotechnical, environmental, and surveying and photogrammetric labora tories. Courses in engineering mechanics, hydraulics, and civil engineering systems are offered.

Following is the recommended sequence of courses for the junior and senior years. Depending on Lower Division course progress, a student may not be able to take all of these courses in the order suggested below, since certain courses are prerequisites for later courses in the program. Those students intending to take advanced courses in structural or geotechnical engineering technical area should take CE 287 in the fall of their junior year, and those students intending to take advanced courses in environmental/water resources should take CE 297 in the fall of their junior year.

Civil Engineering

Junior Year First Semester

	Credits
CE 291 – C&EE Professional Issues Seminar [i]	0
CE 240 – Soil Mechanics	4
CE 263 – Environmental EngineeringFundamentals	3
CE 287 – Mechanics of Materials	3
CE 297 – Fluid Mechanics	3
Elective	3

Junior Year Second Semester

	Credits
CE 291 – C&EE Professional Issues Seminar [i]	0
CE 222 – Civil Engr. Materials *or* CE 262 – Environmental Engr. Lab	3
CE 234 – Basic Structural Analysis *or* CE 260 – Water Quality Engr.	3
CE 236 – Basic Structural Design	4
Literature course (Group 4)	3
Non-Western course (Group 5)	3

Senior Year First Semester

	Credits
CE 291 – C&EE Professional Issues Seminar [i]	0
EE 220 – Electrical Engineering Principles	3
Professional Requirement	3
Professional Requirement	3
Professional Requirement	3
Elective	3
Elective	3

Senior Year Second Semester

	Credits
CE 280W – Civil Engineering Projects	3
CE 281 – Engineering Economics	1
ME 233 – Thermodynamic Principles	3
Professional Requirement	3
Professional Requirement	3
Professional Requirement	3

The Professional Requirements are only satisfied by Upper Division (200-level or higher) courses and must include one course each from two of the technical areas listed below and must satisfy the engineering design credit and other distribution requirements as specified by the *Civil & Environmental Engineering Department Guide to Course Selection*. The student is encouraged to select the remaining professional requirements from among the Civil & Environmental Engineering electives unless specific career objectives are better served by other courses falling under the broad definition of professional requirements. Selection of courses for the professional requirements must be developed in conjunction with the student's advisor.

Technical Areas

1. Environmental Water Resources Engineering
CE 260 – Water Quality Engineering
CE 262 – Environmental Engineering Laboratory
CE 265 – Hydraulic Engineering
CE 266 – Hydraulic Engineering Laboratory
CE 267 – Engineering Hydrology

2. Transportation Engineering
CE 251 – Civil Engineering Systems
CE 256 – Advanced Civil Engineering Systems
CE 274 – Photogrammetry
CE 275 – Route Surveying

3. Geotechnical Engineering
CE 241 – Foundation Design
CE 242 – Soil Engineering

Note: GEOL 102 (Introductory Geology) and GEOL 229 (Engineering Geology) are recommended electives for students interested in pursuing a career in Geotechnical Engineering.

4. Structural Engineering
CE 222 – Civil Engineering Materials
CE 234 – Basic Structural Analysis
CE 237 – Advance Structural Analysis
CE 238 – Reinforced Concrete Structures
CE 239 – Design of Steel Structures

Computer Science & Engineering

The Computer Science & Engineering curriculum satisfies the accreditation requirements of both the Accreditation Board for Engineering and Technology ABET) and the Computing Sciences Accreditation Board (CSAB). As such, it

[i] Students must complete, with a grade of satisfactory, two semesters of CE 291 (Civil & Environmental Engineering Professional Issues Seminar) prior to CE 280W.

provides students with a broad base of study in the field of computing. A goal of the curriculum is to provide an education, in the field of Computer Science & Engineering, which prepares graduates for a good entry-level position in the profession or for graduate study in the field.

The first two years of the curriculum (emphasizing basic sciences and engineering) are similar for all branches of engineering. The student obtains a broad foundation in chemistry, mathematics, physics, humanities, arts, and social sciences. The students are also given an introduction to the field of computing, both hardware and software, as well as fundamental work in electrical engineering and applied mechanics.

The latter two years of the Computer Science & Engineering curriculum build upon and complement the basic knowledge through required courses, design laboratories, and professional electives. Students take required courses in Software Engineering, Operating Systems, Compiler Theory, Computer Organization, Computer Architecture, and Probabilistic Analysis of Computer Systems. They also enhance their understanding of mathematics and the theoretical foundations of Computer Science in course work that includes Linear Algebra, Probability and Statistics, Discrete Mathematics, and Algorithms and Computational Complexity. The design laboratories and professional requirements define an area of concentration in Computer Science & Engineering. Currently there are three areas of concentration described in the *Computer Science & Engineering Guide to Course Selection*; Computer Architecture and Networks, Graphics and Imaging, and Software Engineering. Whichever area of concentration is chosen or developed, the professional electives must include a least 3 credits of CSE course work and at least 2 credits of engineering design. The program also includes a small number of free electives that allow the student to explore other areas of interest or to take more course work in Computer Science & Engineering.

Engineering Science and Design, ethics and the social implications of computing, as well as the development of communication skills, are integrated throughout the curriculum. The overall program objectives are to help our students attain fundamental knowledge, acquire an appreciation for life-long learning, and develop skills in analysis, design, teamwork, and oral and written communication necessary for a successful career. The program is heavily laboratory based, with most courses requiring outside laboratory work, and many having a closed laboratory component.

The Computer Science & Engineering Program includes at least one course that contains a team experience. The requirement for a team experience is normally satisfied through selection of a Design Laboratory, which includes this experience. Laboratory courses cannot be used as professional requirements unless specifically approved by the Department beforehand.

Computer Science & Engineering

Junior Year First Semester

	Credits
CSE 230 – Intro. to Software Engineering	3
CSE 241 – Computer Organization	3
CSE 254 – Intro. to Discrete Systems	3
EE 202 – Signals and Systems	3
Literature Course (Group 4)	3

Junior Year Second Semester

	Credits
CSE 228 – Parallel Systems *or* CSE 252 – Digital System Design	3
CSE 240 – Intermediate Computer Systems Lab	3
CSE 259 – Algorithms and Complexity	3
MATH 231Q– Probability [j] or STAT 220Q – Statistical Methods [j]	3
Non-Western course (Group 5)	3
Elective	3

Senior Year First Semester

	Credits
Design Laboratory	3
CSE 221 – Probabilistic Performance Analysis	3
CSE 244 – Programming Language Translation	3
MATH 227Q – Applied Linear Algebra	3
Professional Requirement [k]	3
Elective	3

Senior Year Second Semester

	Credits
Design Laboratory	3
CSE 258 – Operating Systems	3
Professional Requirement [k]	3
Professional Requirement [k]	3
Elective	4

Electrical Engineering

The goal of the undergraduate program in Electrical Engineering is to prepare men and women to successfully enter rewarding and challenging careers in electrical engineering. The undergraduate program of study is designed with sufficient breadth and depth to enable our graduates to work successfully in industry or government, or to continue studies in graduate school.

The overall program objectives are to enable students to attain fundamental knowledge, acquire an appreciation of life-long learning, and develop skills in analysis, design, and teamwork. Students are expected to apply their theoretical knowledge and experimental skills to find practical solutions to a wide range of analytical and design problems, and develop oral and written communication skills necessary for a successful career.

The electrical engineering curriculum provides a firm foundation in fundamentals, while also giving students exposure to current technologies for design and implementation. It strives for a balance between theory, laboratory and design experience. In the first two years of study, students are given a broad foundation in mathematics, physics, chemistry, computer programming, applied mechanics, communication skills and humanities. Introductory courses in computer science and electric circuit analysis are also taken in the sophomore year. In the final two years, students build upon their earlier course work, taking a set of required EE courses intended to provide the core knowledge expected of every electrical engineer.

A student in consultation with his or her advisor chooses a number of electrical engineering professional elective courses, and various elective courses in the humanities and social sciences. The professional elective courses taken give the student expertise in an area of specialization in electrical engineering, or allow him or her to explore topics of individual interest. Areas of specialization in electrical engineering include: biomedical engineering, electronic circuits and instrumentation, microelectronics, systems, and telecommunications. Suggestions on the choice of professional electives appropriate for each area of specialization are found in the *Electrical & Systems Engineering Department Guide to Course Selection.*

As students progress through the electrical engineering curriculum, they experience the challenge of design integrated into electrical engineering courses and laboratories. Many electrical engineering courses stress design in their specific areas through semester design projects and homework problems calling for design decisions. In general, students are exposed to system-wide analysis, critique, and evaluation in an iterative fashion, while applying previously-learned material to meet the design objectives. Wherever appropriate, students are also introduced to the important role of relevant safety, economic, and environmental factors in the decision making processes in all design related courses.

Laboratory work in electrical engineering is a significant curriculum component that provides hands-on experience with the design of hardware and software in a variety of areas. Laboratory experience for electrical engineers begins in the sophomore year and continues through the senior year, culminating in the senior electrical engineering (capstone) design project. The senior capstone design project follows a design principles seminar in which the essential elements of design are reinforced, and the capstone project is selected and planned for. A wide spectrum of senior design project topics is available, including problems presented by current industrial sponsors of the electrical engineering design laboratory.

A University rule provides that no course prerequisite to a second course in the same department shall be open for credit to a student after he or she has passed the second course unless exception is made by the department. Concurrent prerequisites to electrical engineering courses offered by the Electrical & Systems Engineering Department are excepted from this rule so that a student who fails a concurrently prerequisite course may repeat it for credit.

[j] STAT 230Q may be substituted for MATH 231Q or STAT 220Q.
[k] See the CS&E *Department Guide to Course Selection* for course ordering.

Electrical Engineering Curricula

There are two electrical engineering curricula, one of "core" Electrical Engineering topics, and the other one for computer engineering. Both share the same freshman and sophomore requirements.

Core Electrical Engineering Curriculum

Junior Year First Semester

	Credits
EE 202 – Signals and Systems	3
EE 204 – Electronic Devices and Circuits	3
EE 206 – Electromagnetic Fields and Applications	3
EE 261 – Electrical Engineering Lab A	3
Literature course (Group 4)	3

Junior Year Second Semester

	Credits
EE 207 – Electromagnetic Waves and Applications	3
EE 232 – Systems Analysis	3
EE 245 – Micro/Opto-electronic Devices	3
EE 262W – Electrical Engineering Lab B	3
STAT 224Q – Probability Models for Engineers	3
Non-Western course (Group 5)	3

Senior Year First Semester

	Credits
Design Laboratory	3
EE 241 – Communication Systems	3
EE 290 – Elec. Engineering Design I	2
Professional Requirement [1]	3
Professional Requirement [1]	3
Elective	3

Senior Year Second Semester

	Credits
Design Laboratory	3
EE 240 – Electronic Circuits and Applications	3
EE 291 – Electrical Engineering Design II	3
Professional Requirement [1]	3
Professional Requirement [1]	3
Elective	1 or 2

Five Areas of Concentration (AOCs) are defined: Telecommunications, Systems, Microelectronics/Optoelectronics, Electronic Circuits and Instrumentation, and Biomedical Engineering. Courses which may be used to fulfill the 6 credits of design laboratory and 12 credits of professional requirements for each AOC are described in the *Electrical and Systems Engineering (E&SE) Department Guide to Course Selection - Core Electrical Engineering Curriculum*. The entire program of professional requirements is selected by the student prior to registration in the fifth semester at the time the *Plan of Study* is prepared. This *Plan of Study* form may be revised as necessary during subsequent semesters.

Computer Engineering Electrical Engineering Curriculum

Junior Year First Semester

	Credits
CSE 241 – Computer Organization	3
EE 202 – Signals and Systems	3
EE 204 – Electronic Devices and Circuits	3
EE 206 – Electromagnetic Fields and Applications	3
EE 261 – Electrical Engineering Lab A	3
Literature course (Group 4)	3

Junior Year Second Semester

	Credits
CSE 230 – Introduction to Software Engineering	3
CSE 254 – Introduction to Discrete Systems	3
STAT 224Q – Probability Models for Engineers	3
Professional Requirement [1]	3
Non-Western course (Group 5)	3

Senior Year First Semester

	Credits
Design Laboratory	3
EE 247 – Digital Signal Processing	3
EE 290 – Electrical Engineering Design I	2
MATH 227 - Applied Linear Algebra	3
Professional Requirement [1]	3
Elective	3

Senior Year Second Semester

	Credits
Design Laboratory	3
EE 291 – Electrical Engineering Design II	3
CSE 258 - Operating Systems	3
Professional Requirement [1]	6
Elective	2

Three Areas of Concentration (AOCs) are defined: Device Fabrication (VLSI), Real-Time Computing Systems, and Communication and Computer Networks. Courses which may be used to fulfill the 6 credits of design laboratory and 12 credits of professional requirements for each AOC are described in the *Electrical and Systems Engineering (E&SE) Department Guide to Course Selection - Computer Engineering Curriculum*. The entire program of professional requirements is selected by the student prior to registration in the fifth semester at the time the *Plan of Study* form is prepared. This *Plan of Study* may be revised as necessary during subsequent semesters.

Minor in Environmental Engineering

An undergraduate minor in Environmental Engineering is available. This minor degree program can significantly enhance and strengthen the educational experience of students to provide a firm basis for understanding the impact of human activity and pollutants on the environment as well as the need for environmentally sound manufacturing processes and sustainable development. The required courses provide an introduction to fundamental principles that govern natural and engineered environmental systems. Elective courses allow students to complement the required courses and focus on topics relevant to his/her professional interests. Other less formal opportunities are also available to studnets in this program. These include research experiences in environmental engineering faculty laboratories, participation in the Environmental Scholars Colloquium and cooperative education programs with local and national firms.

Requirements. The Minor Degree Program in Environmental Engineering includes 18 credits of upper division work, of which no more than three credit hours may be research. All students completing the Minor must take CE 260 (Water Quality Engineering), CE 263 (Environmental Engineering Fundamentals), CHEG 285 (Introduction to Air Polution), and CE 279 (Environmental Modeling). These courses are selected to expose students to a wide variety of environmental topics. CE 263 provides a broad-based introduction to environmental engineering and introduces fundamental concepts. CE 260 and CHEG 285 introduce students to water and air quality/pollution engineering, respectively. Finally, CE 279 provides students with an introduction to modeling approaches used for both normal and engineered systems. Students are strongly advised to ensure that all appropriate prerequisites are met prior to taking each required course. Due to the interdisciplinary nature of environmental engineering, six additional credit hours may be selected from a wide variety of courses available in many departments throughout the University. See the Director of the Environmental Engineering Program for a list. The Director must approve in writing all elective courses.

Mechanical Engineering

The principal goal of the Mechanical Engineering program is to graduate a professional with a strong base of engineering topics and professional practice including engineering science, design, and ethics. This is accomplished by courses that provide the student with the ability to work professionally in both thermal ane mechanical systems areas including their design and realization. The program begins with the fundamentals of mathematics and physical science, utilizing laboratory and computer experiences to demonstrate physical behavior and to allow development of test procedures and computer simulation. It is the intent of the Mechanical Engineering Department to apply programming principles toward

[1] See the *E&SE Department Guide to Course Selection* for course ordering and recommended professional electives.

the solution of problems. Therefore, it is mandatory that each student become knowledgeable in the use of a high level programming language. The languages of choice are FORTRAN or C.

Laboratory courses accompany the classroom work throughout the program, and in the senior year the Mechanical Engineering Program is completed with a one-year capstone design sequence that requires students to design, construct and exhibit solutions to real problems. During this process, students are required to demonstrate their written and oral skills. The required courses are supplemented with elective courses that permit students to pursue special interests in the broad areas of energy and mechanical systems, as well as in manufacturing. This strong technical education also provides an understanding of our culture and history in order to prepare the Mechanical Engineering graduate to serve the needs of society.

Students should consult the *Mechanical Engineering Department Guide to Course Selection*, provided by the department, for more details on the program.

Mechanical Engineering

Junior Year First Semester

	Credits
CE 287 – Mechanics of Materials	3
EE 220 – Electrical Engr. Principles	3
ME 234– Applied Thermodynamics	3
ME 253 – Linear Systems Theory	3
ME 262 – Introductory Thermal-Fluids Lab	3
Literature course (Group 4)	3

Junior Year Second Semester

	Credits
ME 220 – Dynamics of Mechanical Systems	3
ME 250 – Fluid Dynamics I	3
ME 260W – Measurement Techniques	3
MMAT 201 – Materials Sci. & Engineering I	3
MMAT 202 – Materials Science & Engineering Lab	1
Mechanical Engineering Requirement [m]	3

Senior Year First Semester

	Credits
ME 227 – Design of Machine Elements	3
ME 242 – Heat Transfer	3
ME 255 – Computational Mechanics	3
ME 271P – Experimental Mechanical Engineering	2
ME 272P – Senior Design Project I	3
Non-Western course (Group 5)	3

Senior Year Second Semester

	Credits
ME 273P – Senior Design Project II	3
Mechanical Engineering Requirement [m]	3
Professional Requirement	3
Professional Requirement	3
Elective	4

Metallurgy & Materials Engineering

Students interested in metallurgy and materials engineering at an undergraduate level may adopt a variety of approaches to study in this area. Metallurgy and materials engineering courses may be included as electives in the student's regular major program or, depending upon the degree of interest, the student may elect to pursue either a double major program or a minor program incorporating materials engineering with his or her primary major area of study. These options, described below, allow the student suitable recognition for specializing his or her elective program in the materials area.

[m] At least two credits of design work must be included in the Mechanical Engineering requirement, and no more than one ME 299 course may be used to fulfill the Mechanical Engineering requirement.

Materials Engineering Double Major

The courses offered deal with the main aspects of metallurgy and materials engineering; i.e., the relationship between microstructure and properties of metals, ceramics and composites, phase equilibria, mechanical behavior, welding, extractive metallurgy, and corrosion. The Materials Engineering double major is a flexible program consisting of at least 30 credits of materials courses, of which as many as 15 credits may be specific requirements of the primary Engineering major. The program must include MMAT 201 and at least 9 credits of additional undergraduate Metallurgy and Materials Engineering course work. Fifteen of the 30 credits that are required may be taken from the primary major course work, where the following are designated as "materials" courses within the primary major indicated:

Chemical: CHEG 211, 212; CHEM 243, 263Q,264Q
Civil: CE 222, 240, 287, 297; ME 233;
Electrical: EE 206, 245, 246, 249, 268
Mechanical: CE 287, ME 233, 234, 260W, MMAT 201, 202.

The remaining 15 credits must be selected from the undergraduate Metallurgy and Materials Engineering department course offerings or from CHEG 256, ME 217, ME 218, or ME 228. The Materials Engineering double major can normally be completed within the 134 credits necessary for the primary major.

Minor in Metallurgy and Materials Engineering

In addition to the double major in Materials Engineering, directed at Engineering majors, the Department of Metallurgy & Materials Engineering offers a minor degree program in Metallurgy and Materials Engineering for both Engineering and non-Engineering majors. The minor degree program provides a firm basis for understanding the relationships between the structure of all classes of materials and the properties of these materials that are critical to science and engineering. The required courses develop the concept of structure at various levels - including microstructure, atomic structure, and electronic structure - as it relates to the mechanical, chemical, electrical, optical, and magnetic properties of materials.

The minor degree program requires 16 credits of upper division course work, of which no more than three credits may be independent study (MMAT 299). MMAT 201, MMAT 202, and MMAT 203 are all required for the minor along with nine additional credits selected from the offerings of the Department of Metallurgy & Materials Engineering.

Management and Engineering for Manufacturing

The Management and Engineering for Manufacturing major is a joint program between the Schools of Business Administration and Engineering. The program is designed to educate manufacturing professionals with a solid background in engineering and business leading to a degree of Bachelor of Science in Management and Engineering for Manufacturing.

The program includes education in concurrent engineering, quality management and control, computer integrated manufacturing, and change management capabilities. Many of the courses in the program are team taught by faculty from both schools. Summer internships are incorporated into a program comprised of courses from Business, Engineering, and ones focusing on the major. These latter courses are listed under the heading Management and Engineering for Manufacturing in the *Directory of Courses*, with an abbreviation of MEM.

The courses prescribed for the program meet the minimum general education requirements of the University. Administration of the program is the responsibility of the co-directors appointed by the deans of Business Administration and Engineering. The directors will make recommendations to the Deans for modifications, waivers, and substitutions of course requirements by individual students. Students are required to meet the academic level of performance as specified by the two schools.

Scholastic Standing Requirements. A cumulative grade point average of at least 2.0 in all courses in Mathematics, Physics, Chemistry, Engineering, and Managemagement & Engineering for Manufacturing applicable toward the degree must be achieved for a student to be admitted to the junior year in the program. Once in the upper division, students must maintain a minimum of 2.0 for their

semester grade point average, a 2.0 for their divisional grade point average, and a 2.0 grade point average in all calculable credits in School of Business Administration and Management & Engineering for Manufacturing courses for which they have been registered. Students who fail to meet these standards are subject to dismissal from the Management & Engineering for Manufacturing program and the schools of Business Administration and Engineering.

The program has requirements that differ from those in the School of Business Administration and School of Engineering. Program requirements and recommended sequencing of courses are presented below.

Management and Engineering for Manufacturing

M.E.M. Freshman Year First Semester

	Credits
CHEM 127Q or 129Q – General Chemistry	4
MATH 115Q [n] – Calculus I	4
ENGR 150C – Introduction to Engineering I	3
ENGL 105 – English Composition	3
HIST 101 – Modern Europe (Group 5)	3

M.E.M. Freshman Year Second Semester

	Credits
MATH 116Q [n] – Calculus II	4
MEM 151 – Intro to Management and Engineering for Manufacturing	3
ENGL 109 – Literature & Composition	3
ECON 113 – Principles of Economics (Group 7)	4
STAT 110V – Elementary Concepts of Statistics	4

M.E.M. Sophomore Year First Semester

	Credits
PHYS 151Q – Physics for Engineers I	4
MATH 210Q – Multivariable Calculus	4
CE 211 – Applied Mechanics I	3
MEM 210 – Manufacturing Equipment Lab	1
ANTH 100 – Other People's Worlds *or* GEOG 160 – World Regional Geography (Group 5)	3
Arts course (Group 4)	3

M.E.M. Sophomore Year Second Semester

	Credits
PHYS 152Q – Physics for Engineers II	4
MATH 211Q – Elementary Differential Equations	3
MEM 211 – Introduction to Manufacturing Systems	3
PHIL 104 – Philosophy & Social Ethics (Group 6)	3
Literature course (Group 4)	3

M.E.M. Junior Year First Semester

	Credits
ACCT 210 – Management and Engineering for Manufacturing Accounting	3
CE 287 – Mechanics of Materials	3
EE 220 – Electrical Engineering Principles	3
MEM 221– Intro. to Products & Processes	3
MMAT 201 – Materials Sci. & Engineering I	3
OPIM 203C – Business Information Systems	3

M.E.M. Junior Year Second Semester

	Credits
FNCE 201 – Business Finance	3
MGMT 201 – Introduction to Management	3
MKTG 201 – Introduction to Marketing Management	3
ME 222 – Production Engineering	3
ME 260W – Measurement Techniques	3
MEM 231 – Computers in Manufacturing	3

M.E.M. Senior Year First Semester

	Credits
BLAW 271 – Business Law	3
ME 221 – Manufacturing Automation	3
ME 227 – Design of Machine Elements	3
MEM 225 – Advanced Products and Processes	3
Technical Elective[o]	3
Humanities course[p]	3

M.E.M. Senior Year Second Semester

	Credits
OPIM 252 – Industrial Quality Control	3
MGMT 290 – Strategy, Policy and Planning	3
ME 238 – Thermal Science	3
MEM 215W – Adv. Manufacturing Systems	4
Technical Elective[o]	3

M.E.M. Internships

Students in the Management & Engineering for Manufacturing program are encouraged to seek faculty supervised manufacturing summer internships prior to the junior and senior years. Such internships may be shown on the student's record by registering for MEM 296 Manufacturing Internship. Registration in this course requires instructor and advisor approval. The student should consult with his or her advisor early in the academic year prior to the summer in which the internship is desired.

Graduate Studies in Engineering

Programs of graduate studies leading to the degrees of Master of Science and Doctor of Philosophy are offered in the following fields of study: Chemical Engineering, Civil Engineering, Computer Science & Engineering, Electrical Engineering, Mechanical Engineering, and Metallurgy. In addition, interdisciplinary fields of study available include Biomedical Engineering, Environmental Engineering, Materials Science, and Polymer Science.

Doctoral students should plan to take most of their course work on the Storrs campus and must devote an extended period to full-time study in residence. Programs leading to the Master of Science degree are also offered in the evenings for engineers and scientists in industry who have been admitted to the Graduate School. Courses are offered at Hartford, New London and Stamford in addition to late afternoon and evening courses on the University campus at Storrs.

Students are referred to the announcement of the Graduate School and to the course offerings under chemical, civil, environmental, electrical and mechanical engineering, computer science & engineering and metallurgy. Undergraduate students are allowed to take graduate courses if they are in their senior year and have a cumulative grade point average of 2.6 or above. Graduate courses in engineering are not open for credits to non-degree students. Therefore, any student planning to take an engineering graduate course who is not enrolled should make early application to the Dean of the Graduate School.

[n] Those students who are not eligible to enroll in MATH 115Q in their first semester, as a result of their performance on the mathematics placement test, may complete the introductory calculus sequence MATH 112Q, 113Q and 114Q in place of the required calculus sequence indicated. Students should use the summer following the first year to take the third course in this sequence, so that they will be ready to take MATH 210Q in the first semester of the sophomore year.

[o] The Technical Elective may be fulfilled by courses numbered 200 or higher listed in the departments listed in Business Administration or Engineering. The course selected by the student must be approved by his or her advisor. requirement is met if the student has successfully completed the third-year high school level course.

[p] Anthopology, Geography, History, or Philosophy at the 200-level from the General Education Requirement Groups 4-7.

School of Engineering Website

http://www.eng2.uconn.edu/