



ARTS AND SCIENCE-ENGINEERING CURRICULA

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering

This five-year program leads to the degree of Bachelor of Arts or Bachelor of Science and the degree of Bachelor of Chemical, Civil, Electrical, or Mechanical Engineering.

The Arts Engineering Program serves to both broaden the engineer's knowledge of the liberal arts and provide him or her with additional professional expertise. Many employers recognize the utility of hiring engineers who have extra proficiency in the language arts, the social sciences, and the humanities. Increasingly they search for employees with knowledge in some field that is interrelated with modern engineering, for example, economics, law, communication, mathematics and computer science and many of the biological and physical sciences. Yet some Arts-Engineering students have opted for this five-year program mainly for the personal satisfaction it can provide. These students, while committed to engineering as a profession, seek to enrich their nonworking hours with artistic or cultural knowledge acquired while in the College of Arts and Science.

In this program, students pursue courses in both the College of Arts and Science and the College of Engineering. It has attracted all kinds of students, among them freshmen who are undecided between a career in engineering or some field in Arts and Science. After sampling courses in both colleges, they can decide to contin-

ue in the program or switch to a four-year engineering or Arts and Science program. Conversely, a significant number of students who graduate as Arts-Engineers transferred into the program at some later time in their college career, either seeking to enrich their engineering studies or, if they were originally Arts and Science majors, deciding to become engineers.

The five-year Arts and Science-Engineering program assumes that all requirements will be fulfilled in the engineering department of the student's choice. A minimum of thirty additional credits in Arts and Science is required. The additional courses are selected in consultation with an Arts and Science adviser in such a way as to fulfill all requirements in that college. Since many courses taken as part of the engineering curricula are also applicable to Arts and Science degrees, all requirements for both degrees can usually be met within the framework of the "bachelor's-plus-30."

For his or her degree in the College of Arts and Science the student must fulfill the following requirements.

Second Writing Course: Must be passed with a grade of C or better; the course may also simultaneously fulfill one of the group or elective courses listed below.

Language: Must pass in an intermediate-level language course or pass a proficiency test at the intermedi-

ate level. Note that credits earned in meeting the language requirements cannot be counted toward fulfilling the group requirements or the Arts and Science electives below.

Group Requirements

Group A: Analysis and appreciation of the creative arts and humanities (12 credits, in at least two departments or programs).

Group B: The study of culture and institutions over time (12 credits in at least two departments or programs).

Group C: Empirically based study of human beings and their environment (12 credits in at least two departments or programs).

Group D: The study of natural phenomena through experiment and analysis. Automatically satisfied by means of the engineering curriculum.

Consult the latest listing of courses fulfilling group requirements available at the Arts and Science Dean's Office, 127 Memorial Hall.

NOTE: The above groups differ from General Education groups of the College of Engineering. (See page 199.) This requires the student to make careful course selection in order to have courses that satisfy both curricula simultaneously.

Area of Concentration: 15 credits of Arts and Science electives to be used for acquiring some depth of knowledge in a field chosen by the student in consultation with an Arts and Science adviser. It is recognized that the 15 credits designated for specialization may well be insufficient to qualify the student for an official major in most departments of the College of Arts and Science. Hence no major is required. Arts-Engineers whose "Area of Concentration" falls short of a major will graduate with a B.A. from the College of Arts and Science.

However, some students do manage to major in an Arts and Science department either by taking more than the minimum number of Arts and Science courses, or by specializing in a scientific or mathematical field, several of whose courses are also required for their engineering program. Some science departments give B.A. and B.S. degrees. Arts-Engineers majoring in such a department can attain either degree by following the appropriate departmental requirements. But there is one exception. While a few departments do not require a language proficiency for a B.S., nevertheless all Arts-Engineers must fulfill the language requirement.

DEGREE: BACHELOR OF ARTS or BACHELOR OF SCIENCE —BACHELOR OF CHEMICAL ENGINEERING MAJOR: NONE REQUIRED—CHEMICAL ENGINEERING

CURRICULUM

CREDITS*

UNIVERSITY REQUIREMENTS

E 110	Critical Reading and Writing	3 ^{1S}
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #		3 ¹⁻⁴

ARTS AND SCIENCE COLLEGE REQUIREMENTS

Skill Requirements

Writing	3
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A writing course involving significant writing experience including two papers with a combined minimum of 3,000 words to be submitted for extended faculty critique of both composition and content.

Foreign Language	0-12
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Completion of the intermediate-level course (107 or 112) in a given language or, for students with more than 4 years of high school foreign language or the equivalent, satisfactory performance on a proficiency test in that language.

Breadth Requirements (See page 74)

Group A	12
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Understanding and appreciation of the creative arts and humanities. Twelve credits representing at least two areas.

Group B	12
---------	----

The study of culture and institutions over time. Twelve credits representing at least two areas.

Group C	12
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Empirically based study of human beings and their environment. Twelve credits representing at least two areas.

The above groups differ from the General Education groups of the College of Engineering. This requires careful course selection in order to have courses that satisfy both curricula simultaneously.

AREA OF CONCENTRATION REQUIREMENTS

Area of Concentration:

Fifteen credits of Arts and Science electives to be used for acquiring some depth of knowledge in a field chosen in consultation with an Arts and Science adviser.	15
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Arts-Science Courses Completed	1-5
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The liberal arts component is listed as 51 credit hours. The absolute minimum required to satisfy the requirements listed above is 45; this assumes that the foreign language requirement is satisfied from high school work, the writing course is in one of the Groups A, B, or C, and that nine credits of the Area of Concentration are also from one of the Groups A, B, or C. Thus, students without language skills and concentrating in science or mathematics will need more than 51 credit hours to complete all of these requirements.

ENGINEERING COLLEGE REQUIREMENTS

Mathematics

M 241	Analytic Geometry and Calculus A	4 ^{1F}
M 242	Analytic Geometry and Calculus B	4 ^{1S}
M 243	Analytic Geometry and Calculus C	4 ^{2F}
M 302	Ordinary Differential Equations	3 ^{2S}

*Superior figures indicate semester (fall or spring) and/or years in which the course is normally taken, i.e., ^{1F}fall of freshman year, ^{2S}spring of sophomore year, etc.
#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 24.

Physics

PS 207	General Physics	4 ^{2F}
PS 208	General Physics	4 ^{2S}

MAJOR REQUIREMENTS**External to the College***Biology*

B 207	Introductory Biology I	4 ^{2F}
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Chemistry

C 111	General Chemistry†	3 ^{1F}
C 119	Quantitative Chemistry I	2 ^{1F}
C 112	General Chemistry	3 ^{1S}
C 120	Quantitative Chemistry II	3 ^{1S}
C 443	Physical Chemistry	3 ^{3F}
C 444	Physical Chemistry	3 ^{3S}
C 331	Organic Chemistry	3 ^{2F}
C 332	Organic Chemistry	3 ^{2S}
C 333	Organic Chemistry Laboratory I	1 ^{1F}

Computer Science

CIS 106	General Computer Science for Engineers	3 ^{1F}
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Within the College

MAI 302	Material Science for Engineers	4 ^{4F}
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Within the Department

CHE 009	Chemical Engineering Freshman Seminar	0 ^{2F}
CHE 112	Introduction to Chemical Engineering	3 ^{2S}
CHE 231	Chemical Engineering Thermodynamics	3 ^{3F}
CHE 341	Fluid Mechanics	3 ^{4F}
CHE 342	Heat and Mass Transfer	3 ^{4S}
CHE 325	Chemical Engineering Thermodynamics	3 ^{3S}
CHE 332	Chemical Engineering Kinetics	3 ^{4S}
CHE 345	Chemical Engineering Laboratory I	3 ^{4S}
CHE 443	Mass Transfer Operations	3 ^{5F}
CHE 445	Chemical Engineering Laboratory II	3 ^{5F}
CHE 432	Chemical Process Analysis	3 ^{5S}

Technical Electives*Technical Electives*

The purpose of the technical electives is to advance the scientific or engineering background of the chemical engineer at the intermediate (300-400) level. The technical electives program is a minimum of six credits taken from courses in the following list, normally two courses. Students should select their technical electives in the spring of sophomore year to avoid scheduling conflicts. Students should formulate an academic plan for their technical and chemical engineering electives with the assistance of their academic advisor.	6 ⁴
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Biology

B 301	Cellular and Molecular Biology	4
B 303	Genetic and Evolutionary Biology	4
B 305	Cell Biology	4
B 306	General Physiology	4
B 4xx	Biology course chosen with the approval of the adviser	3-4

Chemistry

C 334	Organic Chemistry Majors Laboratory II	2
C 457	Inorganic Chemistry	3
C 527	Introductory Biochemistry	3
C 6xx	Chemistry course chosen with the approval of the adviser	3
C 8xx	Chemistry course chosen with the approval of the adviser	3

Computer Science

CIS 300	Introduction to Scientific Computation	3
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Mathematics

M 349	Elements of Linear Systems	3
M 389	Discrete Mathematics	3
M 426	Introduction to Numerical Analysis and Algorithmic Computation	3
M 427	Approximation Theory	3
M 428	Algorithmic and Numerical Solution of Differential Equations	3
M 5xx	Mathematics course chosen with the approval of the adviser	3
M 6xx	Mathematics course chosen with the approval of the adviser	3

Mechanical Engineering Applied Mathematics

ME 361	Applied Engineering Analysis	3
ME 863	Engineering Analysis	3
M E 864	Engineering Analysis	3

Physics

PS 419	Analytical Mechanics	3
PS 420	Analytical Mechanics	3
PS 6xx	Physics course chosen with the approval of the adviser	3

Statistics

ST 450	Statistics for the Engineering and Physical Sciences	3
ST 6xx	Statistics course chosen with the approval of the adviser	3

Electronic Materials

(please note prerequisites)

EE 314	Electronics and Instrumentation	4
EE 340	Solid State Electronics	3
EE 4xx	Solid State Fabrication Laboratory	1
EE 623	Electrical Properties of Matter I	3
EE 626	Integrated Circuits	3
EE 629	Digital Structures	3

Polymeric Materials

ME 410	Experimental Mechanics for Composite Materials	3
ME 415	Finite Element Analysis	3

Chemical Engineering Technical Electives 9⁵

The curriculum provides three chemical engineering technical electives in the senior year. These courses are intended to provide some flexibility in selecting a chemical engineering program at the advanced level. Students should decide with the assistance of their adviser if they should conduct a program of independent research and then choose their course elective(s).

Chemical engineering technical electives are defined as follows:

Any Chemical Engineering course numbered between 470 and 499; any 400- or higher-level Materials and Metallurgy course; U 401-U 402 Senior Thesis; any 600- or 800-level course in Chemical Engineering. Courses at the 600 level and 800 level are graduate courses open, with the consent of the instructor, to advanced students in senior standing.

Concentrations

The technical electives and chemical engineering electives can be coupled to provide a more intense concentration in an area of interest. The groupings below are some examples of this approach.

Applied Mathematics

M 426	Introduction to Numerical Analysis and Algorithmic Computation	3 ^{4S}
M 389	Discrete Mathematics	3 ^{5F}
CHE 827	Chemical Engineering Problems	2-3 ^{5S}

Biology

B 301	Cellular and Molecular Biology	4 ^{5S}
C 527	Introductory Biochemistry	3 ^{5F}
CHE 620	Biochemical Engineering	3 ^{5S}

†Students may enter Chemical Engineering after completing the eight-credit freshman Chemistry sequence, C 103-104. However, an additional three-credit Chemistry course will be required.

Chemistry

C 457	Inorganic Chemistry	3 ^{4S}
C 527	Introductory Biochemistry	3 ^{5F}
CHE 606	Introduction to Catalysis	3 ^{5S}
CHE 610	Industrial and Engineering Chemistry	3 ^{5S}
CHE 836	Applied Chemical Kinetics	3 ^{5F}

Electronic Materials

EE 314	Electronics and Instrumentation	4 ^{4F}
EE 340	Solid State Electronics	3 ^{4S}
EE 4xx	Solid State Fabrication Laboratory	1 ^{5F}
CHE 667	Solid State Device Fabrication	3 ^{5S}

Polymeric Materials

ME 213	Principles of Mechanics I	4 ^{4W}
ME 415	Finite Element Analysis	3 ^{5F}
ME 410	Experimental Mechanics for Composite Materials	3 ^{5W}
CHE 601	Structure and Properties of Polymer Materials	3
or		
CHE 603	Polymerization Reaction Engineering	3 ^{4F}
CHE 602	Polymer Process Analysis and Design	3 ^{4S}
or		
CHE 604	Introduction to Polymer Science and Engineering II	3

CREDITS TO TOTAL A MINIMUM OF 160

**DEGREE: BACHELOR OF ARTS or BACHELOR OF SCIENCE
—BACHELOR OF CIVIL ENGINEERING
MAJOR: NONE REQUIRED—CIVIL ENGINEERING**

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

E 110	Critical Reading and Writing	3 ^{1S}
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #		3 ¹⁻⁴

ARTS AND SCIENCE COLLEGE REQUIREMENTS*Skill Requirements*

<i>Writing</i>	3
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A writing course involving significant writing experience including two papers with a combined minimum of 3,000 words to be submitted for extended faculty critique of both composition and content.

<i>Foreign Language</i>	0-12
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Completion of the intermediate-level course (107 or 112) in a given language or, for students with more than 4 years of high school foreign language or the equivalent, satisfactory performance on a proficiency test in that language.

Breadth Requirements (See page 74)

<i>Group A</i>	12
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Understanding and appreciation of the creative arts and humanities. Twelve credits representing at least two areas.

<i>Group B</i>	12
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The study of culture and institutions over time. Twelve credits representing at least two areas.

<i>Group C</i>	12
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Empirically based study of human beings and their environment. Twelve credits representing at least two areas.

The above groups differ from the General Education groups of the College of Engineering. This requires careful course selection in order to have courses that satisfy both curricula simultaneously.

AREA OF CONCENTRATION REQUIREMENTS*Area of Concentration:*

Fifteen credits of Arts and Science electives to be used for 15
acquiring some depth of knowledge in a field chosen in consultation with an Arts and Science adviser.

Arts-Science Courses Completed 1-5

The liberal arts component is listed as 51 credit hours. The absolute minimum required to satisfy the requirements listed above is 45; this assumes that the foreign language requirement is satisfied from high school work, the writing course is in one of the Groups A, B, or C, and that nine credits of the Area of Concentration are also from one of the Groups A, B, or C. Thus, students without language skills and concentrating in science or mathematics will need more than 51 credit hours to complete all of these requirements.

ENGINEERING COLLEGE REQUIREMENTS*Mathematics*

M 241	Analytic Geometry and Calculus A	4 ^{1F}
M 242	Analytic Geometry and Calculus B	4 ^{1S}
M 243	Analytic Geometry and Calculus C	4 ^{2F}
M 302	Ordinary Differential Equations	3 ^{2S}

Physics

PS 207	General Physics	4 ^{1F}
PS 208	General Physics	4 ^{2F}

MAJOR REQUIREMENTS**External to the College**

C 103	General Chemistry	4 ^{1F}
C 104	General Chemistry	4 ^{1S}
CIS 106	General Computer Science for Engineers	3 ^{2F}
GEO 107	General Geology I	4 ^{2F}
E 410	Technical Writing	3 ^{3S}
ST 450	Statistics for the Engineering and Physical Sciences	3 ^{3S}

Within the College

EG 125	Introduction to Engineering (MAE)	2 ^{1F}
EG 132	Engineering Graphics/Analysis	2 ^{1F}
MEC 305	Fluid Mechanics	3 ^{3S}
MEC 306	Fluid Mechanics Laboratory	1 ^{3S}
MAT 302	Material Science for Engineers	4 ^{3F}

Within the Department

CE 211	Statics	3 ^{2F}
CE 212	Strength of Materials	3 ^{2S}
CE 213	Materials Laboratory	1 ^{2S}
CE 331	Introduction to Environmental Engineering	3 ^{3F}
CE 301	Analysis of Structures	4 ^{3F}
CE 311	Dynamics	3 ^{3F}
CE 351	Transportation Engineering	3 ^{3S}
CE 381	Civil Engineering Analysis	3 ^{3S}
CE 420	Soil Mechanics	4 ^{4F}
CE 461	Senior Design Project	3 ^{4S}
CE 482	Systems Design and Operation	3 ^{4F}

One of:

CE 402	Steel Design	3 ^{4F}
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or

CE 403	Concrete Design	3
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One of:

CE 431	Water Supply Engineering	3 ^{4S}
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or

CE 432	Waste Water Engineering	3
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*Superior figures indicate semester (fall or spring) and/or years in which the course is normally taken, i.e., ^{1F}fall of freshman year, ^{2S}spring of sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 24.

One of:	
CE 441 Hydrology	3 ^{4S}
or	
CE 442 Hydraulic Engineering	3
Technical Electives†	
<i>Technical Electives</i>	12 ^{3,4}
Four courses: Three additional design points must be satisfied; see current department technical elective listing.	
CREDITS TO TOTAL A MINIMUM OF	161

DEGREE: BACHELOR OF ARTS or BACHELOR OF SCIENCE
—BACHELOR OF ELECTRICAL ENGINEERING
MAJOR: NONE REQUIRED—ELECTRICAL ENGINEERING

CURRICULUM	CREDITS*
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UNIVERSITY REQUIREMENTS

E 110 Critical Reading and Writing	3 ^{1S}
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #	3 ¹⁻⁴

ARTS AND SCIENCE COLLEGE REQUIREMENTS

Skill Requirements

<i>Writing:</i>	3
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A writing course involving significant writing experience including two papers with a combined minimum of 3,000 words to be submitted for extended faculty critique of both composition and content.

<i>Foreign Language:</i>	0-12
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Completion of the intermediate-level course (107 or 112) in a given language or, for students with more than 4 years of high school foreign language or the equivalent, satisfactory performance on a proficiency test in that language.

Breadth Requirements (See page 74)

<i>Group A</i>	12
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Understanding and appreciation of the creative arts and humanities. Twelve credits representing at least two areas.

<i>Group B</i>	12
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The study of culture and institutions over time. Twelve credits representing at least two areas.

<i>Group C</i>	12
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Empirically based study of human beings and their environment. Twelve credits representing at least two areas.

The above groups differ from the General Education groups of the College of Engineering. This requires careful course selection in order to have courses that satisfy both curricula simultaneously.

AREA OF CONCENTRATION REQUIREMENTS

Area of Concentration:

Fifteen credits of Arts and Science electives to be used for acquiring some depth of knowledge in a field chosen in consultation with an Arts and Science adviser.	15
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Arts-Science Courses Completed,	1-5
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The liberal arts component is listed as 51 credit hours. The absolute minimum required to satisfy the requirements listed above is 45; this assumes that the foreign language requirement is satisfied from high school work, the writing course is in one of the Groups A, B, or C, and that nine credits of the Area of Concentration are also from one of the Groups A, B, or C. Thus, students without language skills and concentrating in science or mathematics will need more than 51 credit hours to complete all of these requirements.

ENGINEERING COLLEGE REQUIREMENTS

Physics

PS 207 General Physics	4 ^{1F}
PS 208 General Physics	4 ^{2S}

MAJOR REQUIREMENTS

External to the College

Mathematics

M 242 Analytic Geometry and Calculus B	4 ^{1F}
M 243 Analytic Geometry and Calculus C	4 ^{1S}
M 367 Differential Equations & Linear Algebra I	3 ^{2F}
M 367 Differential Equations & Linear Algebra II	3 ^{2S}

Chemistry

C 103 General Chemistry	4 ^{1F}
CIS 180 Introduction to Computer Science I	3 ^{1F}
CIS 181 Introduction to Computer Science II	3 ^{1S}
E 301 Problems in Composition	3 ^{3F}
PHL 367 Ethics in the Engineering Profession	1 ^{4F}

Within the Department

EE 210 Introduction to Combinational Logic	2 ^{2F}
EE 211 Introduction to Sequential Circuits	2 ^{2S}
EE 205 Linear Circuit Theory	2 ^{3F}
EE 220 Microprocessor Based Systems I	2 ^{3F}
EE 309 Electronic Circuit Analysis I	4 ^{3S}
EE 221 Microprocessor Based Systems II	2 ^{3S}
EE 302 Electrical Properties of Materials	4 ^{3S}
EE 305 Signal Processing I	3 ^{4F}
EE 312 Electronic Circuit Analysis II	4 ^{4F}
EE 320 Field Theory	3 ^{4F}
EE 306 Signal Processing II	4 ^{4S}
EE 310 Random Signals and Noise	3 ^{4S}
EE 340 Solid State Electronics	3 ^{4S}
EE 417 Feedback Control Systems	3 ^{5F}
EE 413 Field Theory II	4 ^{5F}
EE 433 Energy Systems	3 ^{5S}

EE 310 may be taken in the senior year (s) and EE 413 and/or EE 433 in the junior year (s) when appropriate to a plan for a technical concentration.

Design Requirement

In addition to the design content of the normal program, every student must take at least one course in their senior year in which one design project is at least 50% of the coursework. Regularly offered courses that presently meet this requirement are EE 420, 422, 650 and 664. The design requirement may also be met with special projects carried out in conjunction with faculty research with the prior approval of the Departmental Undergraduate Representative. Students must consult with their advisers for the proper selection of design courses.

*Superior figures indicate semester (fall or spring) and/or year or years in which the course is normally taken, i.e., ^{1F}fall of freshman year, ^{2S}spring of sophomore year, etc.
 #This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 24.

†The technical elective program is under constant review by the faculty. An updated list is available in the department office. Students should check with their advisers before selecting courses and should be aware that a formal mechanism exists to provide additional flexibility in selection of their Technical Elective courses.

Technical Electives*Technical Electives*

Each student must select a concentration to structure their technical elective program. Four concentrations are now defined (computer engineering, systems and signals engineering, electronic devices and materials engineering, and power systems engineering). Students with a special interest may define their own concentrations in conjunction with their adviser. With some exceptions, upper-level engineering, computer science, physics, science and mathematics courses are acceptable technical electives. However, students planning their own programs of concentration should realize that there must be a theme holding together at least most of the courses chosen. Any special concentrations must be approved by the Departmental Undergraduate Representative prior to the start of the senior year.

Each of the four regular concentrations specifies 15, or more, of the 21 technical elective credits in the core program. Students should note that the requirement for a senior design project will, in some cases, further constrain the choice of technical electives.

The technical electives must be chosen from an area of concentration. The four concentrations follow:

Technical Electives—Computer Engineering

CIS 220	Data Structures	3 ^{4F}
CIS 360	Computer Architecture	3 ^{4S}
EE 323	Digital System Design I	3 ^{4S}
EE 422	Digital System Design II	3 ^{5F}
EE 618	Modern Control Engineering	3 ^{5S}
or		
EE 631	Digital Signal Processing	3 ^{5F}
Technical electives chosen with the approval of an adviser		6 ⁵

Technical Electives—Systems and Signals Concentration

CIS 220	Data Structures	3 ^{3S}
M 426	Introduction to Numerical Analysis and Algorithmic Computation	3 ^{4F}
EE 403	Communication Systems Engineering	3 ^{5F}
EE 618	Modern Control Engineering	3 ^{5S}
EE 631	Digital Signal Processing	3 ^{5F}
Technical electives chosen with the approval of an adviser		6 ⁵

Technical Electives—Devices and Materials Concentration

Students whose primary interest is in the Devices and Materials Engineering concentration should take:

PS 209	General Physics	3 ^{3S}
PS 313	Physical Optics	3 ^{4S}
EE 623	Electronic Properties of Matter	3 ^{5F}

Students whose primary interest is in optoelectronics and electro-optics should take:

EE 640	Optoelectronics	3 ^{5F}
and		
EE 642	Special Topics in Electrooptics	3 ^{5S}

Students whose primary interest is in electronic services should take:

EE 626	Integrated Circuits	3 ^{5F}
and		
EE 650	Semiconductor Device Design and Fabrication**	3 ^{5S}

Technical electives chosen with the approval of an adviser

Technical Electives—Power Systems Concentration

ME 307	Thermodynamics I	3 ^{3F}
EE 412	Introduction to Power Systems Analysis	4 ^{5F}
EE 414	Electrical Machines, Motors and Generators	4 ^{5S}
EE 618	Modern Control Engineering	3 ^{5S}

ME 408	Power Generation System Design	3 ^{3S}
or		
EE 323	Digital Systems Design I	3 ^{3S}
Technical electives chosen with the approval of an adviser		6 ⁵
CREDITS TO TOTAL A MINIMUM OF		158

DEGREE: BACHELOR OF ARTS or BACHELOR OF SCIENCE
—BACHELOR OF ELECTRICAL ENGINEERING
MAJOR: SELECTED ARTS AND SCIENCE MAJOR
—MECHANICAL ENGINEERING

CURRICULUM**CREDITS*****UNIVERSITY REQUIREMENTS**

E 110	Critical Reading and Writing	3 ^{1S}
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #		3 ¹⁻⁴

ARTS AND SCIENCE COLLEGE REQUIREMENTS*Skill Requirements*

<i>Writing:</i>	3
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A writing course involving significant writing experience including two papers with a combined minimum of 3,000 words to be submitted for extended faculty critique of both composition and content.

<i>Foreign Language:</i>	0-12
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Completion of the intermediate-level course (107 or 112) in a given language or, for students with more than 4 years of high school foreign language or the equivalent, satisfactory performance on a proficiency test in that language.

Breadth Requirements (See page 74)

<i>Group A</i>	12
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Understanding and appreciation of the creative arts and humanities. Twelve credits representing at least two areas.

<i>Group B</i>	12
----------------	----

The study of culture and institutions over time. Twelve credits representing at least two areas.

<i>Group C</i>	12
----------------	----

Empirically based study of human beings and their environment. Twelve credits representing at least two areas.

The above groups differ from the General Education groups of the College of Engineering. This requires careful course selection in order to have courses that satisfy both curricula simultaneously.

AREA OF CONCENTRATION REQUIREMENTS*Area of Concentration:*

Fifteen credits of Arts and Science electives to be used for acquiring some depth of knowledge in a field chosen in consultation with an Arts and Science adviser	15
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Arts-Science Courses Completed	1-5
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The liberal arts component is listed as 51 credit hours. The absolute minimum required to satisfy the requirements listed above is 45; this assumes that the foreign language requirement is satisfied from high school work, the writing course is in one of the Groups A, B, or C, and that nine credits of the Area of Concentration are also from one of the Groups A, B, or C.

*Superior figures indicate semester (fall or spring) and/or year or years in which the course is normally taken, i.e., ^{1F}fall of freshman year, ^{2S}spring of sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 24.

**Courses must be taken as a sequence, EE 640 and EE 642 or EE 626 and EE 650.

Thus, students without language skills and concentrating in science or mathematics will need more than 51 credit hours to complete all of these requirements

ENGINEERING COLLEGE REQUIREMENTS

Mathematics

M 241	Analytic Geometry and Calculus A	4	1F
M 242	Analytic Geometry and Calculus B	4	1S
M 243	Analytic Geometry and Calculus C	4	2F
M 302	Ordinary Differential Equations I	3	2S

Physics

PS 207	General Physics	4	2F
PS 208	General Physics	4	2S

MAJOR REQUIREMENTS

External to the College

Chemistry

C 103	General Chemistry	4	1F
C 104	General Chemistry	4	1S

Within the College

EG 125	Introduction to Engineering (ME)	3	1F
EG 132	Engineering Graphics/Analysis	2	1S
MAT 302	Material Science for Engineers	4	2S
EE 314	Electronics and Instrumentation	4	4F
MEC 305	Fluid Mechanics	3	4F
MEC 306	Fluid Mechanics Laboratory	1	4F

Within the Department

ME 213	Principles of Mechanics I	3	2F
ME 214	Principles of Mechanics II	3	2S
ME 313	Strength of Materials	4	2S
ME 361	Applied Engineering Analysis	3	3F
ME 307	Thermodynamics I	3	4F
ME 308	Thermodynamics II	3	4S

ME 316	Materials Engineering	3	4F
ME 347	Mechanical Design I	3	4F
ME 348	Mechanical Design II	3	4S
ME 391	Engineering Science Laboratory I	4	3S
ME 336	Fluid Mechanics II	3	4S
ME 302	Heat Transfer	3	4S
ME 427	Systems Dynamics I	3	5F
ME 447	Design and Systems Synthesis I	3	5F
ME 448	Design and Systems Synthesis II	3	5S

Technical Electives†

The technical electives illustrated below are for concentration in Aerospace Engineering. The technical elective selections for the other four options are given in the program description of the standard ME curricula

Technical Electives

A minimum of twelve credits to be selected from the following courses or substitute other courses in consultation with the adviser:

ME 411	Structural Mechanics for Mechanical and Aerospace Engineering	3
ME 413	Advanced Mechanics of Materials	3
ME 415	Finite Element Analysis	3
ME 432	Aerodynamics	3
ME 435	Propulsion	3
ME 436	Fluid Machinery	3
ME 445	Senior Research	3-6
ME 616	Composite Materials Structures	3

CREDITS TO TOTAL A MINIMUM OF 161

†The technical elective program is under constant review by the faculty. An updated list is available in the department office. Students should check with their advisers before selecting courses and should be aware that a formal mechanism exists to provide additional flexibility in selection of their Technical Elective courses.