The University of Connecticut

School of Engineering

ELECTRICAL ENGINEERING

GUIDE TO COURSE SELECTION

AY 2003-2004

for

Electrical Engineering (EE) Majors

in the School of Engineering

Prepared by the
Electrical & Computer Engineering Curricula & Courses Committee
School of Engineering, University of Connecticut.

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1. INTRODUCTION

The purpose of this document is to guide students in designing a plan of study for the Electrical Engineering program at the University of Connecticut. Any such plan must be consistent with the Electrical Engineering Program Educational Objectives. The Program Educational Objectives have been developed to satisfy the requirements of the Accreditation Board for Engineering and Technology (ABET).

The Electrical Engineering curriculum allows for the choice of several senior-level courses. This makes it possible for students to specialize in one of the following areas: Biomedical Engineering, Electronic Circuits and Instrumentation, Microelectronics/Optoelectronics, Systems, or Telecommunications.

This Guide is intended to be used in conjunction with the University of Connecticut General Catalog as a source of information regarding degree requirements in Electrical Engineering.

1.1 Preparation of Plans of Study

Prior to registration during the first semester of the Junior year, or for transfer students in the second semester at the University of Connecticut, whichever is later, each student must complete a Plan of Study form documenting the program he/she intends to follow. In order to help students in developing a suitable Plan of Study form which is consistent with the Electrical Engineering Program Educational Objectives, the ECE department holds a Plan of Study meeting during the first five weeks of each semester. All students intending to file a Plan of Study form in EE should attend one of these meetings.

2. ELECTRICAL ENGINEERING PROGRAM

The Electrical Engineering Program at the University of Connecticut is continuously evolving and improving in response to feedback from our constituents and program assessment results.

We have developed a set of Program Educational Objectives which are periodically reviewed by all constituents (ECE students, ECE faculty, alumni, and employers). The feedback provided by our constituents is used to continuously refine and improve the Program Educational Objectives.

We have determined a set of Program Outcomes which are necessary for the achievement of the Program Educational Objectives. We use several assessment tools (employer surveys, alumni surveys, exit interviews, senior surveys, and course assessment surveys) to measure our success with respect to the Program Outcomes. The assessment results are reviewed periodically and used for the continuous improvement of the program and our courses.

The two-loop process involving the definition of the Program Educational Objectives (loop one) and the assessment / program improvement (loop two) is shown below.

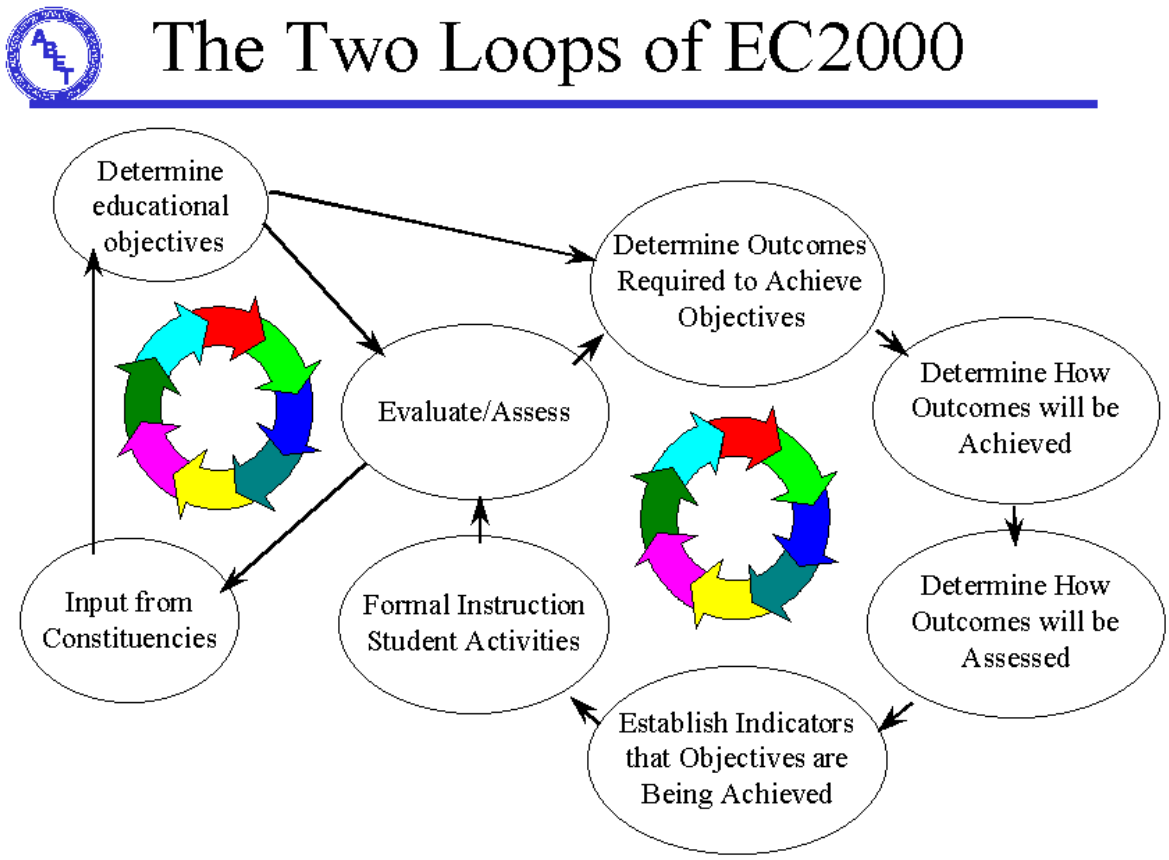


Figure 2.1. The two-loop process of Engineering Criteria 2000, as defined by Accreditation Board for Engineering and Technology.

2.1 Electrical Engineering Program Educational Objectives

Following the mission of the University and the School the Electrical and Computer Engineering department is committed to excel in teaching and research. Traditionally, the ECE Dept. mission statement (periodically updated based on revisions in the School and University mission statements and the input from our various constituencies) has served as a proxy for the EE Program Educational Objectives. In Spring 1999, a formal process was put in place to formulate and revise the Program Educational Objectives within an integrated framework of an outcome-based assessment process and related curricular strategies. The EE Program Educational Objectives are outlined below:

1. Our graduates will function at a *technically competent* level in formulating and solving

problems in electrical engineering and information/computing systems.

2. Our graduates will have had *experience* in tackling practically relevant engineering projects *in "realistic" work-situations*.

3. Our graduates will have acquired essential *non-technical skills* such as written and oral communication, project management, and leadership for functioning well in an organizational setting.

4. Our graduates will have a thorough grounding in *engineering fundamentals*, thus preparing them for a successful engineering career amid future technological changes.

5. Our graduates will have a *well-rounded education* to permit flexible career paths as well as to promote an interest in life-long learning together with the ability to advance professionally.

The Electrical Engineering Curriculum described in section 3 has been designed to achieve these five Program Educational Objectives.

2.2 Electrical Engineering Outcomes and Assessment

Based on the Program Educational Objectives, we have defined Program Outcomes necessary for their fulfillment. Program assessment is used to insure that the these outcomes are achieved. The following tables detail our integrated outcome-based assessment process and related curricular strategies.

TABLE 2.1 EE Program Educational Objectives, Outcomes, ABET Criteria, and Assessment Methods

Objective #1: Our graduates will function at a *technically competent* level in formulating and solving problems in electrical engineering and information/computing systems.

Strategies	**Outcomes**	**ABET Criteria**	**Assessment Methods**
Have all the students take a carefully chosen common core of ECE courses.	1A. The students will acquire the ability to apply fundamental electrical engineering principles in the areas of electronic circuits, systems analysis, microelectronic devices, communications, electromagnetics, and computing.	(a), (e)	EBI Survey; Alumni Survey
Have all the students take a coherent set of professional electives from one or more area(s) of specialization. The courses should include both analysis and design components.	1B. The students will acquire proficiency in solving engineering analysis and design problems in one or more electrical/computer engineering areas such as real-time (embedded) computer systems in communications, signal processing, and control; digital or analog communication systems; microelectronic and photonic devices and systems; biomedical instrumentation systems.	(a), (e), (k)	Alumni survey
Incorporate open-ended problems wherever appropriate in (at a minimum) some of the required ECE courses.	1C. The students will have demonstrated ability to think and act independently and creatively in the solution of engineering problems.	(c), (e)	Alumni survey; EBI survey; Employer survey
Have all the students take a structured sequence of ECE laboratory courses.	1D. The students will have learnt to use standard instrumentation, test rigs and experimental techniques to test and characterize prototype devices and systems.	(b)	EBI survey; Employer survey
Introduce students to general algorithm development and one or more computer languages early in their curriculum. Require use of computational tools such as PSPICE and MATLAB in required electrical engineering courses.	1E. The students will have developed the ability to use computing techniques, computing tools and computer languages to analyze, design, simulate, and implement solutions to engineering problems.	(k)	Alumni survey; Employer Survey

TABLE 2.1 (cont.) **EE Program Educational Objectives, Outcomes, ABET Criteria, and Assessment Methods**

Objective #2: Our graduates will have had *experience* in tackling practically relevant engineering projects *in "realistic" work-situations*.

Strategies	**Outcomes**	**ABET Criteria**	**Assessment Methods**
Integrate team-based (in a variety of team member and leadership roles) design experiences throughout the curriculum.	2A. The students will have learnt how to function effectively on design-teams to complete small technical projects.	(d)	EBI survey; Alumni survey; Employer survey
Require all students to complete the capstone design sequence.	2B. The students will have gained experience in a team-setting with the process of going from a conceptual paper-design to a "tangible product," subject to technical as well as non-technical constraints.	(c), (d), (e), (g), (k)	EBI survey; Alumni survey; Employer survey
Strongly recommend (but not require) and facilitate (via a reasonably flexible curriculum and by working with the Career Services) participation in a co-op experience.	2C. Participating students will acquire valuable work experience in an actual industrial setting. A co-op experience will also enhance a student's chances in the job market.	(c), (d), (e), (f), (k)	EBI survey; Alumni survey
Recommend and facilitate work on a senior thesis for students interested in graduate school.	2D. Participating students will acquire valuable undergraduate research experience, which should motivate and prepare them for attending graduate school.	(a), (e), (i)	Exit interview; Alumni survey

TABLE 2.1 (cont.) **EE Program Educational Objectives, Outcomes, ABET Criteria, and Assessment Methods**

Objective #3: Our graduates will have acquired essential *non-technical skills* such as written and oral communication, project management, and leadership for functioning well in an organizational setting.

Strategies	**Outcomes**	**ABET Criteria**	**Assessment Methods**
The General Education requirements include English 105 and 109 as well as a year (or equivalent high school experience) of a foreign language.	3A. Students will have demonstrated facility with the English language and appreciation of and perhaps some facility with other languages.	(g)	Transcripts
Require oral and written reports in some of the required ECE courses. Reinforce it further as part of the capstone design sequence.	3B. Students will have gained proficiency in using effectively oral and written communication techniques and tools.	(g)	EBI survey; Employer survey; Alumni survey
Integrate team-based (in a variety of team member and leadership roles) design experiences throughout the curriculum.	3C. The students will have learnt how to lead and function effectively on design-teams to complete technical projects.	(c), (d)	EBI survey; Alumni survey; Employer survey

TABLE 2.1 (cont.) **EE Program Educational Objectives, Outcomes, ABET Criteria, and Assessment Methods**

Objective #4: Our graduates will have a thorough grounding in *engineering fundamentals*, thus preparing them for a successful engineering career amid future technological changes.

Strategies	**Outcomes**	**ABET Criteria**	**Assessment Methods**
Require all EE students to take (at least) a sequence of calculus courses, physics and chemistry courses (including laboratories), and a course in probability and statistics.	4A. Students will have acquired proficiency in using natural laws and mathematical techniques.	(a)	Alumni survey; EBI survey; Exit interview
Require all EE students to take a broad selection of engineering science courses (most but *not* all) related to electrical engineering.	4B. Students will have gained proficiency in using key concepts and techniques essential for *analyzing* engineering problems arising in a variety of technological applications.	(a), (e)	Exit interview; EBI survey; Employer survey
Incorporate exercises and/or mini-projects in some of the required *ECE laboratory* courses requiring students to develop and implement strategies for collecting and/or generating appropriate experimental data and analyzing it.	4C. Students will have gained proficiency in experimental data collection and analysis.	(b)	Exit interview; Employer survey
Incorporate exercises and/or mini-projects in some of the required ECE courses requiring students to apply modeling techniques/simulation and computer-aided design tools to characterize and evaluate solutions to engineering problems. Reinforce it further as part of the capstone design sequence.	4D. Students will have learnt to apply modeling techniques/simulation and computer-aided design tools to characterize and evaluate solutions to engineering problems.	(k)	Alumni survey; Employer Survey

TABLE 2.1 (cont.) **EE Program Educational Objectives, Outcomes, ABET Criteria, and Assessment Methods**

Objective #5: Our graduates will have a *well-rounded education* to permit flexible career paths as well as to promote an interest in life-long learning together with the ability to advance professionally.

Strategies	**Outcomes**	**ABET Criteria**	**Assessment Methods**
Ensure that the General Education requirements for the School of Engineering include an appropriate mix of courses from humanities and social sciences.	5A. Students will have acquired a familiarity with and appreciation of the history and cultures of our country and the world and the social issues facing engineers.	(h), (i), (j)	EBI survey; Transcripts
In addition to taking the required course Phil 104, students will participate in a supervised discussion (seminar) of principles of ethical and moral thought, particularly as applied to the engineering profession, as part of the major meaningful design experience (ECE 290/291).	5B. Students will have knowledge of and ability to interpret and apply, basic principles of ethical and moral thought, particularly as applied to the engineering profession.	(f)	Alumni Survey; EBI survey

3. ELECTRICAL ENGINEERING CURRICULUM

The basic level curriculum has been designed to achieve the Program Educational Objectives and to meet the University General Education Requirements. Section 2 described the Program Educational Objectives, Outcomes, and Assessment. Section 3.1 describes the University General Education Requirements. Section 3.2 describes the basic-level Electrical Engineering Curriculum, and Section 3.3 describes areas of specialization within Electrical Engineering.

3.1 General Education Requirements (University Core Curriculum)

As part of all baccalaureate degree programs at the University, students are required to satisfy a common core of coursework known as the General Education Requirements. The General Education Requirements comprise eight categories or groups as summarized below:

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. If the student has not met the minimum requirement through high school coursework, he or she must complete a two semester course sequence in a language at the University.

Group 2. Expository Writing

All students must take ENGL 110 Seminar in Academic Writing or ENGL 111 Seminar in Writing through Literature. In addition to these courses, all students must complete two Writing (W) courses. As shown in the following pages, two Writing courses are specified in the required coursework in Electrical Engineering.

Group 3. Mathematics and Computer Course

All students must take two Quantitative (Q) courses and one Computer (C) course. Students in majoring in EE meet this requirement through required coursework in their major.

Groups 4 through 7 (Humanities & Social Sciences coursework)

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, coursework in the Humanities and Social Sciences is an integral part of the engineering program. As outlined in the University of Connecticut General Catalog, a minimum of six courses must be taken and distributed as follows:

Literature and the Arts (Group 4):

All students must take two courses: one which emphasizes major works of literature and one which emphasizes major achievements in art, and/or music and/or dramatic arts.

Culture and Modern Society (Group 5):

All students must take HIST 100 The Roots of the Western Experience or HIST 101 Modern Europe and a course which emphasizes non-Western or Latin American Cultures.

Philosophical and/or Ethical Analysis (Group 6):

All students must take a course in philosophical and/or ethical analysis. For students in Engineering, the course that must be taken is PHIL 104 Philosophy and Social Ethics.

Social Scientific and Comparative Analysis (Group 7):

All students must take one course in social science and/or comparative analysis. Note that details on which courses may be used to satisfy these requirements are given in the Engineering section of the University of Connecticut General Catalog.

Humanities and Social Sciences Area of Concentration

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, at the 200-level in one of the departments listed in the Catalog, provided that prior approval is obtained from the Director of Undergraduate Advising, Prof. David Jordan (486-5462).

Examples:

ANTH 106 (Group 7) and ANTH 226 (Group 5 Non-Western)
ENGL 210 (Group 4 Literature) and ENGL 218 (Group 5 Non-Western)
HIST 100 (Group 5 Western) and HIST 281 (Group 5 Non-Western)

Group 8. Science & Technology

All students must take two courses in science and technology, at least one of which must include a semester of laboratory. Students majoring in EE meet this requirement through required coursework in their major.

3.2 Electrical Engineering Basic-Level Curriculum

The basic-level curriculum is given in Table 3.1. This basic-level curriculum includes 35 credit hours of Math and Basic Science, 68 credit hours of Engineering Topics, 22 credit hours of General Education, and 9 credit hours of Other topics, as defined by the Accreditation Board for Engineering and Technology.

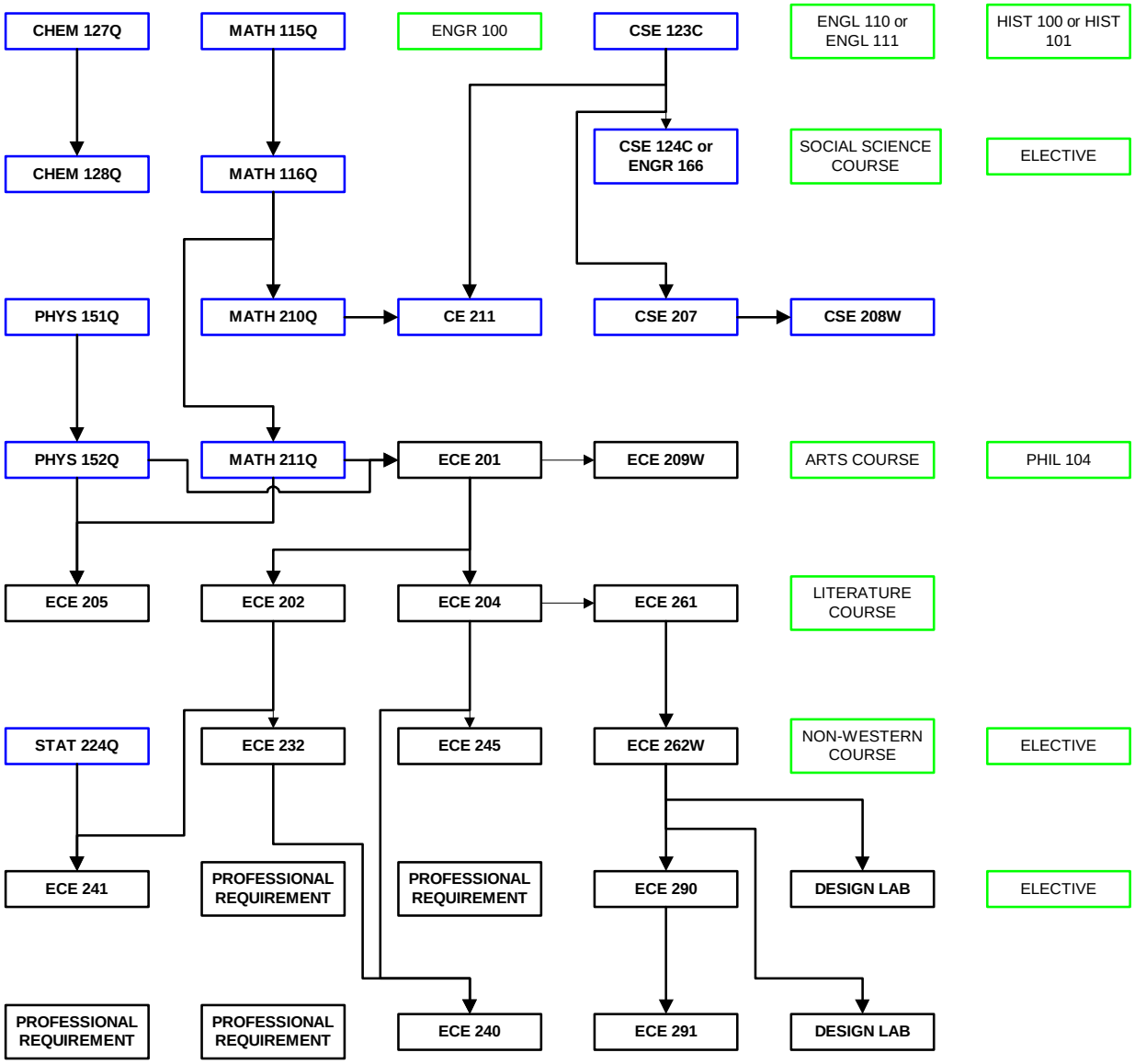
Table 3.1. Basic-Level Curriculum

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Sciences	Engineering Topics Check if Contains Design (✓)	General Education.	Other
Freshman Fall	CHEM 127Q General Chemistry	4	( )		
	MATH 115Q Calculus I	4	( )		
	ENGL 110 or ENGL 111		( )	4	
	CSE 123C		2 (✓)		
	ENGR 100 Orientation to Engineering		1 ( )		
	HIST 100 The Roots of Western Experience or HIST 101 Modern Europe		( )	3	
Freshman Spring	CHEM 128Q General Chemistry	4	( )		
	MATH 116Q Calculus II	4	( )		
	CSE 124C or ENGR 166		3 (✓)	3	
	Social Sciences Course		( )	3	
	elective		( )		3
Sophomore Fall	PHYS 151 Physics for Engineers I	4	( )		
	MATH 210Q Multivariable Calculus	4	( )		
	CE 211		3 ( )		
	CSE 207 Digital Logic		3 (✓)		
	CSE 208W Logic Design Laboratory		2 (✓)		
Sophomore Spring	PHYS 152Q Physics for Engineers II	4	( )		
	MATH 211Q Elementary Differential Equations	3	( )		
	PHIL 104		( )	3	
	ECE 201 Fundamentals of Circuit Analysis		3 ( )		
	ECE 209W Electric Circuits Design Laboratory		2 (✓)		
	Arts Course		( )	3	

(continued on next page)

Table 3.1. Basic-Level Curriculum (continued)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Science	Engineering Topics Check if Contains Design (✓)	General Education	Other
			( )		
Junior Fall	ECE 202 Signals and Systems		3 ( )		
	ECE 204 Electronic Devices and Circuits		3 (✓)		
	ECE 205 Electromagnetic Fields and Waves	1	2 ( )		
	ECE 261 Analog Electronics Design Laboratory		3 (✓)		
	Literature Course		( )	3	
Junior Spring	ECE 232 Systems Analysis		3 (✓)		
	ECE 245 Micro/Opto-electronic Devices		3 (✓)		
	ECE 262W Switching and Digital Electronics Design Laboratory		3 (✓)		
	STAT 224Q Probability Models for Engineers	3	( )		
	Non-Western Course		( )	3	
	Elective		( )		3
Senior Fall	ECE 290 Computer and Electrical Engineering Design I		2 (✓)		
	ECE 241 Communication Systems		3 (✓)		
	Design Laboratory		3 (✓)		
	Professional Requirement		3 ( )		
	Professional Requirement		3 ( )		
	Elective		( )		3
Senior Spring	ECE 291 Computer and Electrical Engineering Design II		3 (✓)		
	ECE 240 Electronic Circuits and Applications		3 (✓)		
	Design Laboratory		3 (✓)		
	Professional Requirement		3 ( )		
	Professional Requirement		3 ( )		
			( )		
			( )		
			( )		
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		35	68 (✓)	22	9
OVERALL TOTAL FOR DEGREE		134			
PERCENT OF TOTAL		26%	51% (✓)	17%	6%
Totals must satisfy one set	Minimum semester credit hours	32 hrs	48 hrs		
	Minimum percentage	25%	37.5 %		



Electrical Engineering Prerequisite Flow.

3.3 Overview of the Freshman and Sophomore Years

The lower division or freshman and sophomore years of the Electrical Engineering curriculum are similar to the other engineering curricula. The recommended sequence of courses is as follows.

FRESHMAN YEAR

First Semester	Credits	Second Semester	Credits
CHEM 127Q	4	CHEM 128Q	4
MATH 115Q[1]	4	MATH 116Q[1]	4
ENGL 110 or ENGL 111	4	CSE 124C or ENGR 166[2]	4 or 3
CSE 123C	2	Social Science course (Group7)	3
HIST 100 or 101 (Group 5)	3	Elective	3
ENGR 100	1		_
	18		18 or 17

SOPHOMORE YEAR

First Semester	Credits	Second Semester	Credits
PHYS 151Q	4	PHYS 152Q	4
MATH 210Q	4	MATH 211Q	3
CE 211	3	PHIL 104 (Group 6)	3
CSE 207	3	ECE 201	3
CSE 208W	2	ECE 209W	2
	_	Arts course (Group 4)	3
	16		18

CSE 123C, CSE 207, CSE 208W, ECE 201 and ECE 209W are required courses for students majoring in EE. CSE 124C is recommended but not required of EE majors. CSE 207 and CSE 208W are taken in the third semester, and ECE 201 and ECE 209W are taken in the fourth semester. If CSE 207 and/or ECE 201 are delayed to the fifth semester there will be an inconvenience in subsequent course scheduling. The applied mechanics requirement, CE 211, should be completed in the sophomore year.

[1] May be replaced by the three-semester sequence of MATH 112Q-113Q-114Q. Of this latter sequence, only eight credits are applicable toward the degree; i.e, credits for MATH 112Q are not used.

[2] CSE 124C is recommended for students planning to take additional courses in programming.

3.4 Overview of the Junior and Senior years

The Electrical Engineering upper division curriculum, as described below, includes required courses and a number of professional requirements. The professional requirements are used to allow the student to specialize in a particular area within Electrical Engineering or to broaden his or her knowledge.

JUNIOR YEAR

First Semester	Credits	Second Semester	Credits
ECE 202	3	ECE 232	3
ECE 204	3	ECE 245	3
ECE 205	3	ECE 262W	3
ECE 261	3	STAT 224Q	3
Literature course (Group 4)	3	Non-Western course (Group 5)	3
	_	Elective	3
	15		18

SENIOR YEAR

First Semester	Credits	Second Semester	Credits
Design Laboratory	3	Design Laboratory	3
ECE 241	3	ECE 240	3
ECE 290	2	ECE 291	3
Professional Requirement (PR)	3	Professional Requirement (PR)	3
Professional Requirement (PR)	3	Professional Requirement (PR)	3
Elective	2 or 3		_
	16 or 17		15

Courses which may be used to fulfill the 6 credits Design Laboratory requirement are ECE 229, 263, 265, 266, 267, 268, or 292.

The 12 credits of Professional Requirements must be technical (defined as engineering, mathematics, statistics, physical and life sciences, when appropriate) courses numbered 200 or higher. At least six (6) credits of the Professional Requirement coursework must be chosen from Electrical and Computer Engineering (ECE) courses, and at least three (3) credits must be from other than Electrical and Computer Engineering (non-ECE) courses. Laboratory courses cannot be used for PR's unless approved by the Department in writing before the course is taken. With the exception of MATH 227Q, courses open to sophomores (regardless of their numbers) may not be used as PR's. If they are necessary, they may be taken as free electives.

The entire program of professional requirements is selected by the student, subject to approval by his/her advisor, the Department Head and final approval by the Dean of Engineering.

4. DOUBLE MAJORS, MINORS, and ADDITIONAL DEGREES

Opportunities exist to pursue a double major program in Electrical Engineering and one of the other undergraduate engineering curricula, to pursue a minor degree program in conjunction with the EE degree, or to pursue an additional degree within the University.

Double Major with another Engineering program

Opportunities exist to pursue a double major program in Electrical Engineering and one of the other undergraduate engineering curricula. Of the other curricula, the Computer Engineering (CMPE) and the Computer Science and Engineering (CSE) majors have the most overlap with that of the EE curriculum and are the most popular double majors for EE students. If a student wishes to be a double major within Engineering, he or she should notify the Dean. Careful planning of course selection should be done each semester in consultation with the student's advisor. A separate Plan of Study form for each major must be prepared and submitted for approval.

Minors

Several minors are available within the University that may be attractive to students pursuing the Electrical Engineering degree. Examples include minors in Mathematics and Statistics, within the College of Liberal Arts & Sciences, as well as the Biomedical Engineering minor within the School of Engineering.

Additional Degree with another major outside of Engineering

From time to time students wish to obtain an additional degree in a field outside of the School of Engineering. One example of an additional degree would be that found in the EUROTECH program in which the completion of a degree in German Studies within the College of Liberal Arts & Sciences is achieved at the same time the student completes the primary degree in a major within the School of Engineering. Students who have such an interest should discuss the procedure for pursuing the additional degree with the Director of Undergraduate Advising, Prof. David Jordan (486-5462).

5. FILLING OUT THE PLAN OF STUDY FORM

All students in the first semester of their Junior year in the Engineering curriculum must prepare a written Plan of Study form. These students should work with their advisors to determine a Plan of Study which meets the degree requirements of the School of Engineering and the University.

After an initial consultation with the advisor, the student should prepare two (2) original copies of the Plan of Study form (available from the Department office) by following the guidelines given below. Once the two original copies are prepared, the student should make an appointment with his/her advisor to have him/her review and approve the form. Both the advisor and the student should check his/her transcript to be sure that all Lower Division (freshman/sophomore) requirements have been met and should check that the proposed Upper Division (junior/senior) plan satisfies Department, School and University requirements. After the form is approved by the advisor, the two originals should be forwarded to the Associate Department Head, Prof. John Ayers, for approval, prior to being forwarded to the Director of Undergraduate Advising, Prof. David Jordan. Note: the student should check back with his/her advisor to see if any corrections must be made after the form has been reviewed by Associate Department Head.

The Associate Department Head will evaluate and indicate his approval of the Plan of Study, and then will send the two originals to the Director of Undergraduate Advising. The Director of Undergraduate Advising will evaluate the Plan and indicate his approval of it. In the event that approval is not given, the difference of opinion must be worked out among the advisor, the student and the Director of Undergraduate Advising or Associate Department Head, as appropriate.

The Dean's Office will return two copies of the approved tentative Plan of Study form to the advisor: one of the two "originals" which is to be kept in the student's counseling folder, the other being a photocopy to be given to the student.

Note that an approved Plan of Study form can be modified at any time if course offerings and student objectives warrant it. However, no modification that jeopardizes the meeting of requirements will be approved. Modification must be made in consultation with the student's advisor and will usually involve the submission of a "revised" Plan of Study form for approval, in the same manner as the "original" form was prepared and submitted. Although not required until the last semester, it is suggested that a "revised" form be submitted each semester rather than waiting until the final semester. This way any problems can be caught as early as possible. This "revised" Plan of Study form may be created as done initially by forming two new originals, or by marking the changes on the approved "original" and having this "revised" form circulated for approval. Alterations to the courses listed should be made by crossing out the course(s) not taken, writing in those that were, and having the advisor initial and date each change. If extensive changes are to be made, or if a second revision is necessary, a new "original" Plan of Study form must be submitted.

The Plan of Study form should be reviewed at each subsequent registration period. ***In the student's last semester, he/she is required to file a "final" Plan of Study form which accurately lists all the courses that were taken to satisfy degree requirements.*** Any modifications to an already approved Plan of Study form should then be submitted for final approval following the above procedure.

The Plan of Study forms should be filled out neatly and in ink. All approval initials and signatures should also be in ink and dated. Expected date of graduation and year of catalog requirements must be clearly shown. The following guidelines should be adhered to:

Double Major: If you plan to follow a double major, indicate at the bottom of the Plan of Study form what it will be; i.e. " Double Major: department ". Note that some double majors will require submitting a completed Plan of Study form from each department. The approval of the Department Head from the double major department is also required as indicated on the form. Note: Double majors with Materials Engineering (Metallurgy & Materials Engineering department) should indicate which courses are being used as materials courses.

Catalog year and date of graduation: It is extremely important that you accurately list what catalog year you are filing under and your intended date of graduation. Both items are needed for use by the Registrar so that completion of your degree requirements may be certified by your graduation date.

Courses taken: The Plan of Study form must show exactly the courses being used to satisfy degree requirements. Exemption from specific School of Engineering course requirements or substitution of alternative courses must be clearly indicated on the Plan of Study form, explained in the "Comments" section and/or with an attachment, and may require approval via petition by the Director of Undergraduate Advising (see "Exemption and Substitution" below).

Group 1. Foreign Language Requirement: The Foreign Language requirement calls for three years of a single foreign language in High School or a two semester course sequence in a language at the University. The words "High School" should be circled if the student has met this requirement in High School. If not, the appropriate courses should be listed with the credit by category columns modified accordingly (see "Credit Summary" below). Elementary levels of a foreign language should fall under the "Other" category, while more advanced language courses may be counted as "Humanities" credits in the ABET categories.

Group 2. Expository Writing Requirement: The General Education Requirement for Expository Writing is met through ENGL 105 and 109 and two "W" (writing) courses which are part of the engineering curriculum for each department (for EE majors, CSE 208W, EE 209W and EE 262W are required). Thus, the Plan of Study form (and the student transcript) must show these courses. If, for some reason beyond the student's

control, the major "W" courses are not taken, the student will have to take the required "W" courses outside the department curriculum.

Group 3. Mathematics and Computer Course Requirement: Students in Engineering are required to complete MATH 115Q, 116Q, 210Q, and 211Q which also satisfy the General Education Requirement for quantitative (Q) courses. (Note that MATH 112Q-113Q-114Q may be used to meet the freshman year calculus requirement.) In addition, all students at the University must complete a computer (C) course as part of their General Education Requirements. This is normally done through the freshman year CSE 123C and CSE 124C or ENGR 166C offerings. If for some reason the student does not meet this requirement, as may be the case for transfer students, he or she should see the Dean as soon as possible.

Group 8. Science Course Requirement: Students in Engineering are required to complete CHEM 127Q, 128Q and PHYS 151Q, 152Q which also satisfy the General Education Requirement for laboratory science courses.

Groups 4 through 7. Humanities and Social Sciences courses: As outlined in the University of Connecticut General Catalog, a minimum of six courses must be taken and distributed as follows:

Literature and the Arts (Group 4): All students must take two courses: one which emphasizes major works of literature and one which emphasizes major achievements in art, and/or music and/or dramatic arts.

Culture and Modern Society (Group 5): All students must take HIST 100 or 101 and a course which emphasizes non-Western or Latin American Cultures.

Philosophical and/or Ethical Analysis (Group 6): All students in Engineering must take PHIL 104 to satisfy the philosophical and/or ethical analysis General Education Requirement.

Social Scientific and Comparative Analysis (Group 7): All students must take one course in social science and/or comparative analysis.

In addition, all students are required to complete an "area of concentration" among the courses chosen to satisfy the Groups 4-7 by having at least two courses taken in one of the departments listed in the Catalog, with at least one of these two courses at the 200-level. Students may also meet this requirement for depth by taking an additional course, beyond the minimum prescribed, at the 200-level in one of the departments listed in the Catalog, provided that prior approval is obtained from the Dean.

Required courses: Required courses are shown on the form. If there are alternatives listed, the course(s) that the student has taken or intends to take should be circled (e.g. HIST 100 or HIST 101, circle 100 or 101 depending on which one was taken). The credit by category columns should be modified as needed (see "Credit Summary" below).

Professional Requirements: The Professional Requirements which are not specified on the Plan of Study form are chosen in consultation with the student's advisor.

Restrictions: The following courses may not be counted for credit toward graduation: MATH 112Q and 118Q along with other mathematics courses numbered below 110Q; PHYS 101Q, 103Q; CSE 101C; 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 requirement of the School of Engineering. Many general University restrictions are shown in the Academic Regulations and Procedures section of the University Catalog. Some examples include: Not more than 12 credits of biology at the 100-level may be counted toward graduation; Not more than 2 credits of ESLE 160 may be counted toward graduation; Not more than 6 credits from PHIL 101, 102, 103, 104, 105 may be counted toward graduation; and No credit for a course prerequisite to a second course in the same department may be counted for credit toward graduation after the student has passed the second course.

Exemption and Substitution: Students who desire to be excused from any of the requirements, or to substitute other courses for those prescribed, must do so by submitting a petition to the Dean. Some examples of this type of departure from a published regulation are as follows: exemption from MATH 115Q for a student who had Calculus in high school and started in our MATH 116Q or substitution of PHYS 121Q, 122Q, 125Q for PHYS 151Q, 152Q. Note that a substitution of three courses for two (as in the Physics example) results in only the credits for the two being counted for graduation, i.e. you are making a substitution for the equivalent work. Note that substitutions for courses taken as departmental Professional Requirements usually do not require a petition for approval by the Dean, but may be indicated on the Plan of Study form directly. Students must not write down or leave unchanged anything on the Plan of Study that they have not actually taken or plan to take.

Transfer Courses: Transfer courses should be listed on the Plan of Study form just as any other course, with a superscript of "T" to indicate which courses were transferred. Transfer courses may be counted at their University of Connecticut equivalent credit in the category totals if the transcript does not show the number of credits granted for the particular course.

For transfer work that does not have an exact University of Connecticut equivalent; e.g., 4.25 credits of ECE 100 LEVEL, the credits should be listed as follows:

ECE 100 LEVEL $(4.25)^{T}$

In other words, the discipline followed by the level with an indication of how many credits is needed.

The total transfer credit granted (not the sum of the University of Connecticut equivalents) less any equivalent restrictions (such as subtracting 3 credits if MATH 107Q is listed since this course does not count for credit in the School) should be listed on the

line labeled "Transfer Credits". The total of all credits taken at the University of Connecticut should be listed on the line labeled "University of Connecticut Credits". The sum of the "Transfer Credits" and the "University of Connecticut Credits" should be listed on the "Total Credits" line. The total credits must equal or exceed 134.

Changes: Changes to a previously submitted Plan of Study form may be made in consultation with the advisor and will require submission of a "revised" Plan of Study form for approval, in the same manner as the "original" form was prepared and submitted. This may be done by marking the changes on the previously approved original Plan of Study form, available from the advisor or the Office of the Dean, and having the advisor initial and date each change. No modifications of a photocopy will be accepted. If a second revision of an "original" is necessary, of if extensive changes are to be made, the submission of a new "original" Plan of Study form is required. In the student's last semester, he/she must submit a "final" Plan of Study form which accurately lists all the courses that were taken to satisfy degree requirements.

APPENDIX: Engineering Accreditation and ABET Engineering Criteria 2000

The Accreditation Board for Engineering and Technology (ABET) is recognized in the United States as the sole agency responsible for accreditation of educational programs leading to degrees in engineering. The first statement of the Engineers Council for Professional Development (ECPD, now ABET) relating to accreditation of engineering educational programs was proposed by the Committee on Engineering Schools and approved by the Council in 1933. The original statement, with subsequent amendments, was the basis for accreditation until 2000. The statement presented here is required of programs beginning in 2001.

All accredited engineering programs must include engineering in the program title (An exception has been granted for programs accredited prior to 1984 under the title of Naval Architecture.) To be considered for accreditation, engineering programs must prepare graduates for the practice of engineering at a professional level.

It is the responsibility of the institution seeking accreditation of an engineering program to demonstrate clearly that the program meets the following criteria.

Criterion 1. Students:

The quality and performance of the students and graduates is an important consideration in the evaluation of an engineering program. The institution must evaluate, advise, and monitor students to determine its success in meeting program objectives.

Criterion 2. Program Educational Objectives:

Each engineering program for which an institution seeks accreditation or reaccreditation must have in place

(a) detailed published educational objectives that are consistent with the mission of the institution and these criteria
(b) a process based on the needs of the program's various constituencies in which the objectives are determined and periodically evaluated
(c) a curriculum and process that ensures the achievement of these objectives
(d) a system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program.

Criterion 3. Program Outcomes and Assessment:

Engineering programs must demonstrate that their graduates have

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Each program must have an assessment process with documented results. Evidence must be given that the results are applied to the further development and improvement of the program. The assessment process must demonstrate that the outcomes important to the mission of the institution and the objectives of the program, including those
listed above, are being measured. Evidence that may be used includes, but is not limited to the following: student portfolios, including design projects; nationally-normed subject content examinations; alumni surveys that document professional accomplishments and career development activities; employer surveys; and placement data of graduates.

The institution must have and enforce policies for the acceptance of transfer students and for the validation of credit courses taken elsewhere. The institution must also have and enforce procedures to assure that all students meet all program requirements.

Criterion 4. Professional Component:

The Professional Component requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The engineering faculty must assure that the program curriculum devotes adequate attention and time to each component, consistent with the objectives of the program and institution. Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political. The professional component must include

(a) one year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline
(b) one and one-half years of engineering topics, to include engineering sciences and engineering design appropriate to the student's field of study
(c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Criterion 5. Faculty:

The faculty is the heart of any educational program. The faculty must be of sufficient number; and must have the competencies to cover all of the curricular areas of the program. There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.

The faculty must have sufficient qualifications and must ensure the proper guidance of the program and its evaluation and development. The overall competence of the faculty may be judged by such factors as education, diversity of backgrounds, engineering experience, teaching experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and registration as Professional Engineers.

Criterion 6. Facilities:

Classrooms, laboratories, and associated equipment must be adequate to accomplish the program objectives and provide an atmosphere conducive to learning. Appropriate facilities must be available to foster faculty-student interaction and to create a climate that encourages professional development and professional activities. Programs must provide opportunities for students to learn the use of modern engineering tools. Computing and information infrastructures must be in place to support the scholarly activities of the students and faculty and the educational objectives of the institution.

Criterion 7. Institutional Support and Financial Resources:

Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering program. Resources must be sufficient to attract, retain, and provide for the continued professional development of a well-qualified faculty. Resources also must be sufficient to acquire, maintain, and operate facilities and equipment appropriate for the engineering program. In addition, support personnel and institutional services must be adequate to meet program needs.

Criterion 8. Program Criteria:

Each program must satisfy applicable Program Criteria. Program Criteria provide the specificity needed for interpretation of the basic level criteria as applicable to a given discipline. Requirements stipulated in the Program Criteria are limited to the areas of curricular topics and faculty qualifications. If a program, by virtue of its title, becomes subject to two or more sets of Program Criteria, then that program must satisfy each set of Program Criteria; however, overlapping requirements need to be satisfied only once.

The applicable program criteria for the EE major are the “Program Criteria for Electrical, Computer, and Similarly named Engineering Programs” submitted by the Institute of Electrical and Electronics Engineers, Inc., and duplicated below:

PROGRAM CRITERIA FOR ELECTRICAL, COMPUTER, AND SIMILARLY NAMED ENGINEERING PROGRAMS

Submitted by The Institute of Electrical and Electronics Engineers, Inc.

These program criteria apply to engineering programs which include electrical, electronic, computer, or similar modifiers in their titles.

1. Curriculum

The structure of the curriculum must provide both breath and depth across the range of engineering topics implied by the title of the program.

The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to program objectives.

Programs containing the modifier "electrical" in the title must also demonstrate that graduates have a knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

Programs containing the modifier "computer" in the title must have a knowledge of discrete mathematics.