

The University of Connecticut

School of Engineering

# **ELECTRICAL ENGINEERING**

## **GUIDE TO COURSE SELECTION**

**AY 2016-2017**

*Revised October 7, 2016*

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.

<http://www.ee.uconn.edu/ececourseguide.php>

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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 (PEO) have been developed to satisfy the requirements of the Accreditation Board for Engineering and Technology (ABET).

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 [typically when a student is taking ECE 3101 and/or ECE 3201], or for transfer students in the second semester at the University of Connecticut, whichever is later, each student must submit a Plan of Study documenting the program he/she intends to follow. In order to help students in developing a suitable Plan of Study that is consistent with the Electrical Engineering Program Educational Objectives, the ECE department holds a Plan of Study meeting, normally scheduled sometime during the first five weeks of each semester. All students intending to file a Plan of Study in EE should attend one of these meetings. Details about the process of filling out a Plan of Study are provided later in Section 6.

# 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 (including our alumni and employers of our graduates). PEOs refer to the abilities and accomplishments of EE graduates several years after graduation. The feedback provided by our constituents is used to 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. They describe the abilities that our students will have at the time of graduation from the EE program. We use several assessment tools (including senior design project evaluation, alumni surveys, exit interviews, senior surveys, and course-level assessment) 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.



# The Two Loops of EC2000

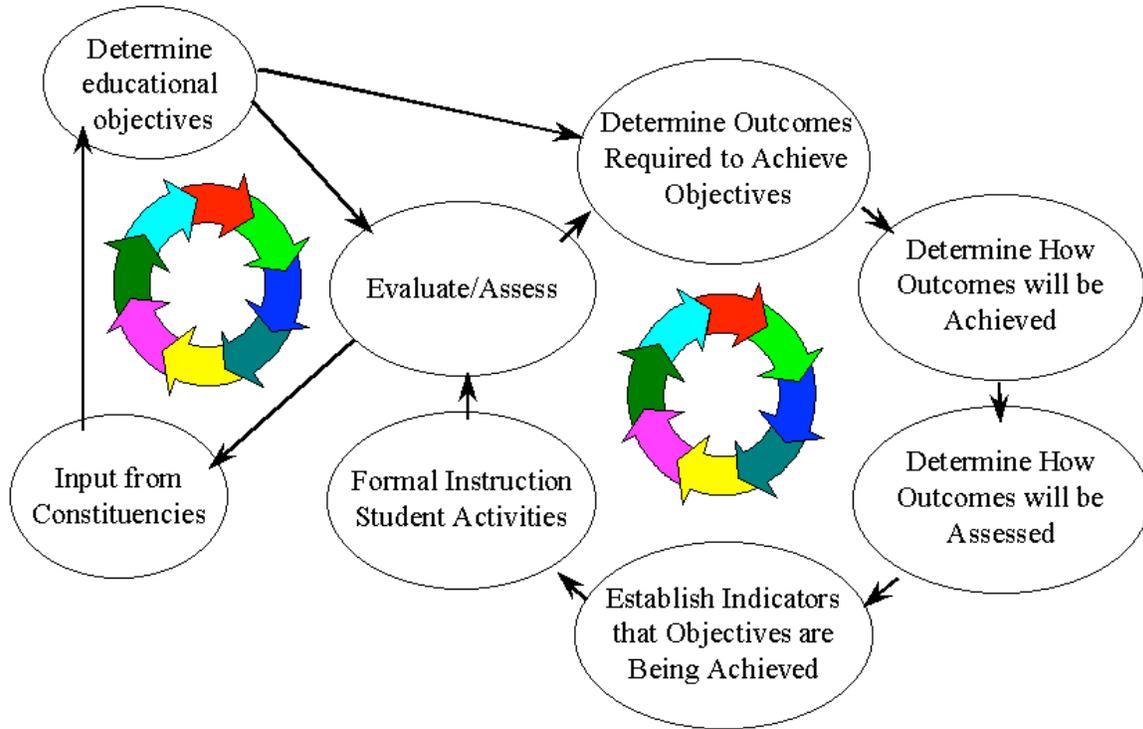


Figure 2.1. The two-loop process of Engineering Criteria 2000, as defined by Accreditation Board for Engineering and Technology (ABET).

## 2.1 Electrical Engineering Program Educational Objectives (PEO)

The Electrical Engineering program educational objectives are that our alumni/ae:

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

The Electrical Engineering Curriculum described in Section 3 has been designed to achieve these three 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 these outcomes are

achieved. The **EE Student Outcomes** are identical to the EAC Outcomes (a)-(k). They require that our graduates will demonstrate:

- (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 within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (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, economic, environmental, 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

### **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 3.1 describes the University General Education Requirements. Section 3.2 describes the basic-level EE Curriculum with the courses and options offered in the lower and upper divisions provided in Sections 3.3 and 3.4.

#### **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. These are described in what follows.

##### *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 pass the second semester course of the introductory year-long course sequence in a language at the University.

##### *Expository Writing*

All students must take ENGL 1010 Seminar in Academic Writing or ENGL 1011 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.

##### *Arts and Humanities (Content Area One)*

All students must take two Arts and Humanities courses. These courses must be from two different departments. All students in the School of Engineering are required to take PHIL 1104, which satisfies one of these requirements.

##### *Social Sciences (Content Area Two)*

All students must take two Social Sciences courses. These courses must be from two different departments.

##### *Science and Technology (Content Area Three)*

All students must take two Science and Technology courses. These courses must be from two different departments. All engineering students satisfy this requirement automatically with required courses.

##### *Diversity and Multiculturalism (Content Area Four)*

All students must take two Diversity and Multiculturalism courses. One of these courses may also count toward the Content Area One or Content Area Two. One of these courses must be an international course.

The list of approved courses has been furnished by the General Education Oversight Committee.

It is available at <http://geoc.uconn.edu/Approved%20Courses.htm>.

### 3.2 Electrical Engineering Basic-Level Curriculum

The basic-level curriculum is given in Table 3.1. This basic-level curriculum typically includes 34 credit hours of Math and Basic Science, 57 credit hours of Engineering Topics, 22 credit hours of General Education, and 13 credit hours of Other topics, as defined by the Accreditation Board for Engineering and Technology.

**Table 3.1. Basic-Level EE Curriculum**

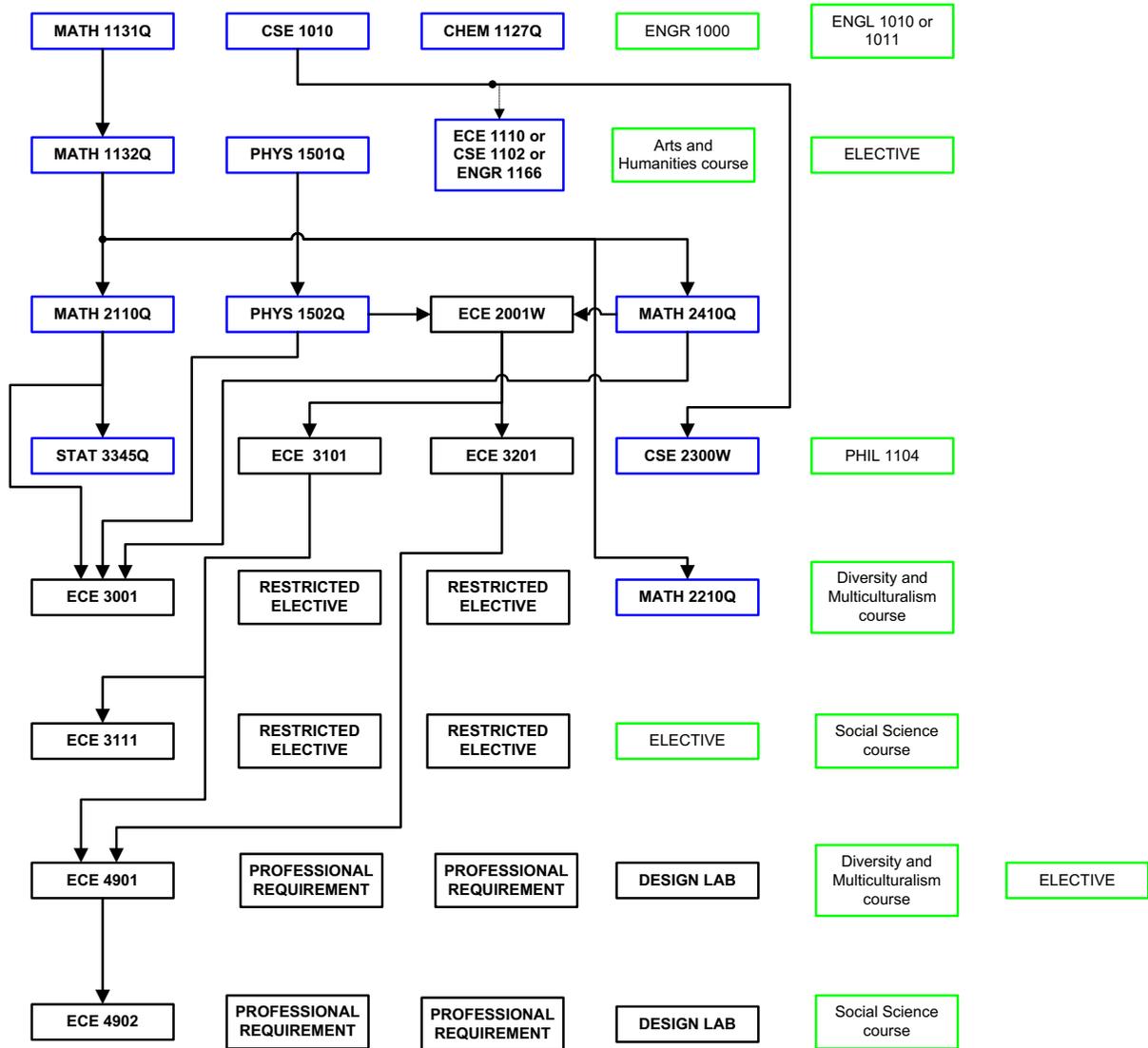
Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Sciences	Engineering Topics	General Education.	Other
			Check if Contains Design (✓)		
Freshman Fall	CHEM 1127Q General Chemistry	4	( )		
	MATH 1131Q Calculus I	4	( )		
	ENGL 1010 or ENGL 1011		( )	4	
	CSE 1010 Intro to Computing for Engr.		( )		3
	ENGR 1000 Orientation to Engineering		( )		1
Freshman Spring	PHYS 1501Q Physics for Engineers I	4	( )		
	MATH 1132Q Calculus II	4	( )		
	ECE 1110 or CSE 1102 or ENGR 1166		3 (✓)		
	Arts and Humanities course		( )	3	
	Elective		( )		3
Sophomore Fall	PHYS 1502Q Physics for Engineers II	4	( )		
	MATH 2110Q Multivariable Calculus	4	( )		
	ECE 2001 Electrical Circuits		4 (✓)		
	MATH 2410 Elementary Differential Equations	3	( )		
Sophomore Spring	ECE 3101 Signals and Systems		3 ( )		
	ECE 3201 Electronic Circuit Design and Analysis		4 (✓)		
	CSE 2300W Digital Logic		4 (✓)		
	STAT 3345Q or MATH 3160	3	( )		
	PHIL 1104 Philosophy and Social Ethics		( )	3	

(continued on next page)

**Table 3.1. Basic-Level EE 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 3001 Electromagnetic Fields and Waves	1	2 ( )		
	Restricted Elective		3 (✓)		
	Restricted Elective		3 (✓)		
	MATH 2210Q Linear Algebra	3	( )		
	Diversity and Multiculturalism course		( )	3	
Junior Spring	ECE 3111 Systems Analysis		4 (✓)		
	Restricted Elective		3 (✓)		
	Restricted Elective		3 (✓)		
	Social Sciences course		( )	3	
	Elective		( )		3
Senior Fall	ECE 4901 Electrical and Computer Engineering Design I		2 (✓)		
	ECE 4099W – Indep. Study w/Writing		1 (✓)		
	Professional Requirement		3 ( )		
	Professional Requirement		3 ( )		
	Design Laboratory		3 (✓)		
	Diversity and Multiculturalism course		( )	3	
Senior Spring	ECE 4902 Electrical and Computer Engineering Design II		3 (✓)		
	Design Laboratory		3 (✓)		
	Professional Requirement		3 ( )		
	Professional Requirement		3 ( )		
	Social Sciences course		( )	3	
			( )		
			( )		
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		34	59 (✓)	22	11
OVERALL TOTAL FOR DEGREE		126			
PERCENT OF TOTAL		27%	47% (✓)	17%	9%
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

<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
CHEM 1127Q General Chemistry	4	PHYS 1501Q Physics for Engineers I	4
MATH 1131Q Calculus I	4	MATH 1132Q Calculus II	4
CSE 1010 Intro to Computing for Engr.	3	CSE 1102 Object Oriented Design or ENGR 1166 Foundations of Engr.	3
ENGL 1010 or ENGL 1011	4	Arts and Humanities course	3
ENGR 1000 Orientation to Engineering	<u>1</u>	Elective	<u>3</u>
	16		17

#### SOPHOMORE YEAR

<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
MATH 2110Q Multivariable Calculus	4	CSE 2300W Digital Logic	4
PHYS 1502Q Physics for Engineers II	4	ECE 3201 Electronic Circuit Design and Analysis	4
ECE 2001 Electrical Circuits	4	ECE 3101 Signals and Systems	3
MATH 2410 Elementary Differential Equations	<u>3</u>	STAT 3345Q Probability Models for Engineers or MATH 3160 Probability	3
	15	PHIL 1104 Philosophy and Social Ethics	<u>3</u>
			17

EE Students have a choice of CSE 1102 or ENGR 1166 in the second semester. If a non-EE section of ENGR1166 is chosen, students must also take ECE1101 as well.

EE Students have a choice of STAT 3345Q or MATH 3160 in the fourth semester. However, students may not take both STAT 3345Q and MATH 3160 and use both towards their Plan of Study.

The three-semester sequence of PHYS 1201Q-1202Q followed by PHYS 1230 or 1530 may be taken instead to satisfy this requirement. However, only eight credits of PHYS 1201-1202-1230/1530 can be used toward the required 126 credits for the Engineering degree.

The courses from content areas one (Arts and Humanities) and two (Social Sciences) must be from four different departments. One course from either content area one (Arts and Humanities) or content area two (Social Sciences) may also be used to fulfill one of the requirements from content area four (Diversity and Multiculturalism). One course from content area four must be an international course.

### 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.

<b>JUNIOR YEAR</b>			
<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
ECE 3001 Electromagnetic Fields and Waves	3	ECE 3111 Systems Analysis	4
Restricted Elective	3	Restricted Elective	3
Restricted Elective	3	Restricted Elective	3
MATH 2210Q Linear Algebra	3	Social Sciences course	3
Diversity and Multiculturalism course	<u>3</u>	Elective	<u>3</u>
	15		15

<b>SENIOR YEAR</b>			
<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
ECE 4901 Electrical and Computer Engineering Design I	2	ECE 4902 Electrical and Computer Engineering Design II	3
ECE 4099W Independent Study w/Writing Design Laboratory	1	Design Laboratory	3
Professional Requirement	3	Professional Requirement	3
Professional Requirement	3	Professional Requirement	3
Diversity and Multiculturalism course	<u>3</u>	Social Sciences course	<u>3</u>
	15		15

#### *Design Laboratories*

Courses which may be used to fulfill the 6 credits Design Laboratory requirement include ECE 3225, 3411, 3421, 4079, 4122, 4132, 4225, 4242, 4244, 4401, and 4402.

#### *Restricted Electives*

The four restricted electives must be selected as follows: ECE 3211, or ECE 3212, or ECE 3231; ECE 3221 or ECE 4201; ECE 4211 or ECE 4225; and ECE 4111 or ECE 4112.

#### *Professional Requirements*

The 12 credits of Professional Requirements must be technical (defined as engineering, mathematics, statistics, physical and life sciences, when appropriate) courses numbered 3000 or higher. At least six (6) credits of the Professional Requirement coursework must be chosen from Electrical and Computer Engineering (ECE) courses. Laboratory courses cannot be used for PR's unless approved by the Department in writing before the course is taken. Courses open to sophomores (regardless of their numbers) may not be used as PR's. If they are deemed necessary, they may be taken as free electives.

Note that a course can only count as a restricted elective or as a professional requirement or as a design lab. In other words, the same course cannot satisfy multiple requirements.

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.

Students are limited to just six credits of ECE 4079 and ECE 4099 to be applied towards the design laboratory and professional requirements. More credits of ECE 4079 and ECE 4099 can be taken as free electives.

## 4. UPPER DIVISION EE HONORS PROGRAM

**Deadlines**  
**Fall Admission**--Early: Feb. 15,  
Regular: June 3

### Rising Juniors

Students with a grade point average of at least a 3.4 (with at least 54 credits completed) who wish to do Honors work in their junior/senior years may apply for admission in the second semester of – or immediately following – the sophomore year. In addition to completing the application for admission, students applying for admission for junior/senior-level study must obtain departmental consent from the major department's Honors advisor (Prof. Krishna Pattipati). In granting departmental consent, an Honors advisor is making a favorable judgment as to the student's qualifications for Honors work in the major. For information about the Honors Program, visit the website at <http://www.honors.uconn.edu>.

### EE Honors Program

The Electrical Engineering program participates in the Honors Program at UConn. The ECE Department will offer honors sections of the following courses so that the Honors Program requirements (minimum 12 credits) can be satisfied within the EE Program. EE Honors students **must** take the following four courses for 12/13 credits.

ECE 3101: **Signals and Systems** (3 credits; Spring, Sophomore Year)

ECE 3221: **Digital Integrated Circuits** or ECE 3111: **Systems Analysis** (3 or 4 credits; Fall/Spring, Junior Year)

ECE 4901 or CSE 4950: **Electrical and Computer Engineering Design I** (2 credits; Fall, Senior Year) **and** ECE 4099W: **Independent Study in Electrical and Computer Engineering** (1 credit)

ECE 4902 or CSE 4951: **Electrical and Computer Engineering Design II** (3 credits; Spring, Senior Year)

Electrical and Computer Engineering Design (ECE 4901 & 4902 /CSE 4950 & 4951) can be used for the Honors Thesis.

*IMPORTANT: For students graduating in December 2015 or later, Honors students must complete 15 honors credits of which 3 must be outside the major.*

### Notes

- ECE *graduate* courses may be taken to fulfill (automatically) honors course requirements.
- The honors thesis can be satisfied with Electrical and Computer Engineering Design I and II. **No other honors thesis is required for the Honors Program if you successfully complete the Senior Design coursework.**

## **5. DOUBLE MAJORS, MINORS, and ADDITIONAL DEGREES**

It is possible 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. Any student pursuing a second baccalaureate degree must i) submit an Additional Degree Petition (which requires the consent signature from the Dean of the School of Engineering) and ii) meet the course requirements of both degrees; and iii) earn at least 30 credits more than the requirements of the degree with the higher credit minimum.

### *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 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 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, (486-5462).

## **6. SUBMITTING THE PLAN OF STUDY**

All students in the first semester of their Junior year in the Engineering curriculum must prepare a preliminary Plan of Study (POS) through StudentAdmin. These students should work with their advisors to determine a POS that meets the degree requirements of the School of Engineering and the University. The preliminary POS allows students to map out the entirety of their degree coursework to assist them in conversations with their advisor about meeting all degree requirements prior to graduation. A preliminary POS is filed after a student has reached junior credit standing (54 credits or more) and outlines the student's plan for the remainder of their

coursework until graduation. Submitting an approved preliminary POS is required in the School of Engineering.

A final POS is filed after you have registered for your final semester of coursework. The final POS must demonstrate that the student meets all requirements to graduate. The final POS is a UConn graduation requirement.

It is the student's responsibility to fill out and file both the preliminary and final POS. However, students should do so with the guidance of their Academic Advisor. It is ideal to start this process at least one semester ahead of time, that is, in the spring of your sophomore year.

### **How do I submit a preliminary POS?**

First, you must access your academic planner in Student Administration.

*SA Self Service > Student Center > Academic Planner*

Then you can select "Plan by Requirements" to review your remaining unsatisfied requirements for your degree. You may also add courses to your planner using the "Browse Course Catalog" component.

Once you understand which courses you still need to take, review what semester those courses are offered and enter them into your Academic Planner accordingly. When you have completed this, you can select "Submit Plan of Study" and the document will be sent electronically to your faculty advisor for their review.

Ultimately, if the preliminary POS is **denied**, you must fix whatever errors are indicated and submit a new, correct POS that satisfies all degree requirements. If the POS is **approved**, you now have a complete and accurate plan to reach graduation. If you decide to deviate from this plan, it is your responsibility to discuss the changes with your academic advisor and ensure that you are still completing all degree requirements.

If you need further assistance, please access this video tutorial or contact your Academic Advisor:  
<https://www.youtube.com/watch?v=bXChknVu1yM>

### **How do I submit a final POS?**

First, you must apply for graduation via Student Administration here:

*SA Self Service > Learner Services > Academics > Apply for Graduation*

Next, submit your final POS. You can do this by navigating the following path:

*SA Self Service > Student Center > Academic Requirements (under the drop down menu at the left) > "Submit Final Plan of Study" button*

All of your requirements must show as satisfied in StudentAdmin to have your final POS approved.

The final POS must be submitted as soon as possible after registering for your final semester of coursework. The latest a final POS can be submitted is by the end of the fourth week of the semester in which a student plans to graduate.

When preparing the POS, 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.

**Catalog year and date of graduation:** It is extremely important that you accurately note what catalog year you are filing under and your intended date of graduation. The catalog year determines the set of requirements under which you will be graduating. If you need to change the catalog year, contact the Registrar. You can use any catalog year from the year you entered UConn to the year of your graduation.

**Courses taken:** The POS must show exactly the courses being used to satisfy degree requirements. Exemption from specific School of Engineering course requirements or substitution of alternative courses require approval (see "Exemption and Substitution" below).

**Foreign Language Requirement:** The Foreign Language requirement calls for three years of a single foreign language in High School or passing the second semester course of the introductory year-long course sequence in a language at the University.

**Expository Writing Requirement:** The General Education Requirement for Expository Writing is met through ENGL 1010 or ENGL 1011 and two "W" (writing) courses which are part of the engineering curriculum for each department (for EE majors, CSE 2300W and ECE 2001W or ECE 4099W are required). Thus, the POS (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.

**Arts and Humanities (Content Area One):** All students must take two Arts and Humanities courses. These courses must be from two different departments. All students in the School of Engineering are required to take PHIL 1104, which satisfies one of these requirements.

**Social Sciences (Content Area Two):** All students must take two Social Sciences courses. These courses must be from two different departments.

**Science and Technology (Content Area Three):** All students must take two Science and Technology courses. These courses must be from two different departments. All engineering students satisfy this requirement with required courses.

**Diversity and Multiculturalism (Content Area Four):** All students must take two Diversity and Multiculturalism courses. One of these courses may also count toward the Content Area One or Content Area Two. One of these courses must be an international course.

**Restrictions:** The following courses may not be counted for credit toward graduation: MATH 1120Q and 1110Q along with other mathematics courses numbered below 1120Q; PHYS 1010Q; PHYS 1030Q; CSE 1000C; STAT 1000CQ; and courses labeled "independent study" or "variable topics" 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.

**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 getting approval from the department head and SoE Director of Undergraduate Advising. Some examples of this type of departure from a published regulation are as follows: exemption from MATH 1131Q for a student who had Calculus in high school and started in MATH 1132Q or substitution of transfer courses for UConn equivalents. Exceptions can be approved by submitting an exceptions (<http://www.engr.uconn.edu/pdf/GradExcep-SubsFillable.pdf>) and requires approval from your advisor, the department head (or associate department head), and the SoE Director of Undergraduate Advising.

**Changes:** Changes to a previously submitted preliminary POS should be made in consultation with the advisor and will require submission of a revised POS for approval.