

The University of Connecticut

School of Engineering

# **ENGINEERING PHYSICS**

## **EE track**

**GUIDE TO COURSE SELECTION**

**AY 2012-2013**

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for

Engineering Physics (EngPhys) Majors

in the School of Engineering and College of Liberal Arts and Sciences

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

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

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## 1. INTRODUCTION

The objective of this Guide is to outline courses offered by the School of Engineering and the College of Liberal Arts and Sciences leading toward a degree in **Engineering Physics** (EngPhys) which will prepare the student for a career in the chosen field, meet the curricular requirements of the Departments, the School of Engineering and the College of Liberal Arts and Sciences, and the University. 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 Engineering Physics.

This Guide describes the Engineering Physics (EngPhys) curriculum, which is intended to provide the core of knowledge expected of a professional engineer working in this field. In addition to the required core courses, there are many senior year Professional Requirement courses which are chosen based on the desired area of concentration. The suggested professional requirement courses for the Engineering Physics program allow students to align themselves with either Electrical Engineering, Mechanical Engineering, or Materials Engineering. This guide has been tailored to the Electrical Engineering concentration in Engineering Physics; other guides are available for the other concentrations. The choice of the Professional Requirement courses, subject to the rules noted below, is up to the student and his or her advisor. Finally, all plans of study developed by the student must satisfy the curriculum requirements in EngPhys, and the minimum requirements for engineering science and design established by the School of 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 UConn, whichever is later, each student must complete a Plan of Study form documenting the program he/she intends to follow to satisfy the degree requirements of the chosen major in engineering. In order to help students in developing a suitable Plan of Study form that meets graduation requirements, the ECE department holds Plan of Study meetings, normally scheduled sometime during the first five weeks of each semester. All students intending to file a Plan of Study form in EngPhys must attend one of these meetings. Details about the process of filling out a Plan of Study form are provided later in Section 4.

## 2. ENGINEERING PHYSICS CURRICULUM

The Engineering Physics program of study is designed to give sound knowledge of basic principles in mathematics, physics, and chemistry; to offer training in the theory, principles, and practices of engineering; and to present the opportunity to obtain additional instruction and experience in one of the major engineering fields. Throughout the four-year curricula, opportunities are available to study general cultural and scientific topics. In addition, elective credits are available which can be used by those interested in professional schools or management and administration to supplement the required courses outlined in this Guide for the EngPhys curriculum.

For students in the School of Engineering, the engineering requirements which must be met are stated in detail in the Plan of Study current at the time of the student's entry into the

junior year program or the time of the student's admission or readmission to the School, whichever is later. Thus, this Guide provides the details omitted from the University Catalog. Note that a student must have earned at least a 2.0 grade point average for all calculable Upper Division course work to receive the degree.

## **2.1 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 for the Electrical Engineering concentration in Engineering Physics.

### *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>.



## 2.2 Overview of the Freshman and Sophomore years

The lower division or freshman and sophomore years of the Engineering Physics curriculum are similar to the other engineering curricula and are described in the Engineering Section of the University of Connecticut General Catalog. The required program includes courses in Mathematics, Physics, Chemistry and Engineering with additional coursework in English and the Humanities and Social Sciences.

<b>FRESHMAN YEAR</b>			
<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
MATH 1131Q - Calculus I	4	MATH 1132Q - Calculus II	4
CHEM 1127Q - Gen. Chem. I	4	CHEM 1128Q – General Chemistry II	4
PHYS 1501Q – Physics for Engineers I	4	PHYS 1502Q – Physics for Engineers II	4
ENGL 1010 or ENGL 1011 - Acad. Writing	4	Arts and Humanities Course <sup>2</sup>	3
ENGR 1000 - Orientation to Engr.	<u>1</u>	CSE 1010 – Intro. to Computing for Engr.	<u>3</u>
	17		18

<b>SOPHOMORE YEAR</b>			
<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
MATH 2110Q - Multivariable Calculus	4	MATH 2410Q - Differential Equations	3
PHYS 3101Q – Mechanics I	3	ECE 2001W - Electric Circuits	4
PHYS 2501WC – Lab. in Electricity, Magnetism, and Mechanics	3	PHYS 2300Q – Quantum Physics	3
CSE 2300W - Logic Design	<u>4</u>	PHIL 1104 - Phil. and Social Ethics	3
	14	STAT 3345Q – Prob. Mod. For Engr.	<u>3</u>
			16

<sup>1</sup>The three-semester sequence of MATH 1125Q-1126Q followed by Math 1132Q may be taken instead to satisfy this requirement. Only one credit of MATH 1125Q can be used toward the required 128 credits for the Engineering degree.

<sup>2</sup>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.

## 2.3 Overview of the Junior and Senior years

The Engineering Physics upper division curriculum, as described below, includes required courses and a number of professional requirements. The professional requirements allow a student to align with one of the other engineering disciplines (Electrical Engineering, Mechanical Engineering, or Materials Engineering). The suggested plan below includes professional requirements for the Electrical Engineering option.

<b>JUNIOR YEAR</b>			
<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
ECE 3201 - Electronic Devices and Circuits	4	ECE 3111 - Systems Analysis	3
ECE 3101 - Signals and Systems	3	PHYS 3202 – Electricity and Magnetism II	3
PHYS 3201 – Electricity & Magnetism I	3	ECE 4111 – Communication Systems	3
MATH 2210Q - Linear Algebra	3	Social Sciences course <sup>2</sup>	3
MATH 3410 – Diff. Eqns. Appl.	<u>3</u>	Diversity and Multiculturalism course <sup>2</sup>	<u>3</u>
	16		15

<b>SENIOR YEAR</b>			
<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
ECE 4901 - Elec. & Comp. Engr. Design I	2	ECE 4902 - Elec. & Comp. Engr. Design II	3
ECE 3223 – Optical Engineering	3	ECE 4211 – Micro/Optoelectronic Devices	3
PHYS 3401 – Quantum Mechanics <sup>3</sup>	3	ECE 3225 – Optical Engineering laboratory	3
PHYS 3300 – Stat. & Therm. Phys.	3	Diversity and Multiculturalism course <sup>2</sup>	3
Social Sciences course <sup>2</sup>	3	Elective	<u>3</u>
Elective	<u>3</u>		15
	17		

<sup>2</sup>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.

<sup>3</sup>Quantum mechanics for Engineers offered by the ECE department can be substituted.

### **3. DOUBLE MAJORS, MINORS, AND ADDITIONAL DEGREES**

It is possible to pursue a double major program in Engineering Physics and one of the other undergraduate engineering curricula, to pursue a minor degree program in conjunction with the Engineering Physics 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 Engineering Physics and one of the other undergraduate engineering curricula. 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 from each department must be prepared and submitted for approval.

#### *Minors*

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

### **4. 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 or from the School of Engineering website at <http://www.engr.uconn.edu/plansofstudy.php>) 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 Chandy and to Prof. Niloy Dutta (PHYS) for approval, prior to being forwarded to the Director of Undergraduate Advising (U-3187).

The Associate Department Head will 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 in ink. All approval initials and signatures should be in ink and dated. Expected date of graduation and year of catalog requirements must be clearly shown.

**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 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).

**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. The words "High School" should be circled if the student has met this requirement in High School. If not, the appropriate university courses should be listed.

**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 Engineering Physics majors in the Electrical Engineering concentration, CSE 2300W and ECE 2001W 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.

**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.

**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., ENGL 1010 or ENGL 1011, circle 1010 or 1011 depending on which one was taken].

**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 1120Q and 1110Q along with other mathematics courses numbered below 1120Q; PHYS 1010Q; PHYS 1030Q; CSE 1000C; STAT 1000QC; 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 submitting a petition to the Dean. 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 our MATH 1132Q or substitution of PHYS 1201Q, 1202Q, 1530Q for PHYS 1501Q, 1502. 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 1000 (ECE 100-level), the credits should be listed as follows:

ECE 1000 (4.25)<sup>T</sup>

In other words, the discipline followed by the level with an indication of how many credits are 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 1040Q 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 128.

**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, or 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.