

ELECTRICAL ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK For Academic Year 2011-2012

Department of Electrical Engineering and Computer Science

**L.C. Smith College of Engineering and Computer Science
Syracuse University**

This document describes the requirements for an undergraduate major in Electrical Engineering. It applies to students entering in the Fall 2011 and Spring 2012 semesters.

Disclaimer: The *Syracuse University Bulletin: Undergraduate Course Catalog* has the Official description of the program. This document is *intended* to contain a restatement and an elaboration on what is in the catalog. However, if on some point this document and the catalog are in conflict, the catalog has precedence over the handbook.

1. INTRODUCTION

The Department of Electrical Engineering and Computer Science (EECS) was created in July 1997 through the merger of the former Department of Electrical and Computer Engineering (ECE) and the former School of Computer and Information Science (CIS). Since then, the Bachelor of Science programs in Computer Engineering (BSCE), Computer Science (BSCS), and Electrical Engineering (BSEE) have all been administered by the Department of EECS.

The mission of the Electrical Engineering Program is to assist students to be ready for work and ready for change. This means preparing students to make professional contributions to electrical engineering immediately upon graduation and throughout their professional careers, and to adapt to technological and societal changes.

2. EDUCATIONAL OBJECTIVES FOR THE BSEE PROGRAM

The program educational objectives of the Bachelor of Science in electrical engineering (BSEE) program in the Department of Electrical Engineering and Computer Science (EECS) at Syracuse University state that our graduates must be *well-rounded*, *ready for work* and *ready for change*.

- I. Well-rounded graduates of the BSEE program are known by their professional competence, innovative thinking, willingness to further enhance their education, ability to work individually and in diverse teams, leadership abilities, communication skills, and integrity.
- II. Graduates of the BSEE program who are ready for work are engaged in applying the knowledge acquired in their major, combined with their problem solving abilities, to produce feasible solutions to problems, in a timely manner, which are deemed important in industry, government, or academia.
- III. Graduates of the BSEE program who are ready for change exhibit the intellectual flexibility necessary to solve new problems in innovative ways by integrating multiple viewpoints from several disciplines in search of the best possible solutions or applying their knowledge to different professional disciplines.

The BSEE educational objectives are available to view on the web at <http://www.lcs.syr.edu/academic/accreditation.aspx>.

3. STUDENT OUTCOMES FOR THE BSEE PROGRAM

In addition to successfully completing the requirements for the BSEE program, graduates from this program must achieve the following Student Outcomes prior to graduation:

- (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 multidisciplinary 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.
- (l) An ability to think critically as evidenced by skills in interpretation, analysis, evaluation, and inference.

The above student outcomes are listed together with our program educational objectives in our department web site http://lcs.syr.edu/documents/2008/11/6/BSEE_ABET.pdf

4. BSEE REQUIREMENTS

4.1. Program Components

All EE students must obtain, throughout the curriculum, a major design experience and professional components such as mathematics and basic sciences, engineering topics, and general education. The requirements of the BSEE curriculum can be grouped as follows:

1. Engineering courses (60 credits), including
 - a. courses with major design experience (22 credits)
 - b. other engineering courses (38 credits)
2. Mathematics and basic sciences (33 credits)
3. General education (30 credits), including
 - a. writing (12 credits)
 - b. social sciences and humanities (12 credits)
 - c. other general education/non technical courses (6)
4. Other courses (9 credits)

Total 132 credits

4.2. A Typical Program of Study for the BSEE curriculum

<i>First Year,</i>	<i>Fall</i>	<i>Credits</i>	<i>Third Year,</i>	<i>Fall</i>	<i>Credits</i>
<i>ECS 101</i>	Introduction to ECS	3	<i>ELE 331</i>	Digital Circuits	3
<i>CHE 106</i>	General Chemistry I	3	<i>ELE 391</i>	Digital Circuits Lab	3
<i>CHE 107</i>	General Chemistry Lab I	1	<i>ELE 351</i>	System and Signal Analysis	3
<i>MAT 295</i>	Calculus I	4	<i>ELE 324</i>	Electromagnetics I	3
<i>WRT 105</i>	Writing Studio I	3	<i>MAT 521</i>	Intro Prob & Statistics	3
	SS&H Elective	3	<i>WRT 307</i>	Advanced Writing Studio	3
<i>Subtotal</i>		17	<i>Subtotal</i>		18
<i>First Year,</i>	<i>Spring</i>		<i>Third Year,</i>	<i>Spring</i>	
<i>ECS 102</i>	Introduction to Computing	3	<i>ELE333</i>	Analog Circuits	3
<i>MAT 296</i>	Calculus II	4	<i>ELE 325</i>	Electromagnetics II *	3
<i>PHY 211</i>	General Physics I	3	<i>ELE 392</i>	Analog Circuits Lab	3
<i>PHY 221</i>	General Physics Lab I	1	<i>ELE 352</i>	Digital Signal Processing	3
	SS&H Elective	3	<i>ELE 312</i>	Controls Systems *	3
	Non technical Elective	3		Free Elective	3
<i>Subtotal</i>		17	<i>Subtotal</i>		18
<i>Second Year,</i>	<i>Fall</i>		<i>Fourth Year,</i>	<i>Fall</i>	
<i>PHY 212</i>	General Physics II	3	<i>WRT 407</i>	Adv. Workshop in Professional, Technical or Disciplinary Writing	3
<i>PHY 222</i>	General Physics Lab II	1	<i>ELE 497</i>	Senior Design Project	3

<i>ELE 231</i>	EE Fundamentals I	3		Technical Elective	6
<i>ELE 291</i>	EE Lab I	1		<i>ECS 392</i> Ethical Aspects of ECS	3
<i>MAT 397</i>	Calculus III	4			15
	SS&H Elective	3			
<i>Subtotal</i>		15		<i>Subtotal</i>	
<i>Second Year, Spring</i>				<i>Fourth Year, Spring</i>	
<i>MAT 485</i>	ODE & Linear Algebra	3		<i>ELE 497</i> Senior Design Project	1
<i>WRT 205</i>	Writing Studio II	3		Technical Elective	6
<i>ELE 232</i>	EE Fundamentals II	3		Math/Sci Elective	3
<i>ELE 292</i>	EE Lab II	1		Nontechnical Elective	3
<i>ELE 346</i>	Semiconductor Devices*	3		Free Elective	3
<i>CSE 261</i>	Digital Logic Design	3		<i>Subtotal</i>	16
<i>Subtotal</i>		16		<i>Total</i>	132

* These courses may be replaced with technical electives by students who choose to complete an ECS technical minor.

College of Engineering and Computer Science

Electrical Engineering
Fall 2011

Name _____
SUID _____

Track: _____
Minor: _____

CREDIT GRADE	FIRST-YEAR		SOPHOMORE		JUNIOR		SENIOR		VAR +/-
	F	S	F	S	F	S	F	S	
MATHEMATICS (18)									
MAT295 Calculus 1	(4)	4							
MAT296 Calculus 2	(4)		4						
MAT397 Calculus 3	(4)			4					
MAT485 Diff. Equations & Matrix Algebra	(3)				3				
MAT521 Probability and Statistics+	(3)					3			
SCIENCES (15)									
CHE106 General Chemistry 1	(3)	3							
CHE107 General Chemistry Lab 1	(1)	1							
PHY211 General Physics 1	(3)		3						
PHY221 General Physics Lab 1	(1)		1						
PHY212 General Physics 2	(3)			3					
PHY222 General Physics Lab 2	(1)			1					
Science/Math Elective	(3)							3	
ENGLISH (12)									
WRT105 Studio 1: Practices of Academic Writing	(3)	3							
WRT205 Studio 2: Critical Research and Writing	(3)			3					
WRT307 Adv. Writing Studio: Professional Writing	(3)				3				
WRT407 Adv. Wrkshp in Prof. Tech. or Disc. Writing	(3)						3		
SOC. SCIENCE/HUMANITIES/GEN. ED. (18)									
SSH Elective _____	(3)	3							
SSH Elective _____	(3)		3						
SSH Elective _____	(3)			3					
ECS392 Ethical Aspects of ECS	(3)						3		
Non-Tech Elective _____	(3)		3						
Non-Tech Elective _____	(3)							3	
ENGINEERING (9)									
ECS101 Intro. to Engr. & Comp. Sci.	(3)	3							
ECS102 Intro. to Computing	(3)		3						
CSE261 Digital Logic Design	(3)				3				
ELECTRICAL ENGINEERING (36)									
ELE231 Electrical Engr. Fundamentals I	(3)			3					
ELE232 Electrical Engr. Fundamentals II	(3)				3				
ELE291 Electrical Engr. Lab. I	(1)			1					
ELE292 Electrical Engr. Lab. II	(1)				1				
ELE324 Electromagnetics I	(3)					3			
ELE325 Electromagnetics II*	(3)						3		
ELE331 Digital Circuits & Systems	(3)					3			
ELE333 Analog Circuits	(3)						3		
ELE346 Semiconductor Devices*	(3)				3				
ELE351 System and Signal Analysis	(3)					3			
ELE391 Digital Circuits Laboratory	(3)					3			
ELE392 Analog Circuits Laboratory	(3)						3		
ELE491 Senior Design Project 1	(1)							1	
ELE492 Senior Design Project 2	(3)								3
TECHNICAL ELECTIVES (18)									
Select Two of the Following 3 Courses:	()						3		
ELE312 Control Systems* (3)	()						3		
ELE352 Digital Signal Processing (3)									
ELE424 Fund. of RF and Microwaves (3)									
And Another 4 Technical Electives:									
Tech Elective _____	(3)							3	
Tech Elective _____	(3)							3	
Tech Elective _____	(3)								3
Tech Elective _____	(3)								3
FREE ELECTIVES (6)									
Free Elective _____	(3)						3		
Free Elective _____	(3)								3
TOTAL CREDITS	132	17	17	15	16	18	18	13	18

4.3. General Information

ELECTRICAL ENGINEERING

Curriculum Notes

2011-2012

1. Electrical Engineering (EE) students must complete 18 credit hours in social sciences/humanities/Non-Technical electives using any one of the following options:

Option 1: Students may use their electives to complete a non-technical minor. Students pursuing this option must plan early in their degree program.

Option 2: Complete the divisional perspective requirements of humanities division and take the remaining electives from the social sciences division.

Option 3: Complete the divisional perspective requirements of social sciences division and take the remaining electives from the humanities division.

2. In EE program, tracks of specialization (described in the *2009-2010 Syracuse University Bulletin: Undergraduate Course Catalog*) and minors are used to regulate technical electives. A student must complete four technical elective courses in Electrical Engineering or Computer Engineering. In general, two of these courses complete one EE track. Students need to complete only one EE track (two EE elective courses). If a student chooses to complete two tracks, in most cases, there are 12 credits of technical electives. If a student chooses to complete one EE track and a technical ECS minor, the technical electives are increased to 21 credits. Courses that are not required for students who complete a technical minor are ELE 346, 325 and 312.

3. First year courses in Physics, Mathematics and computer programming may not be used as unspecified electives.

+ CIS 321 can be substituted if a student does not want a mathematics minor.

* Students who choose to complete a technical ECS minor may replace these courses with technical electives.

4.4 Electrical Engineering

Track Sheet

2011-2012

Tracks (Technical Electives)

Tracks are intended to provide a cohesive set of technical electives for electrical engineering students. A track usually consists of a group of four courses (12 credits). In the Department of Electrical Engineering and Computer Science there are three tracks in electrical engineering.

Communications Track:

ELE 351	System and Signal Analysis	3
ELE 352	Digital Signal Processing	3
and two of the following:		
ELE 551	Communication Systems	3
ELE 458	Data Networks: Basic Principles	3
ELE 591	Special Topics in Communications	3

Electromagnetics Track:

ELE 324	Electromagnetics I	3
ELE 325	Electromagnetics II *	3
and two of the following:		
ELE 424	Fundamentals of RF & Microwaves	3
ELE 425	Microwave Engineering	3
ELE 524	Introduction to Applied Optics	3
ELE 525	Electromagnetics Compatibility	3

VLSI Track:

ELE 331	Digital Circuits & System	3
ELE 346	Semiconductor Devices *	3
two technical electives:		
ELE 464	Introduction to VLSI Design	3
ELE 541	Integrated Circuits	3

* Students who choose to complete a technical ECS minor may replace these courses (ELE346, ELE325) with technical electives.

5.0 Elective Courses

In order to maximize the flexibility of the Electrical Engineering curriculum while maintaining its structure, electives have been divided into the following categories.

5.1 Technical Electives

Tracks of specialization (listed above) and minors are (typically) used to regulate technical electives. *Students must take 36 required course credits, and 18 technical elective credits.*

Among the technical electives, each student must choose at least two from ELE312 (Control Systems), ELE352 (Digital Signal Processing), and ELE424 (Fund. of RF and Microwaves).

Each student must satisfy the requirements of a Track by taking at least one of the sets of technical electives listed below:

1. *Communications Track: ELE352, and two from {ELE458, 551, 591}*
2. *Electromagnetics Track: Two from {ELE424, 425, 524, 525}*
3. *VLSI Track: ELE464, 541.*

5.2 Mathematics and Science Elective

The 3-credits elective may be fulfilled by any mathematics course with a calculus prerequisite, any physics course with a calculus-based physics prerequisite, or any college-level course in other science departments. By taking an appropriate math course, EE students can use this elective to complete a minor in mathematics.

5.3 Social Sciences and Humanities Electives

This 9-credit requirement may be fulfilled by any combination of courses listed in the social sciences division or humanities division of the College of Arts and Sciences. A glossary of course designations with such contents can be found in the Humanities Division and the Social Sciences Division of the College of Arts and Sciences. Courses outside of this scope require prior approval from the academic advisors and Program Director.

5.4 General Education Electives

This 6-credit requirement may be fulfilled by any combination of courses that do not have technical engineering, computer science, mathematics and natural science content. These courses, either by themselves or in combination with social sciences and humanities electives and free electives, present a very attractive opportunity to complete one of the non-technical minors offered in the University.

5.5 Free Electives

This 6-credit requirement may be fulfilled by any combination of college level courses, for example, to help fulfill the requirements of a technical or a non-technical minor.

6.0 Graduation Requirements

- Students must complete their program of study satisfying all the course requirements described in Sections 4.2, 4.3, and 4.4;
- Students cannot graduate with courses having missing grades or incompletes;
- Students must have earned an average GPA of at least 2.0 (C) in all the engineering, mathematics and science courses. In addition, the overall GPA of all courses taken at Syracuse University must be at least 2.0 (C);

6.1 Monitoring Student's Progress

Advising: Each student is assigned an academic advisor. A list of advisors can be found at the board outside Room 130 in Link Hall.

6.2 Helpful Advice

If you designate a minor in your program of study and you decide not to pursue it any longer, you must drop it before graduation. Otherwise, you will not be able to be certified for graduation because you have not fulfilled the requirements for this minor.