

COMPUTER ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK For Academic Year 2015-2016

Department of Electrical Engineering and Computer Science

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

(Updated November 9, 2015)

This document describes the requirements for an undergraduate major in Computer Engineering. It applies to students entering in the Fall 2015 and Spring 2016 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 Bachelor of Science in Computer Engineering (BSCE) program at Syracuse was originally established in 1969 through the former Department of Electrical Engineering and was the second such program of its kind in the nation. This program has been accredited by the Accreditation Board for Engineering and Technology (ABET) since 1973. Currently the BSCE program is housed in the Department of Electrical Engineering and Computer Science (EECS) which is a department in the College of Engineering and Computer Science (ECS).

Computer Engineering (CE) at Syracuse University has two primary foci: Computer Hardware Design: including an understanding of design methodologies for electronic circuits, digital systems, computer architecture and integrated circuits, and Computer Software Design: including an understanding of design methodologies for algorithms and data structures, operating systems, and a wide variety of software applications across various computer languages. In addition to design methodologies, test and verification principles are studied, as well as performance estimation and the underlying computation theory. There is an excellent opportunity in laboratories to put the theory and design methods into practice by using digital components, design simulators, and microcontrollers.

Part of the department's mission is to enable CE graduates to use computer engineering and other knowledge to solve relevant societal problems as described by the BSCE Educational Objectives. This is accomplished by a rigorous curriculum that prepares students to achieve the BSCE Educational Outcomes prior to graduation and the BSCE Educational Objectives after graduation.

2. EDUCATIONAL OBJECTIVES FOR THE BSCE PROGRAM

The educational objective of the Bachelor of Science in Computer Engineering (BSCE) program in the Department of Electrical Engineering and Computer Science (EECS) at Syracuse University is to prepare **well-rounded** graduates that are **ready for work** and **ready for change**.

- I. Well-rounded graduates of the BSCE 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 BSCE program who are ready for work are engaged in applying the knowledge acquired in Computer Engineering, 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 BSCE 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.

3. STUDENT OUTCOMES FOR THE BSCE PROGRAM

In addition to successfully completing the requirements for the BSCE program which are described further on in this handbook, graduates from this program must also achieve the following educational outcomes prior to graduation:

BSCE STUDENT OUTCOMES

- 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 verify design correctness and evaluate performance of computing systems.

4. BSCE REQUIREMENTS

4.1. Program Components

The BSCE program has four fundamental educational components: mathematics and sciences, engineering, social sciences and humanities, and general education. A liberal number of courses have been set-aside as electives in order to allow students, with the guidance of their advisors, to customize their education according to their personal and career objectives. A summary of required and elective credits within each component is as follows:

<i>Math and Science Education:</i>	33 required, 0 elective; for a total of 33 credits,
<i>Engineering Education:</i>	48 required, 18 elective; for a total of 66 credits,
<i>General Education:</i>	9 required, 12 elective; for a total of 21 credits,
<i>Social Science and Humanities Education:</i>	3 required, 6 elective; for a total of 9 credits.

Total Credits 129

4.2. A Typical Program of Study Presented by Semester

<i>First Year, Fall Semester</i>	<i>Credits</i>	<i>Third Year, Fall Semester</i>	<i>Credits</i>
ECS 101 Intro to Engn. & Comp Sci	3	CSE 381 Computer Architecture	3
ECS 102 Introduction to Computing	3	CSE 397 Computer Lab I	3
MAT 295 Calculus I	4	CSE 484 Computer & Network Sec.	3
CHE 106 General Chemistry I	3	Non-Eng./Comp. Science elective	3
CHE 107 General Chemistry II	1	ECS 392 Ethical Aspects of ECS	3
WRT 105 Writing Studio I	3	Social Science/Humanities elective	3
	17		18
<i>First Year, Spring Semester</i>	<i>Credits</i>	<i>Third Year, Spring Semester</i>	<i>Credits</i>
PHI 251 Logic	3	CIS 321 Intro to Prob. and Stat.	4
MAT 296 Calculus II	4	CSE 398 Computer Lab II	3
PHY 211 General Physics I	3	CSE 486 Design of Operating Systems	3
PHY 221 General Physics Lab I	1	Technical electives	3
CSE 283 Intro to Obj.-Oriented Design ...	3	Non-Eng./Comp. Science elective	3
Social Science/Humanities elective	3		
	17		16
<i>Second Year, Fall Semester Credits</i>		<i>Fourth Year, Fall Semester</i>	<i>Credits</i>
CIS 275 Intro to Discrete Mathematics ...	3	CSE 491 Senior Design Project I	1
CSE 489 Web Sys Arch and Prog.	3	WRT 401 Tech Comm. Design Meth.	2
MAT 331 1st Course in Linear Alge.	3	Technical electives	9
ELE 231 EE Fundamentals I	3	Non-Eng./Comp. Science Electives	3
ELE 291 EE Lab I.....	1		15
PHY 212 General Physics II	3		
PHY 222 General Physics Lab II	1	<i>Fourth Year, Spring Semester</i>	<i>Credits</i>
	17	CSE 492 Senior Design Project II	3
 		WRT 402 Tech Comm. Proto&Constr.	1
<i>Second Year, Spring Semester</i>	<i>Credits</i>	Technical electives	6
CSE 261 Digital Logic Design	3	Non-Eng./Comp. Science elective	3
CSE 262 Digital Sys. Design and Sim.	1		13
CSE 384 Systems Programming	3		
CSE 382 Algo. and Data Structures	3		
ELE 232 EE Fundamentals II	3		
ELE 292 EE Lab II	1		
WRT 205 Writing Studio II	3		
	17		Total 130

College of Engineering and Computer Science												
Computer Engineering				Name _____								
Effective Fall 2015				SUID _____								
Minor/Second Major (if any): _____				Credit Grade	Freshman		Sophomore		Junior		Senior	
					F	S	F	S	F	S	F	S
MATHEMATICS (21)												
CIS275	Intro to Discrete Mathematics	(3)	_____				3					
PHI 251	Logic	(3)	_____			3						
MAT295	Calculus 1 (C- or better)	(4)	_____		4							
MAT296	Calculus 2 (C- or better)	(4)	_____			4						
MAT331	1 st Course in Linear Algebra	(3)	_____				3					
CIS321	Intro. to Probability and Statistics*	(4)	_____							4		
SCIENCES (12)												
CHE150	General Chemistry for Eng.	(3)	_____		3							
CHE151	General Chemistry for Eng. Lab	(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					
ENGLISH (9)												
WRT105	Practices of Academic Writing	(3)	_____		3							
WRT205	Critical Research and Writing	(3)	_____				3					
WRT401	Technical Comm. Design Methodology	(2)	_____								2	
WRT402	Technical Comm. Prototyping & Constr.	(1)	_____									1
SOC. SCIENCE/HUMANITIES/GEN. ED. (9)												
ECS392	Ethical Aspects of ECS	(3)	_____						3			
SSH Elective _____		(3)	_____			3						
SSH Elective _____		(3)	_____						3			
ENGINEERING (14)												
ECS101	Intro. to Engineering & Computer Sci	(3)	_____		3							
ECS102	Intro. to Computing	(3)	_____		3							
ELE231	Electrical Engr. Fundamentals I	(3)	_____				3					
ELE232	Electrical Engr. Fundamentals II	(3)	_____					3				
ELE291	Electrical Lab. 1	(1)	_____				1					
ELE292	Electrical Lab. 2	(1)	_____					1				
COMPUTER ENGINEERING (35)												
CSE261	Digital Logic Design	(3)	_____					3				
CSE262	Digital Sys. Design and Sim.	(1)	_____					1				
CSE283	Intro. To Object-Oriented Design	(3)	_____			3						
CSE381	Computer Architecture	(3)	_____						3			
CSE382	Algorithms & Data Structures	(3)	_____					3				
CSE397	Computer Laboratory 1	(3)	_____						3			
CSE384	Systems Programming	(3)	_____					3				
CSE398	Computer Laboratory 2	(3)	_____							3		
CSE484	Computer & Network Sec.	(3)	_____						3			
CSE486	Design of Operating Systems	(3)	_____							3		
CSE489	Web Sys Arch, and Programming	(3)	_____				3					
CSE491	Senior Design Project I	(1)	_____								1	
CSE492	Senior Design Project II	(3)	_____									3
TECHNICAL ELECTIVES (18)**												
Tech Elective _____		(3)	_____							3		
Tech Elective _____		(3)	_____								3	
Tech Elective _____		(3)	_____								3	
Tech Elective _____		(3)	_____								3	
Tech Elective _____		(3)	_____									3
Tech Elective _____		(3)	_____									3
NON-ENG./COMP. SCIENCE ELECTIVES (12) ***												
Non-Eng./Comp. Sci. Elective _____		(3)	_____						3			
Non-Eng./Comp. Sci. Elective _____		(3)	_____							3		
Non-Eng./Comp. Sci. Elective _____		(3)	_____								3	
Non-Eng./Comp. Sci. Elective _____		(3)	_____									3
TOTAL CREDITS				130	17	17	17	17	18	16	15	13

*CIS 321 can be waived if a student takes both MAT521 and MAT525. **Every year, three courses will be selected as Group A courses, at least two of them have to be selected. ***At least 6 of the 12 credits must be from the College of Arts & Sciences or contain the nature of arts and sciences.

4.3. General Information

Note that you **cannot take CIS 554 – Object-Oriented Programming in C++**, to fulfill any requirement in the Computer Engineering undergraduate program. This is because a considerable amount of material covered in this course overlaps with the material covered in the core course CSE 283 – Introduction to Object-Oriented Design.

Note that **CPS courses cannot be taken** to fulfill any of the requirements for the Computer Engineering undergraduate program. These courses are designed for non-majors in Computer Engineering or in Computer Science.

4.4. Elective Courses

Technical Electives

Students fulfill 18 credits of technical electives. Out of the 18 credits, at least 6 of them must be selected from the Group A courses, which are yearly determined by the Computer Engineering Program Committee. For example, for the students entering in fall 2014, the following courses are in Group A.

- *CSE 482/CSE 483 - Principles of Software Engineering/ C# and Windows Programming
- CSE 464 – Introduction to VLSI Design
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(*One of these two courses will be considered as group A elective. If both are taken, the other one will be considered as a technical elective.)

The remaining technical electives can be selected from any CSE, CIS, or ELE courses, 300-level or above, including courses offered under special topics.

Some examples are listed below:

- ELE 331 - Digital Circuits And Systems
- ELE 333 - Analog Circuits
- ELE 346 - Semiconductor Devices
- ELE 351 - System and Signal Analysis
- CIS 352 - Programming Languages: Theory and Practice
- CIS 373 - Introduction to Automata Theory
- ELE 424 - Fundamentals of RF and Microwaves
- CIS 425 - Introduction to Computer Graphics
- ELE 431 - Analog Circuits and Systems
- CIS 453 - Software Specification and Design
- CIS 454 – Software Implementation
- CIS 467 - Introduction to Artificial Intelligence
- CIS 473 - Logic and Computability Theory
- CIS 483 - Introduction to Computer and Network Security
- CIS 500 - Programming in Java 5.0
- CIS 543/ELE 516 - Control of Robots
- CIS 581 - Concurrent Programming
- CSE 581 - Introduction to Database Management Systems

- CSE 588 - Translator Design

Interdisciplinary (INT) Track:

Objective: To allow students to have a more broad education by being able to take more courses outside of the Department of Electrical Engineering and Computer Science (EECS).

Requirements to complete this track:

- Student must be awarded a minor or a second major in a discipline outside of the Department of Electrical Engineering and Computer Science (EECS), excluding a minor in Mathematics;
- Student may substitute up to six credit hours of technical elective courses to fulfill this minor or second major, while still meeting the requirement that at least 6 credits are selected from the Group A courses.

Social Sciences and Humanities Electives (SSH Electives)

Courses from the following departments can be used for HHS Electives. Courses not included in the following requires petitions.

- Art Photography (APH) African American Studies (AAS)
- Applied Music (AMC) American Studies (AMS)
- Anthropology (ANT) Art (ART)
- Ceramics (CER) Chinese (CHI)
- Communications Design (CMD) Drama (DRA)
- Economics (ECN) English and Textual Studies (ETS)
- Fine Arts (FIA) Fiber Arts (FIB)
- Film (FIL) Foundation (FND)
- French (FRE) Fashion Illustration (FSH)
- Geography (GEO) German (GER)
- Greek (GRE) Hebrew (HEB)
- Hindi (HIN) History (HIS)
- Humanities (HUM) Illustration (ILL)
- International Relations (IRP) Interior Design (ISD)
- Italian (ITA) Latin (LAT)
- Linguistics (LIN) Literature in Translation (LIT)
- Metalsmithing (MET) Music History & Literature (MHL)
- Museum Studies (MUS) Public Affairs & Citizenship (PAF)
- Philosophy (PHI) Polish (POL)
- Political Science (PSC) Psychology (PSY)

- Printmaking (PRT) Painting (PTG)
- Religion (REL) Russian (RUS)
- Sculpture (SCU) Communication and Rhetorical Studies (CRS)
- Sociology (SOC) Social Science (SOS)
- Spanish (SPA) Surface Pattern Design (SPD)
- Studio Arts (STA) Art Video (VID)
- Writing (WRT) Women's Studies (WSP)

Non-Engineering/Computer Science Electives

The purpose of this 12-credit requirement of non-engineering/computer science elective courses is to provide students with a broad educational experience in a diversity of subjects. Out of the 12 credits, at least 6 credits have to be from the College of Arts and Sciences or contain the nature of Arts and Sciences. Moreover, technical courses offered by (or cross-listed with) the College of Engineering and Computer Science (ECS), courses with pass/fail grades, CPS courses, and 100-level courses in CHE, MAT, and PHY cannot be used to satisfy this requirement. IST courses will require permissions from academic advisors.

4.5. Minors

The Computer Engineering curriculum is flexible enough to allow a student to complete minors without taking additional credits or by taking only a few extra courses. Today's computer engineers work in an environment where they are expected to know not only computer hardware and software, but also material from a collection of other subject areas—from device technology or computer science to management and how computers affect the world. The computer engineering curriculum responds to this need by providing students with a strong basis in the fundamentals of computer engineering coupled with additional courses drawn from mathematics, electrical engineering and computer science. With the core courses in MAT and ELE, *BSCPE students normally are no more than 9 credits away from completing a minor in Electrical Engineering (ELE) or Mathematics (MAT).*

4.6. 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);

4.7. 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.

4.8. 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.