# **B.S. in Computer Engineering**

## (120 credit minimum)

First Year		
1st Semester		Credits
CHEM 125	General Chemistry I	3
FED 101	Fundamentals of Engineering Design	2
ENGL 101	English Composition: Introduction to Academic Writing	3
MATH 111	Calculus I	4
PHYS 111	Physics I	3
PHYS 111A	Physics I Lab	1
FYS SEM	First-Year Student Seminar	0
	Term Credits	16
2nd Semester		
CS 115	Introduction to Computer Science I in C++	3
MATH 112	Calculus II	4
PHYS 122	Electricity & Magntsm ECE Appl	3
PHYS 121A	Physics II Lab	1
ECE 101	Introduction to Electrical and Computer Engineering	0
ENGL 102	English Composition: Introduction to Writing for Research	3
	Term Credits	14
Second Year		
1st Semester		
CS 116	Introduction to Computer Science II in C++.	3
ECE 231	Circuits and Systems I	3
ECE 251	Digital Design	3
MATH 222	Differential Equations	4
Lliston ( and Llumonitia		
requirements/ger-200-	s GER 200 level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education- level/)	3
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	level/)	
requirements/ger-200	level/)	
requirements/ger-200 2nd Semester	level/) Term Credits	16
requirements/ger-200- 2nd Semester ECE 232	level/) Term Credits Circuits and Systems II	<b>16</b> 3
2nd Semester ECE 232 ECE 252	level/) Term Credits Circuits and Systems II Microprocessors	<b>16</b> 3 3
<b>2nd Semester</b> ECE 232 ECE 252 MATH 213	level/) Term Credits Circuits and Systems II Microprocessors Calculus III B	<b>16</b> 3 3 4
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271	level/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory	16 3 3 4 2
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294	level/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I	16 3 3 4 2 3
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271	level/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I	16 3 3 4 2 3
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271 Third Year	level/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I	16 3 3 4 2 3
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requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271 Third Year 1st Semester CS 280	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts	16 3 3 4 2 3 15 3
requirements/ger-200-         2nd Semester         ECE 232         ECE 252         MATH 213         ECE 294         ECE 271         Third Year         1st Semester         CS 280         ECE 368	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission	16 3 3 4 2 3 15 3 3 3 3
requirements/ger-200-         2nd Semester         ECE 232         ECE 252         MATH 213         ECE 294         ECE 271         Third Year         1st Semester         CS 280         ECE 368         ECE 395	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission Microprocessor Laboratory Discrete Analysis for Computer Engineers Random Signals and Noise	16 3 3 4 2 3 15 3 3 3 2
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271 Third Year 1st Semester CS 280 ECE 368 ECE 395 MATH 326	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission Microprocessor Laboratory Discrete Analysis for Computer Engineers	16 3 3 4 2 3 3 15 3 3 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271 Third Year 1st Semester CS 280 ECE 368 ECE 395 MATH 326 ECE 321 2nd Semester	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission Microprocessor Laboratory Discrete Analysis for Computer Engineers Random Signals and Noise Term Credits	16 3 3 4 2 3 15 3 3 3 3 3 3 3 14
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271 Third Year 1st Semester CS 280 ECE 368 ECE 395 MATH 326 ECE 321 2nd Semester CS 332	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission Microprocessor Laboratory Discrete Analysis for Computer Engineers Random Signals and Noise Term Credits Principles of Operating Systems	16 3 3 4 2 3 15 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
requirements/ger-200-         2nd Semester         ECE 232         ECE 252         MATH 213         ECE 294         ECE 271         Third Year         1st Semester         CS 280         ECE 395         MATH 326         ECE 321         2nd Semester         CS 332         MATH 340	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission Microprocessor Laboratory Discrete Analysis for Computer Engineers Random Signals and Noise Term Credits Principles of Operating Systems Applied Numerical Methods	16 3 3 4 2 3 15 3 3 3 3 3 3 3 14
requirements/ger-200- 2nd Semester ECE 232 ECE 252 MATH 213 ECE 294 ECE 271 Third Year 1st Semester CS 280 ECE 395 MATH 326 ECE 321 2nd Semester CS 332 MATH 340 or MATH 337	tevel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission Microprocessor Laboratory Discrete Analysis for Computer Engineers Random Signals and Noise Term Credits Principles of Operating Systems Applied Numerical Methods or Linear Algebra	16 3 3 4 2 3 3 15 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
requirements/ger-200-         2nd Semester         ECE 232         ECE 252         MATH 213         ECE 294         ECE 271         Third Year         1st Semester         CS 280         ECE 395         MATH 326         ECE 321         2nd Semester         CS 332         MATH 340	Ievel/) Term Credits Circuits and Systems II Microprocessors Calculus III B Analog and Digital Circuits Laboratory Electronic Circuits I Term Credits Programming Language Concepts Signal Transmission Microprocessor Laboratory Discrete Analysis for Computer Engineers Random Signals and Noise Term Credits Principles of Operating Systems Applied Numerical Methods	16 3 3 4 2 3 15 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3

Select one of the fo	bllowing:	3
MGMT 390	Principles of Business	5
IE 492	Engineering Management	
ECON 201	Economics	
ECON 265	Microeconomics	
ECON 266	Macroeconomics	
	Term Credits	15
Fourth Year		
1st Semester		
ECE 414	Electrical and Computer Engineering Project I	1
ECE 495	Computer Engineering Design Lab	3
COE Track Elective	e l	3
COE Track Elective	e II	3
<b>Technical Elective</b>		3
History and Humar requirements/ger-3	nities GER 300+ level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education- 300-level/)	3
	Term Credits	16
2nd Semester		
ECE 416 or ECE 417	Electrical and Computer Engineering Project II or Electrical & Computer Engineering Project II	3
COE Track Labora	tory Elective	2
COE Track Elective	e III	3
Technical Elective		3
	cial Science Senior Seminar GER (http://catalog.njit.edu/undergraduate/academic-policies-procedures/ requirements/hss-capstone/)	3
	Term Credits	14
	Total Credits	120

#### **Computer Engineering Tracks**

The computer Engineering technical tracks are designed to provide in-depth study in a specialty area. Students at the fourth year of the curriculum must choose one of the available tracks. Courses are listed below. Students may take alternative courses but must see their academic advisor for approval.

Code	Title	Credits
Computer Engineering Tracks	- Select one of the following:	
1. Advanced Computer System	ns Track	
ECE 451	Advanced Computer Architecture	
ECE 452	High Performance Computer Architecture	
ECE 453	Introduction to Discrete Event Systems	
or IS 461	Systems Simulation	
ECE 459	Advanced Computer Systems Design Lab	
2. Computer Communications	Track	
ECE 421	Digital Data Communication	
ECE 422	Computer Communications Networks	
ECE 425	Wireless Communication Systems	
ECE 429	Computer Communications Lab	

## **Computer Engineering Technical Electives - 3 courses**

The ECE Elective must be a 300 or 400 level ECE course or an advisor approved upper level engineering, science or mathematics course. Elective courses cannot cover the same material as other courses taken by the student. For example, a CS course covering the same material as an ECE course taken by the student cannot count as a technical elective. Courses from the Engineering Technology Department are generally not approved as ECE electives.

Co-op courses bearing degree credit replace a technical elective or another course approved by the faculty advisor in the student's major department. In Computer Engineering, ECE 310 Co-op Work Experience I is taken for zero credits, and ECE 410 Co-op Work Experience II is taken for 3 degree credits, upon acceptance by the faculty co-op advisor of an approved proposal.

## CoOp Option A Track

(145 credits minimum)

1st Semester		Credits
CHEM 125	General Chemistry I	eroun
FED 101	Fundamentals of Engineering Design	
ENGL 101	English Composition: Introduction to Academic Writing	
MATH 111	Calculus I	4
PHYS 111	Physics I	;
PHYS 111A	Physics I Lab	
FYS SEM	First-Year Student Seminar	(
	Term Credits	10
2nd Semester		
CS 115	Introduction to Computer Science I in C++	3
MATH 112	Calculus II	2
PHYS 122	Electricity & Magntsm ECE Appl	3
PHYS 121A	Physics II Lab	
ECE 101	Introduction to Electrical and Computer Engineering	(
ENGL 102	English Composition: Introduction to Writing for Research	
	Term Credits	14
Second Year		-
1st Semester		
CS 116	Introduction to Computer Science II in C++.	
ECE 231	Circuits and Systems I	3
ECE 251	Digital Design	3
MATH 222	Differential Equations	2
	nities GER 200 level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-	
requirements/ger-2		,
	Term Credits	16
	Term Credits	16
2nd Semester		
2nd Semester ECE 232	Circuits and Systems II	3
<b>2nd Semester</b> ECE 232 ECE 252	Circuits and Systems II Microprocessors	3
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271	Circuits and Systems II Microprocessors Electronic Circuits I	3
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B	3 3 2
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213 ECE 294	<ul> <li>Circuits and Systems II</li> <li>Microprocessors</li> <li>Electronic Circuits I</li> <li>Calculus III B</li> <li>Analog and Digital Circuits Laboratory</li> </ul>	3 3 3
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213 ECE 294	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I	
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213 ECE 294 ENGR 211	<ul> <li>Circuits and Systems II</li> <li>Microprocessors</li> <li>Electronic Circuits I</li> <li>Calculus III B</li> <li>Analog and Digital Circuits Laboratory</li> </ul>	
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213 ECE 294 ENGR 211 <b>Summer</b>	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I	
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213 ECE 294 ENGR 211 <b>Summer</b>	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I Term Credits	3 3 2 2 1 1 1
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213 ECE 294 ENGR 211 <b>Summer</b> CO-OP I	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I	
<b>2nd Semester</b> ECE 232 ECE 252 ECE 271 MATH 213 ECE 294 ENGR 211 <b>Summer</b> CO-OP I <b>Third Year</b>	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I Term Credits	3 3 2 2 1 1 1
2nd Semester ECE 232 ECE 252 ECE 271 MATH 213 ECE 294 ENGR 211 Summer CO-OP I Third Year 1st Semester	<ul> <li>Circuits and Systems II</li> <li>Microprocessors</li> <li>Electronic Circuits I</li> <li>Calculus III B</li> <li>Analog and Digital Circuits Laboratory</li> <li>Professional Skills for Engineers I</li> <li>Term Credits</li> </ul>	3 3 2 1 1 0 (
2nd Semester ECE 232 ECE 252 ECE 271 MATH 213 ECE 294 ENGR 211 Summer CO-OP I Third Year 1st Semester	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I Term Credits Co-op Work Experience I	3 3 2 2 1 1 0 1 1 1 1
2nd Semester           ECE 232           ECE 252           ECE 271           MATH 213           ECE 294           ENGR 211           Summer           CO-OP I           Third Year           1st Semester           ENGR 310	<ul> <li>Circuits and Systems II</li> <li>Microprocessors</li> <li>Electronic Circuits I</li> <li>Calculus III B</li> <li>Analog and Digital Circuits Laboratory</li> <li>Professional Skills for Engineers I</li> <li>Term Credits</li> </ul>	3 3 2 2 1 1 0 1 1 1 1
2nd Semester           ECE 232           ECE 252           ECE 271           MATH 213           ECE 294           ENGR 211           Summer           CO-OP I           Third Year           1st Semester           ENGR 310           2nd Semester	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I Term Credits Co-op Work Experience I Term Credits	3 3 2 2 1 1 1 1 1 2 1 2 1 2 1 2 1 2 1 2
2nd Semester           ECE 232           ECE 252           ECE 271           MATH 213           ECE 294           ENGR 211           Summer           CO-OP I           Third Year           1st Semester           ENGR 310	Circuits and Systems II Microprocessors Electronic Circuits I Calculus III B Analog and Digital Circuits Laboratory Professional Skills for Engineers I Term Credits Co-op Work Experience I	3 3 2 2 1 1 0 1 1 1 1

MATH 326	Discrete Analysis for Computer Engineers	3
ECE 321	Random Signals and Noise	3
	Term Credits	14
Summer		
CO-OP II		
	Term Credits	0
Fourth Year		
1st Semester		
ENGR 410	Co-op Work Experience II	12
	Term Credits	12
2nd Semester		
CS 332	Principles of Operating Systems	3
MATH 340	Applied Numerical Methods	3
or MATH 337	or Linear Algebra	
ECE 353	Computer Organization and Architecture	3
PHIL 334	Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering	3
Select one of the	ollowing:	3
MGMT 390	Principles of Business	
IE 492	Engineering Management	
ECON 201	Economics	
ECON 265	Microeconomics	
ECON 266	Macroeconomics	
	Term Credits	15
Fifth Year		
1st Semester		
ECE 414	Electrical and Computer Engineering Project I	1
ECE 495	Computer Engineering Design Lab	3
COE Track Electiv	re I	3
COE Track Electiv	re II	3
Technical Elective		3
History and Huma requirements/ger-	nities GER 300+ level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education- 300-level/)	3
	Term Credits	16
2nd Semester		
ECE 416	Electrical and Computer Engineering Project II	3
or ECE 417	or Electrical & Computer Engineering Project II	
COE Track Labora	atory Elective	2
COE Track Electiv	re III	3
Technical Elective		3
Humanities and S	ocial Science Senior Seminar GER (http://catalog.njit.edu/undergraduate/academic-policies-procedures/	3
general-education	-requirements/hss-capstone/)	
	Term Credits	14
	Total Credits	145

## **Computer Engineering Tracks**

The computer Engineering technical tracks are designed to provide in-depth study in a specialty area. Students at the fourth year of the curriculum must choose one of the available tracks. Courses are listed below. Students may take alternative courses but must see their academic advisor for approval.

Code	Title	Credits
Computer Engineering	Tracks - Select one of the following:	
1. Advanced Computer	Systems Track	
ECE 451	Advanced Computer Architecture	
ECE 452	High Performance Computer Architecture	

ECE 453	Introduction to Discrete Event Systems
or IS 461	Systems Simulation
ECE 459	Advanced Computer Systems Design Lab
2. Computer Communications Track	
ECE 421	Digital Data Communication
ECE 422	Computer Communications Networks
ECE 425	Wireless Communication Systems
ECE 429	Computer Communications Lab

## **Computer Engineering Technical Electives - 3 courses**

The ECE Elective must be a 300 or 400 level ECE course or an advisor approved upper level engineering, science or mathematics course. Elective courses cannot cover the same material as other courses taken by the student. For example, a CS course covering the same material as an ECE course taken by the student cannot count as a technical elective. Courses from the Engineering Technology Department are generally not approved as ECE electives.

## **CoOp Option B Track**

(145 credits minimum)

First Year		
1st Semester		Credits
CHEM 125	General Chemistry I	3
FED 101	Fundamentals of Engineering Design	2
ENGL 101	English Composition: Introduction to Academic Writing	3
MATH 111	Calculus I	4
PHYS 111	Physics I	3
PHYS 111A	Physics I Lab	1
FYS SEM	First-Year Student Seminar	0
	Term Credits	16
2nd Semester		
CS 115	Introduction to Computer Science I in C++	3
MATH 112	Calculus II	4
PHYS 122	Electricity & Magntsm ECE Appl	3
PHYS 121A	Physics II Lab	1
ECE 101	Introduction to Electrical and Computer Engineering	0
ENGL 102	English Composition: Introduction to Writing for Research	3
	Term Credits	14
Second Year		
1st Semester		
CS 116	Introduction to Computer Science II in C++.	3
ECE 231	Circuits and Systems I	3
ECE 251	Digital Design	3
MATH 222	Differential Equations	4
History and Huma requirements/ger-2	nities GER 200 level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education- 200-level/)	3
	Term Credits	16
2nd Semester		
ECE 232	Circuits and Systems II	3
ECE 252	Microprocessors	3
ECE 271	Electronic Circuits I	3
MATH 213	Calculus III B	4
ECE 294	Analog and Digital Circuits Laboratory	2
	Term Credits	15

Third Year		
1st Semester		
CS 280	Programming Language Concepts	3
ECE 368	Signal Transmission	3
ECE 395	Microprocessor Laboratory	2
MATH 326	Discrete Analysis for Computer Engineers	3
ECE 321	Random Signals and Noise	3
ENGR 211	Professional Skills for Engineers I	1
	Term Credits	15
2nd Semester		
ENGR 310	Co-op Work Experience I	12
	Term Credits	12
Summer		
CO-OP I		
	Term Credits	0
Fourth Year		
1st Semester		
CS 332	Principles of Operating Systems	3
MATH 340	Applied Numerical Methods	3
ECE 353	Computer Organization and Architecture	3
PHIL 334	Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering	3
Select one of the fo	ollowing:	3
MGMT 390	Principles of Business	
IE 492	Engineering Management	
ECON 201	Economics	
ECON 265	Microeconomics	
ECON 266	Macroeconomics	
	Term Credits	15
2nd Semester		
ENGR 410	Co-op Work Experience II	12
	Term Credits	12
Summer		
CO-OP II		
	Term Credits	0

1

3

3

3

3

3

16

## and C

Fifth Year **1st Semester** 

ECE 414

ECE 495

COE Track Elective I

COE Track Elective II

requirements/ger-300-level/)

**Technical Elective** 

2nd \$	Semester		
ECE or		trical and Computer Engineering Project II r Electrical & Computer Engineering Project II	3
COE	Track Laboratory Elec	ctive	2
COE	Track Elective III		3
Tech	nical Elective		3

History and Humanities GER 300+ level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-

Electrical and Computer Engineering Project I

Computer Engineering Design Lab

**Term Credits** 

Humanities and Social Science Senior Seminar GER (http://catalog.njit.edu/undergraduate/academic-policies-procedures/	
general-education-requirements/hss-capstone/)	
Term Credits	14
Total Credits	145

### **Computer Engineering Tracks**

The computer Engineering technical tracks are designed to provide in-depth study in a specialty area. Students at the fourth year of the curriculum must choose one of the available tracks. Courses are listed below. Students may take alternative courses but must see their academic advisor for approval.

Code	Title	Credits
Computer Engineering Tracks - Sele	ect one of the following:	
1. Advanced Computer Systems Tra	ack	
ECE 451	Advanced Computer Architecture	
ECE 452	High Performance Computer Architecture	
ECE 453	Introduction to Discrete Event Systems	
or IS 461	Systems Simulation	
ECE 459	Advanced Computer Systems Design Lab	
2. Computer Communications Track		
ECE 421	Digital Data Communication	
ECE 422	Computer Communications Networks	
ECE 425	Wireless Communication Systems	
ECE 429	Computer Communications Lab	

#### Computer Engineering Technical Electives - 3 courses

The ECE Elective must be a 300 or 400 level ECE course or an advisor approved upper level engineering, science or mathematics course. Elective courses cannot cover the same material as other courses taken by the student. For example, a CS course covering the same material as an ECE course taken by the student cannot count as a technical elective. Courses from the Engineering Technology Department are generally not approved as ECE electives.

Refer to the General Education Requirements (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/) section of this catalog for further information on electives.

This curriculum represents the maximum number of credits per semester for which a student is advised to register. A full-time credit load is 12 credits. First-year students are placed in a curriculum that positions them for success which may result in additional time needed to complete curriculum requirements. Continuing students should consult with their academic advisor to determine the appropriate credit load.