

Sample Program of Study for ECE Majors

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 31L, Core Concepts in Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. MATH 107, Linear Algebra & Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. BIOLOGY 25L, Principles of Biology <i>or</i> BIOLOGY 147, Systems Biology
5. Free Elective	5. SS-H 2
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE 53L, Electromagnetic Fields	1. ECE Elective
2. ECE Concentration Elective (1)*	2. ECE Concentration Elective (2)*
3. MATH 108, Ordinary & Partial Differential Equations	3. STA 113, Probability & Statistics <i>or</i> MATH 135, Probability <i>or</i> ECE 255, Probability for ECEs *
4. SS-H 3	4. SS-H 4
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)*	1. ECE Concentration Elective (4)*
2. ECE Elective <i>or</i> Approved ECE Design Elective*	2. Approved ECE Design Elective <i>or</i> ECE Elective*
3. SS-H 5	3. Free Elective
4. Free Elective	4. Free Elective

* See NOTES for explanations

NOTES:

- WRITING 20: University Writing Program, required in first year.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- CHEM 21L: AP credit CHEM 19 is also acceptable. Students who have successfully completed CHEM 21L need not take CHEM 31L.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have IPCs for GCE A-level physics take PHYSICS 63L or 143.
- STA 113 *is recommended* but students may substitute MATH 135 or ECE 255. If ECE 255 is elected, it may not simultaneously also count as an ECE Concentration Elective, ECE Elective, or Approved Design Elective.
- ECE Concentration Electives: Four courses selected from the set approved for the ECE program. Courses must be selected from at least two Areas of Concentration, and at least two courses must be from the same Area.
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which latter may be taken as a Free Elective.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Senior year (or in Junior year if the student has *senior status*). Currently ECE 123, 135, 154, 164, 251, and 261 are approved. The same course may not be used as a required Concentration Elective, a required ECE Elective, or a required Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

Sample Electrical & Computer Engineering (ECE) and Biomedical Engineering (BME) Dual Major for Classes 2010 & 2011
[with AP credit for MATH 31 and one SS-H Course]

FIRST YEAR	
Fall Semester	Spring Semester
1. CHEM 21L General Chemistry	1. CHEM 22L General Chemistry
2. MATH 32 Calculus II	2. PHYSICS 61L Mechanics
3. EGR 53L Computational Methods in Engineering	3. MATH 103 Intermediate Calculus
4. WRITING 20/SS-H 1	4. SS-H 1/WRITING 20
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. PHYSICS 62L Electricity, Magnetism & Optics	1. ECE 51L Microelectronic Devices & Circuits
2. ECE 27L Fundamentals of ECE	2. ECE 54L Signals & Systems*
3. MATH 107 Linear Algebra & Differential Equations	3. MATH 108 Ordinary & Partial Differential Equations
4. COMPSCI 100E Program Design & Analysis II	4. BME 110L Biomechanics <i>or</i> EGR 75 Mechanics of Solids
5. SS-H 2	5. SS-H 3
JUNIOR YEAR	
Fall Semester	Spring Semester
1. BME 83L Biomaterials <i>or</i> ME 83L Structure & Properties Solids*	1. ECE 53L Electromagnetic Fields
2. ECE 52L Digital Systems	2. BME 154L Biomedical Electronic Measurements II
3. STA 113 Probability & Statistics	3. ECE Concentration Elective (1)*
4. BIOLOGY 25L Principles of Biology*	4. BME 100L Modeling Cellular & Molecular Systems
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (2)*	1. ECE Elective*
2. One of the BME Design Courses {236, 261, <i>or</i> 264L} <i>or</i> BME Elective*	2. BME Elective* <i>or</i> one of the BME Design Courses {236, 261, <i>or</i> 264L}
3. SS-H 4	3. BME Elective*
4. BME 101L Electrobiolgy	4. Life Science Elective*

* See NOTES for explanation.

NOTES:

- Chemistry: All BME majors are required to take two chemistry courses. Students who receive and accept AP credit (CHEM 19) for chemistry must take a second course, typically CHEM 22L or CHEM 23L, and, if planning to attend medical school, the two courses CHEM 151L and CHEM 152L, these latter usually in sophomore or junior year.
- WRITING 20: University Writing Program, required in the first year.

- SS-H (Social Sciences and Humanities): Five SS-H semester-course electives, appropriately distributed, are required. The illustrated sample program assumes that one of the required SS-H courses is covered by an AP credit.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have IPCs for GCE A-level physics take PHYSICS 63L or 143.
- BIOLOGY 25L: Students may **not** substitute BIOLOGY 147 for BIOLOGY 25L in this dual major.
- ECE 54L: Students who successfully completed BME 171 in Spring 2006 or earlier need not take ECE 54L.
- ME 83L: If ME 83L is elected, EGR 75 or BME 110 should be taken first (prerequisite).
- Life Science Elective: Semester course selected from approved list of Life Science Electives in the current edition of [BME Undergraduate Program Handbook](#).
- Pre-Med Students: Students planning to attend medical school should consult with the [Duke Office of Health Professions Advising](#) about course planning. Premeds will need to take CHEM 151 and 152, normally during sophomore or junior year. Fitting these courses into the schedule may require an overload or summer school.
- ECE Concentration Electives: Two courses from the same Concentration Area from the set of approved concentration courses for the ECE program. (The three required courses BME 100L, 100L and 154L together are considered to be two ECE Concentration Electives in a special biomedical ECE Concentration and a special ECE Elective course, a fact already reflected in the sample program. The total program meets all ECE Program Requirements.)
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which latter course may be taken as a general Elective.
- BME Elective: At least one BME Elective must be at the 200 level. The program must also include at least one of the BME-ECE Design Electives BME 236, 261, or 264L, here shown in either the Fall or Spring semester.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program. Independent Study and Undergraduate Research are encouraged for qualified students, and required for Graduation with Departmental Distinction, but may require overload or summer study to fit into the above dual-major program.

Sample Electrical & Computer Engineering (ECE) and Biomedical Engineering (BME) Dual Major for Classes 2012 and Later
[with AP credit for MATH 31 and one SS-H Course]

FIRST YEAR	
Fall Semester	Spring Semester
1. CHEM 21L General Chemistry <i>or</i> CHEM 31L Core Concepts in Chemistry	1. CHEM 22L General Chemistry <i>or</i> CHEM 32L Modern Applications of Chemical Principles <i>or</i> CHEM 151L Organic Chemistry
2. MATH 32 Calculus II	2. PHYSICS 61L Mechanics
3. EGR 53L Computational Methods in Engineering	3. MATH 103 Intermediate Calculus
4. WRITING 20/SS-H 1	4. SS-H 1/WRITING 20
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. PHYSICS 62L Electricity, Magnetism & Optics	1. ECE 51L Microelectronic Devices & Circuits
2. ECE 27L Fundamentals of ECE	2. ECE 54L Signals & Systems*
3. MATH 107 Linear Algebra & Differential Equations	3. MATH 108 Ordinary & Partial Differential Equations
4. COMPSCI 100E Program Design & Analysis II	4. BME 110L Biomechanics <i>or</i> EGR 75 Mechanics of Solids
5. BIOLOGY 25L Principles of Biology*	5. BME 100L Modeling Cellular & Molecular Systems
JUNIOR YEAR	
Fall Semester	Spring Semester
1. BME 83L Biomaterials <i>or</i> ME 83L Structure & Properties of Solids*	1 ECE Concentration Elective (1)*
2. ECE 52L Digital Systems	2. BME 154L Biomedical Electronic Measurements II
3. STA 113 Probability & Statistics	3. BME 201L Electrobiology <i>or</i> BME 233 Diagnostic Imaging Systems
4. ECE 53L Electromagnetic Fields	4. SS-H 3
5. SS-H 2	
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (2)*	1. ECE Elective*
2. One of BME {236, 261, <i>or</i> 264L} <i>or</i> BME General Elective*	2. BME General Elective* <i>or</i> one of BME {236, 261, <i>or</i> 264L}
3. BME Area Elective*	3. BME Elective*
4. SS-H 4	4. Physiology <i>or</i> Life Science Elective*

* See NOTES for explanation.

NOTES:

- Chemistry: All BME majors are required to take two chemistry courses. Students who receive and accept AP credit (CHEM 19) for chemistry must take a second course, typically CHEM 22L or CHEM 23L, and, if planning to attend medical school, the two courses CHEM 151L and CHEM 152L,

these latter usually in sophomore or junior year.

- WRITING 20: University Writing Program, required in the first year.
- SS-H (Social Sciences and Humanities): Five SS-H semester-course electives, appropriately distributed, are required. The illustrated sample program assumes that one of the required SS-H courses is covered by an AP credit.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have IPCs for GCE A-level physics take PHYSICS 63L or 143.
- BIOLOGY 25L: Students may **not** substitute BIOLOGY 147 for BIOLOGY 25L in this dual major.
- ECE 54L: Students who successfully completed BME 171 in Spring 2006 or earlier need not take ECE 54L.
- ME 83L: If ME 83L is elected, EGR 75 or BME 110 should be taken first (prerequisite).
- Life Science Elective: Semester course selected from approved list of Life Science Electives. See current edition of [BME Undergraduate Program Handbook](#).
- Pre-Med Students: Students planning to attend medical school should consult with the [Duke Office of Health Professions Advising](#) about course planning. Premeds will need to take CHEM 151 and 152, normally during sophomore or junior year. Fitting these courses into the schedule may require an overload or summer school.
- ECE Concentration Electives: Two courses from the same Concentration Area from the set of approved concentration courses for the ECE program. (The three required courses BME 100L, 100L and 154L together are considered to be two ECE Concentration Electives in a special biomedical ECE Concentration and a special ECE Elective course, a fact already reflected in the sample program. The illustrated sample program meets all ECE Program Requirements.)
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which latter course may be taken as a general Elective.
- BME Elective: At least one BME Elective must be at the 200 level. The program must also include at least one of the BME-ECE Design Electives BME 236, 261, or 264L, here shown in either the Fall or Spring semester.
- Physiology or Life Science Elective: If BME 233 is elected (in Junior year program), choose from the approved list of Physiology Electives; if BME 201L is elected, choose from the approved list of Life Science Electives. See the approved lists in the current edition of [BME Undergraduate Program Handbook](#).
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program. Independent Study and Undergraduate Research are encouraged for qualified students, and required for Graduation with Departmental Distinction, but may require overload or summer study to fit into the above dual-major program.

**Sample Electrical and Computer Engineering (ECE)
and Computer Science (COMPSCI) Dual Major**
(Program with one-course AP Math Credit)

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 21L, General Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 32, Calculus II	3. MATH 103, Intermediate Calculus
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 107, Linear Algebra & Differential Equations	3. MATH 108, Ordinary & Partial Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. ECE 152, Computer Architectur
5. SS-H 2	
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE Digital-Systems Elective (see NOTES)	1. ECE 53L, Electromagnetic Fields
2. COMPSCI 110 (C-L: ECE 153), Operating Systems	2. COMPSCI Elective
3. STA 113, Probability & Statistics or MATH 135, Probability or ECE 255, Probability for ECEs (see NOTE)	3. COMPSCI 108, Software Design & Implementation
4. SS-H 3	4. SS-H 4
5. Free Elective	
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Elective or ECE/COMPSI Design Elective	1. ECE/COMPSCI Design Elective or ECE Elective
2. COMPSCI Elective	2. BIOLOGY 25L, Principles of Biology or BIOLOGY 147, Systems Biology
3. ECE Concentration Elective or ECE Elective	3. ECE Elective or ECE Concentration Elective
4. SS-H 5	4. Free Elective

NOTES:

- WRITING 20: University Writing Program, required in first year.
- CHEM 21L: AP credit CHEM 19 is also acceptable.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 51L & 52L take PHYSICS 143L.
- STA 113 is recommended but students may substitute MATH 135 or ECE 255.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- COMPSCI Elective: A total of five COMPSCI courses is required for the double major: COMPSCI 100E; COMPSCI 108; COMPSCI 110; one from among COMPSCI 130, 140 and 150; and any other elective course at or above the 100 level.
- ECE Concentration Elective: One course selected from the set approved for the ECE program is needed to complete the four-course ECE Concentration requirement and the additional ECE-COMPSCI dual major requirements. Three courses from Digital Systems are built into the illustrated program (ECE 152, 153 and the ECE Digital Systems Elective), so the ECE Concentration Elective must be from outside the Digital Systems area.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Junior or Senior year. Currently ECE 135, 154, 251, and 261 are approved for this dual major. The same course may not be used as a required Concentration Elective, a required ECE or COMSCI Elective, or a required Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE)
and Computer Science (COMPSCI) Dual Major**
(Program *without* any AP Math Credit)

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 21L, General Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. MATH 107, Linear Algebra & Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. ECE 152, Computer Architecture
5. SS-H 2	
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE Digital-Systems Elective (see NOTES)	1. ECE 53L, Electromagnetic Fields
2. COMPSCI 110 (C-L: ECE 153), Operating Systems	2. COMPSCI Elective
3. MATH 108, Ordinary & Partial Differential Equations	3. STA 113, Probability & Statistics or MATH 135, Probability or ECE 255, Probability for ECEs (see NOTE)
4. COMPSCI 108, Software Design & Implementation	4. SS-H 3
5. Free Elective	
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Elective or ECE/COMPSCI Design Elective	1. ECE/COMPSCI Design Elective or ECE Elective
2. COMPSCI Elective	2. BIOLOGY 25L, Principles of Biology or BIOLOGY 147, Systems Biology
3. ECE Concentration Elective or ECE Elective	3. ECE Elective or ECE Concentration Elective
4. SS-H 4	4. SS-H 5

NOTES:

- WRITING 20: University Writing Program, required in first year.
- CHEM 21L: AP credit CHEM 19 is also acceptable.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 51L & 52L take PHYSICS 143L.
- STA 113 is recommended but students may substitute MATH 135 or ECE 255.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- COMPSCI Elective: A total of five COMPSCI courses is required for the double major: COMPSCI 100E; COMPSCI 108; COMPSCI 110; one from among COMPSCI 130, 140 and 150; and any other elective course at or above the 100 level.
- ECE Concentration Elective: One course selected from the set approved for the ECE program is needed to complete the four-course ECE Concentration requirement and the additional ECE-COMPSCI dual major requirements. Three courses from Digital Systems are built into the illustrated program (ECE 152, 153 and the ECE Digital Systems Elective), so the ECE Concentration Elective must be from outside the Digital Systems area.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Junior or Senior year. Currently ECE 135, 154, 251, and 261 are approved for this dual major. The same course may not be used as a required Concentration Elective, a required ECE or COMSCI Elective, or a required Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE) Program
with an Economics (ECON) Dual Major**

(Program with one AP Math Credit and two AP SS-H Credits)

FIRST YEAR	
Fall Semester	Spring Semester
1. ECON 51D (Economic Principles)	1. WRITING 20
2. CHEM 21L, General Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 32, Calculus II	3. MATH 103, Intermediate Calculus
4. EGR 53L, Computational Methods in Engineering	4. ECON 55D, Intermediate Economics I
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. ECE 27L, Fundamentals of ECE	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. PHYSICS 62L, Electricity, Magnetism & Optics	3. BIOLOGY 25L, Principles of Biology or BIOLOGY 147, Systems Biology
4. MATH 107, Linear Algebra & Differential Equations	4. MATH 108, Ordinary & Partial Differential Equations
5. ECON 105D, Intermediate Economics II	5. ECON 110D, Intermediate Economics III
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE 53L, Electromagnetic Fields	1. ECE Elective
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. COMPSCI 100E, Program Design & Analysis II	3. STA 113, Probability & Statistics or MATH 135, Probability or ECE 255, Probability for ECEs (see NOTE)
4. ECON Elective (see NOTES)	4. ECON Elective (see NOTES)
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective or Approved ECE Design Elective	2. Approved ECE Design Elective or ECE Elective
3. ECON 139D, Intro to Econometrics	3. ECON Elective (see NOTES)
4. ECON Elective (see NOTES)	4. ECON Elective (see NOTES)
5. SS-H	

NOTES:

- Departmental Requirements for an Economics Major (BS level): Ten courses in Economics, which must include the core courses ECON 51D, 55D, 105D, 110D and 139D. The remaining courses must be at the 100-level or above, excluding ECON 151, 182, 183 and 888. These requirements are reflected in the above sample program. It is suggested that students wishing to pursue a second major in Economics discuss their specific program with the Director of Undergraduate Studies (DUS) in Economics and with their ECE faculty adviser.
- This sample program does not include any Free Electives (any Duke course counting toward the BSE degree beyond those courses required for the dual major). Free electives and increased flexibility for Study Abroad, for example, could result from additional AP credit in mathematics (for MATH 32, Calculus II), from AP credit for the SS-H course shown (see the SS-H Note below), from additional program overload (5 or more courses in a semester), or from summer courses. Overload is not recommended for the First Year.
- SS-H: Social Sciences & Humanities electives: Because at least two of the five ECON courses are in the Social Sciences (SS) area of knowledge, two of the three remaining required SS-H courses must be distributed among at least two of the three knowledge areas Arts, Literatures, and Performance (ALP); Civilizations (CZ); and Foreign Languages (FL). If appropriate for a student's goals, one or two of those three courses could be ECON courses chosen from the set belong to both SS and CZ areas -- for example, ECON 132, 136, 138, 140 & 150 -- and counted as CZ courses. By a combination of ECON courses in the CZ area and two suitable AP SS-H credits only one explicit SS-H course must be taken. This appears in the sample program as SS-H. If there are AP credits in the ALP area, even this SS-H course might not be required, in which case a Free Elective could be elected or the course load in one of the 5-course semesters reduced. It is strongly recommended that students discuss their selection of upper-level ECON courses with the DUS in Economics and the SS-H requirements with their ECE Faculty Adviser or the ECE DUS.
- WRITING 20: University Writing Program, required in first year.
- CHEM 21L: AP credit CHEM 19 is also acceptable.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 51L & 52L take PHYSICS 143L.
- STA 113 is recommended but students may substitute MATH 135 or ECE 255.
- ECE Concentration Electives: Four courses selected from the set approved for the ECE program. Courses must be selected from at least two areas, and at least two courses must be from the same area.
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which latter course may be taken as as a general Elective.
- ECON Elective: Any ECON course at the 100 level or above, excluding ECON 151, 182, 183, and 888.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Junior or Senior year. Currently ECE 123, 135, 154, 164, 251 and 261 are approved. The same course may not be used as a Concentration Elective and count as a required Design Elective or ECE Elective
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE)
and Mathematics (MATH) Dual Major**
(Program *with* two-course AP Math Credit)

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 21L, General Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 104, Linear Algebra	3. MATH 105, Vector Calculus
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 131, Differential Equations	3. MATH 121, Modern Algebra <i>or</i> MATH 200, Algebraic Structures I
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. MATH 135, Probability
5. SS-H 2 <i>or</i> BIOLOGY 25L Principles of Biology <i>or</i> BIOLOGY 147, Systems Biology	5. BIOLOGY 25L Principles of Biology <i>or</i> BIOLOGY 147, Systems Biology <i>or</i> SS-H 2
JUNIOR YEAR	
Fall Semester	Spring Semester
1. MATH 139, Advanced Calculus I <i>or</i> MATH 203, Basic Analysis I	1. ECE 53L, Electromagnetic Fields
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. MATH 133, Partial Differential Equations	3. MATH Elective (see NOTE)
4. SS-H 3	4. SS-H 4
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective <i>or</i> Approved ECE Design Elective	2. Approved ECE Design Elective <i>or</i> ECE Elective
3. MATH Elective (see NOTE)	3. MATH Elective (see NOTE)
4. SS-H 5	4. ECE Elective

NOTES:

- MATH Major: The illustrated program corresponds in its mathematics

courses to the BS-level mathematics major. Notice that students are assumed to have received AP credit for both MATH 31 and MATH 32, or alternatively that they are qualified to enter MATH 103 or MATH 105 directly in their first year.

- WRITING 20: University Writing Program, required in first year.
- CHEM 21L: AP credit CHEM 19 is also acceptable.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 51L & 52L take PHYSICS 143L.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- MATH Electives: Three courses selected from MATH 128, 132S, 136, 160S, 181, 201, 204, 205, 206, 215 or 216. If MATH 200 or 203 is elected in the above program, consider MATH 201 and 204 as electives.
- ECE Concentration Elective: Four courses selected from the set approved for the ECE program. Selections must span at least two Concentration Areas with at least two courses in one area.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Junior or Senior year. Currently ECE 123, 135, 154, 164, 251, and 261 are approved. The same course may not be used as a required Concentration Elective, a required ECE Elective, or a required ECE Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE) and
Mechanical Engineering (ME) Dual Program**
[with Advanced Math Placement and One SS-H Credit]

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 2	1. SS-H 2/WRITING 20
2. MATH 32, Calculus II	2. MATH 103, Intermediate Calculus
3. CHEM 21L, General Chemistry	3. PHYSICS 61L, Mechanics
4. EGR 53L, Comp Methods in Engineering	4. EGR 20, Engineering Innovation
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. ECE 27L, Fundamentals of ECE	1. ECE 51L, Microelectronic Devices & Circuits
2. MATH 107, Linear Algebra & Differential Equations	2. MATH 108, Ordinary & Partial Differential Equations
3. PHYSICS 62L, Electricity, Magnetism & Optics	3. ME 83L, Structure & Properties of Solids
4. EGR 75L, Mechanics of Solids	4. EGR 123L, Dynamics
5. COMPSCI 100E, Program Design & Analysis II	5. EGR 119, Electrical Fundamentals of Mechatronics
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE 52L, Digital Systems	1. ECE 53L, Electromagnetic Fields
2. ECE 54L, Signals & Systems	2. ME 131, Analysis for Design
3. ECE 142, Robotics & Automation	3. ME 125L, Control of Dynamic Systems
4. ECE 255, Probability & Statistics for Engineers	4. ME 126L, Fluid Mechanics
5. ME 101L, Thermodynamics	
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective	1. ME 160L, Mechanical System Design
2. ME 150L, Heat Transfer	2. BIOLOGY 25L, Principles of Biology or BIOLOGY 147, Systems Biology
3. ME 141L, Mechanical Design	3. ME Technical Elective
4. Approved Design Elective	4. SS-H 4
5. SS-H 3	5. SS-H 5

NOTES:

- WRITING 20: University Writing Program, required in first year.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- PHYSICS 61L & 62L: PHYSICS 51L & 52L are acceptable substitutes for PHYSICS 61L & 62L, respectively.
- ECE Concentration Elective: One course selected from the set approved for the ECE program.
- Approved Design Electives: Any one of the Approved ECE Design Electives. (Currently ECE 123, 135, 154, 164, 251 and 261 are approved.)
- ME Technical Elective: Any ME course at 100 level or higher.

**Sample Electrical and Computer Engineering (ECE)
and Physics (PHYSICS) Dual Major**
(Program with one AP Math Credit and one SS-H AP Credit)

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 21L, General Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 32, Calculus II	3. MATH 103, Intermediate Calculus
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 107, Linear Algebra & Differential Equations	3. MATH 108, Ordinary & Partial Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. PHYSICS 181, Intermediate Mechanics
5. SS-H 2	
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE 53L, Electromagnetic Fields	1. STA 113, Probability & Statistics, <i>or</i> MATH 135, Probability, <i>or</i> ECE 255, Probability for ECEs (see NOTE)
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. PHYSICS 143L, Optics & Modern Physics	3. PHYSICS Elective
4. PHYSICS 182, Electricity & Magnetism	4. BIOLOGY 25L, Principles of Biology, <i>or</i> BIOLOGY 147, Systems Biology
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective <i>or</i> Approved ECE Design Elective	2. Approved ECE Design Elective <i>or</i> ECE Elective
3. SS-H 4	3. ECE 176, Thermal Physics
4. PHYSICS 211, Quantum Mechanics I	4. PHYSICS 212, Quantum Mechanics II
5. PHYSICS 217, Advanced Physics Laboratory	

NOTES:

- Advanced Placement Assumptions: This program assumes AP credit for MATH 31 and for one Social Sciences – Humanities (SS-H) courses, in order to have no more than three 5-course semesters. Other combinations of AP credit are possible with two (vs. one) AP credits in mathematics (for MATH 31 & 32), more than one SS-H AP credit, and/or AP credit in chemistry (CHEM 19 for CHEM 21). For appropriate adjustments in schedule please consult with your faculty advisor.
- WRITING 20: University Writing Program, required in first year.
- CHEM 21L: AP credit CHEM 19 is also acceptable.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 61L & 62L take PHYSICS 143L and consult with the PHYSICS DUS about a substitute for PHYSICS 143L in the Junior-year Fall schedule above.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- STA 113: STA 113 *is recommended* but students may substitute MATH 135 or ECE 255.
- ECE Concentration Elective: Four courses selected from the set approved for the ECE program. Selections must span at least two Concentration Areas with at least two courses in one area.
- PHYSICS Elective: Any PHYSICS course at the 100 level or above except PHYSICS 171L, which is covered in the required courses ECE 27L and ECE 51L, and PHYSICS 230, which for the PHYSICS major is considered to be a mathematics course.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Senior year (or in Junior year for students with *senior status*). Currently ECE 123, 135, 154, 164, 251, and 261 are approved. The same course may not be used as a required Concentration Elective, a required ECE Elective, or a required ECE Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE)
Program for PreMed Students**

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 31L, Core Concepts in Chemistry	2. CHEM 32L, Modern Applications of Chemical Principles
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Comp Methods in Engineering	4. PHYSICS 61L, Mechanics
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. CHEM 151L, Organic Chemistry	1. CHEM 152L, Organic Chemistry
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. MATH 107, Linear Algebra & Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. BIOLOGY 25L, Principles of Biology
5. ECE 27L, Fundamentals of ECE	5. SS-H 2
JUNIOR YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits or ECE 53L, Electromagnetic Fields
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. MATH 108, Ordinary & Partial Differential Equations	3. STA 113, Probability & Statistics or MATH 135, Probability or ECE 255, Probability for ECEs (see NOTE)
4. SS-H 3	4. SS-H 4
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective or Approved ECE Design Elective	2. Approved ECE Design Elective or ECE Elective
3. ECE 53L, Electromagnetic Fields or ECE 51L, Microelectronic Devices & Circuits	3. SS-H 5
4. BIOLOGY Lab Elective (see Pre-Med Requirements NOTE)	4. ECE Elective

NOTES:

- Pre-Med Requirements: Students planning to attend medical school should schedule an appointment with Dean Scheiner at the [Office of Health Professions Advising](#). The premed program requires two courses in general chemistry (CHEM 31L & CHEM 32L), two semesters of organic chemistry (CHEM 151L & 152L taken in sophomore or junior year), BIOLOGY 25L and a second laboratory course in biology, and an ENGLISH or LIT course. AP credit CHEM 19 is acceptable for CHEM 31L. (Students who have previously completed CHEM 21L and 22L need not take CHEM 31L and 32L.)
- WRITING 20: University Writing Program, required in first year.
- SS-H: Social Sciences & Humanities, 5 required semester-course electives, appropriately distributed.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 51L & 52L take PHYSICS 143L.
- ECE 51L and 53L: The Faculty Advisor can provide guidance as to which ordering best matches topic interests for later ECE Elective courses.
- STA 113 is recommended but students may substitute MATH 135 or ECE 255.
- ECE Concentration Electives: Four courses selected from the set approved for the ECE program. Courses must be selected from at least two areas, and at least two courses must be from the same area.
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which latter course may be taken as a general Elective.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Junior or Senior year. Currently ECE 123, 135, 154, 164, 251 and 261 are approved. The same course may not be used as a Concentration Elective and count as a required Design Elective or ECE Elective
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE) Program
with a Biology Minor**

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 31L, Core Concepts in Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. MATH 107, Linear Algebra & Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. BIOLOGY 26L, Organismal Diversity, or BIOLOGY Elective (see NOTE)
5. BIOLOGY 25L, Principles of Biology	
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE 53L, Electromagnetic Fields	1. ECE Elective
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. MATH 108, Ordinary & Partial Differential Equations	3. STA 113, Probability & Statistics or MATH 135, Probability or ECE 255, Probability for ECEs (see NOTE)
4. BIOLOGY Elective (see NOTE)	4. SS-H 3
5. SS-H 2	
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective or Approved ECE Design Elective	2. Approved ECE Design Elective or ECE Elective
3. BIOLOGY Elective (see NOTE)	3. BIOLOGY Elective (see NOTE)
4. SS-H 4	4. SS-H 5

NOTES:

- Departmental Requirements for a BIOLOGY minor: Five courses in Biology, which may include Biology 25L or the equivalent and/or BIOLOGY 26L (A or B), but not including advanced placement credit (BIOLOGY 19). The five courses may include any biology course

numbered 100 or above. Of these, a minimum of 3 courses must be at the 100 level or above in BIOLOGY. A maximum of one course from approved courses in the basic science departments of the School of Medicine or from approved courses of a basic biological character in related departments. A maximum of one independent study or tutorial course may be counted toward the five courses. These requirements are reflected in the above sample program. It is strongly recommended that students discuss their BIOLOGY course selections with the Director of Undergraduate Studies (DUS) in BIOLOGY.

- WRITING 20: University Writing Program, required in first year.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- CHEM 31L: AP credit CHEM 19 is also acceptable. Students who have successfully completed CHEM 21L need not take CHEM 31L.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 61L & 62L take PHYSICS 143L.
- STA 113 *is recommended* but students may substitute MATH 135 or ECE 255. If ECE 255 is elected, it may not simultaneously also count as an ECE Concentration Elective, ECE Elective, or Approved Design Elective.
- BIOLOGY Elective: Any BIOLOGY course at the 100-level or above to meet Departmental Requirements for the BIOLOGY minor. One, and only one, of these courses may be from the approved list of biology courses outside of the BIOLOGY department. It is strongly recommended that students discuss their BIOLOGY course selections with the Directory of Undergraduate Studies (DUS) in BIOLOGY.
- ECE Concentration Electives: Four courses selected from the set approved for the ECE program. Courses must be selected from at least two Concentration Areas, and at least two courses must be from the same Area.
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which latter may be taken as a Free Elective.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Senior year (or in Junior year if the student has *senior status*). Currently ECE 123, 135, 154, 164, 251, and 261 are approved. The same course may not be used as a required Concentration Elective, a required ECE Elective, or a required Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program. Up to one course may be in biology (see above NOTES).

**Sample Electrical and Computer Engineering (ECE) Program
with an Economics (ECON) Minor**

FIRST YEAR	
Fall Semester	Spring Semester
1. ECON 51D (Economic Principles) / WRITING 20	1. WRITING 20/ECON 51D (Economic Principles)
2. CHEM 21L, General Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Comp Methods in Engineering	4. ECE 27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. STA 113, Probability & Statistics
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. ECON 55D, Intermediate Economics I
5. SS-H 1	
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE Elective	1. ECE 53L, Electromagnetic Fields
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. MATH 107, Linear Algebra & Differential Equations	3. MATH 108, Ordinary & Partial Differential Equations
4. ECON Elective (see NOTES)	4. BIOLOGY 25L, Principles of Biology or BIOLOGY 147, Systems Biology
5. SS-H 2	
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective or Approved ECE Design Elective	2. Approved ECE Design Elective or ECE Elective
3. ECON Elective (see NOTES)	3. ECON Elective (see NOTES)
4. SS-H 3	4. Free Elective

NOTES:

- Departmental Requirements for an Economics Minor: Five courses in Economics, which must include ECON 51D, 55D and three courses at the 100-level or above, excluding ECON 182 and 183. Students who receive AP credit for ECON 51D must take one additional economics course, excluding ECON 2, 2A, 91 and 92. These requirements are reflected in the above sample program. It is suggested that students wishing to pursue a minor in Economics discuss their specific program with the Director of Undergraduate Studies (DUS) in Economics and with their ECE faculty adviser.
- This sample program shows one Free Elective (any Duke course counting toward the BSE degree). Additional free electives could result from AP credits or program overload (5 or more courses in a semester). Overload is not recommended for the First Year.
- SS-H: Social Sciences & Humanities electives: Because at least two of the five ECON courses are in the Social Sciences (SS) area of knowledge, two of the three remaining required SS-H courses must be distributed among at least two of the three knowledge areas Arts, Literatures, and Performance (ALP); Civilizations (CZ); and Foreign Languages (FL). If appropriate for a student's goals, one or two of those three courses could be ECON courses chosen from the set belong to both SS and CZ areas -- for example, ECON 132, 136, 138, 140 & 150 -- and counted as CZ courses. Up to two of the required SS-H courses could also be met by AP credits.
- Depending upon ECON course choices and AP credits, students might be able to replace one or all of the three SS-H courses shown in this sample program with Free Electives or to reduce the course load in the 5-course semesters. It is strongly recommended that students discuss their selection of upper-level ECON courses with the DUS in Economics.
- WRITING 20: University Writing Program, required in first year.
- CHEM 21L: AP credit CHEM 19 is also acceptable.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 61L & 62L take PHYSICS 143L.
- STA 113 is recommended but students may substitute MATH 135 or ECE 255.
- ECE Concentration Electives: Four courses selected from the set approved for the ECE program.
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which may be taken as as a free Elective.
- ECON Elective: Any ECON course at the 100 level or above, excluding ECON 182 and 183.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Junior or Senior year. Currently ECE 123, 135, 154, 164, 251 and 261 are approved. The same course may not be used as a Concentration Elective and count as a required Design Elective or ECE Elective
- Independent Study in ECE: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

Sample Focus Program for Electrical and Computer Engineering (ECE) Majors

The Focus program is an opportunity for first year and second year students to study topics in depth. For more information on the second year clusters, please visit the [Focus Program URL](#).

These sample programs below illustrate two possible courses of study for Focus participation in the fall semester of the freshman year depending upon the number and distribution of AP credits. Students with different AP credits may have different options.

Participation in spring semester of the freshman year or during the sophomore year are also options for some students. Interested students should discuss options with Dr. Huettel, Dr. Ybarra, or Ms. Simmons.

Matriculants with AP Credit in Math or Chemistry	
FIRST YEAR	
Fall Semester	Spring Semester
1. Focus Seminar 1	1. MATH 32, Calculus II
2. Focus Seminar 2	2. PHYSICS 61L, Mechanics
3. Focus 105 I	3. SS-H (see Note on next page)
4. WRITING 20 (see Note on next page)	4. EGR 53L, Comp Methods in Engineering
5. MATH 31 or CHEM 31L (see Note)	
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. ECE 27L, Fundamentals of ECE	<i>Follow sample program without AP Math Credit</i>
2. PHYSICS 62L, Electricity, Magnetism & Optics	
3. MATH 103, Intermediate Calculus	
4. ECE 52L, Digital Systems	
5. COMPSCI 100E, Program Design & Analysis II	

Matriculants with AP Credit in Math and Chemistry	
FIRST YEAR	
Fall Semester	Spring Semester
1. Focus Seminar 1	1. MATH 103, Intermediate Calculus
2. Focus Seminar 2	2. PHYSICS 61L, Mechanics
3. Focus 105 I	3. SS-H (see Note)
4. WRITING 20 (see Note)	4. EGR 53L, Comp Methods in Engineering
5. MATH 32, Calculus II	
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. ECE 27L, Fundamentals of ECE	<i>Follow sample program with AP Math Credit</i>
2. PHYSICS 62L, Electricity, Magnetism & Optics	
3. MATH 107, Linear Algebra & Differential Equations	
4. ECE 52L, Digital Systems	
5. COMPSCI 100E, Program Design & Analysis	

NOTES:

- WRITING 20: University Writing Program, required in first year.
- MATH 31, Calculus I, or CHEM 31L, Core Concepts in Chemistry, whichever is not already covered by AP credit.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 51L & 52L take PHYSICS 143L.
- SS-H: Social Sciences and Humanities: 5 required semester-course electives, appropriately distributed. Some Focus courses may count as SS-H courses; check with Dean Simmons to verify whether particular courses meet Engineering SS-H requirements.

**Sample Electrical and Computer Engineering (ECE) Program
with a Physics (PHYSICS) Minor**

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 21L, General Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. MATH 107, Linear Algebra & Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. PHYSICS 143L, Optics & Modern Physics
5. SS-H 2	5. BIOLOGY 25L, Principles of Biology, <i>or</i> BIOLOGY 147, Systems Biology
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE 53L, Electromagnetic Fields	1. STA 113, Probability & Statistics, <i>or</i> MATH 135, Probability, <i>or</i> ECE 255, Probability for ECEs (see NOTE)
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. MATH 108, Ordinary & Partial Differential Equations	3. PHYSICS Elective
4. SS-H 3	4. SS-H 4
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective <i>or</i> Approved ECE Design Elective	2. Approved ECE Design Elective <i>or</i> ECE Elective
3. SS-H 5	3. ECE Elective
4. Free Elective	4. Free Elective

NOTES:

- WRITING 20: University Writing Program, required in first year.
- CHEM 21L: AP credit CHEM 19 is also acceptable.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 61L & 62L take PHYSICS 143L and consult with the PHYSICS DUS about a substitute for PHYSICS 143L in the Junior-year Fall schedule above.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- STA 113: STA 113 *is recommended* but students may substitute MATH 135 or ECE 255.
- ECE Concentration Elective: Four courses selected from the set approved for the ECE program. Selections must span at least two Concentration Areas with at least two courses in one area.
- PHYSICS Elective: Any PHYSICS course at the 100 level or above except PHYSICS 171L, which is covered in the required courses ECE 27L and ECE 51L, and PHYSICS 230, which for the PHYSICS major is considered to be a mathematics course.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Senior year (or in Junior year for students with *senior status*). Currently ECE 123, 135, 154, 164, 251, and 261 are approved. The same course may not be used as a required Concentration Elective, a required ECE Elective, or a required ECE Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE) Program
with a Statistical Science Minor**

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 31L, Core Concepts in Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. STA 113, Probability & Statistics
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. BIOLOGY 25L, Principles of Biology <i>or</i> BIOLOGY 147, Systems Biology
JUNIOR YEAR	
Fall Semester	Spring Semester
1. ECE 53L, Electromagnetic Fields	1. ECE 53L, Electromagnetic Fields
2. ECE Concentration Elective (1)	2. ECE Concentration Elective (2)
3. MATH 107, Linear Algebra & Differential Equations	3. MATH 108, Ordinary & Partial Differential Equations
4. STA Elective	4. STA Elective
5. SS-H 2	5. SS-H 3
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (3)	1. ECE Concentration Elective (4)
2. ECE Elective <i>or</i> Approved ECE Design Elective	2. Approved ECE Design Elective <i>or</i> ECE Elective
3. STA Elective	3. STA Elective
4. SS-H 4	4. SS-H 5

NOTES:

- Departmental Requirements for a Minor in Statistical Science: Four courses in Statistical Science at the 100-level, beyond STA 113 (included in the sample program with placeholders “STA Elective”). It is suggested that students wishing to pursue a minor in Statistical Science discuss their specific program with the Director of Undergraduate Studies (DUS) in Statistical Science and with their ECE faculty advisor.
- WRITING 20: University Writing Program, required in first year.

- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- CHEM 31L: AP credit CHEM 19 is also acceptable. Students who have successfully completed CHEM 21L need not take CHEM 31L.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 61L & 62L take PHYSICS 143L.
- ECE Concentration Electives: Four courses selected from the set approved for the ECE program. Courses must be selected from at least two Concentration Areas, and at least two courses must be from the same Area.
- ECE Elective: Any ECE course at the 100 level or above except ECE 148L, which latter may be taken as a Free Elective.
- Approved Design Elective: Approved Electrical Engineering Design Elective, required in Senior year (or in Junior year if the student has *senior status*). Currently ECE 123, 135, 154, 164, 251, and 261 are approved. The same course may not be used as a required Concentration Elective, a required ECE Elective, or a required Design Elective.
- Independent Study: Accepted for up to two of the Elective ECE Courses and for any of the Free Electives, but not for any other required course in the ECE Program.

**Sample Electrical and Computer Engineering (ECE) Program
for a Junior Fall Semester at the Duke Marine Lab**

FIRST YEAR	
Fall Semester	Spring Semester
1. WRITING 20/SS-H 1	1. SS-H 1/WRITING 20
2. CHEM 31L, Core Concepts in Chemistry	2. PHYSICS 61L, Mechanics
3. MATH 31, Calculus I	3. MATH 32, Calculus II
4. EGR 53L, Computational Methods in Engineering	4. ECE27L, Fundamentals of ECE
SOPHOMORE YEAR	
Fall Semester	Spring Semester
1. COMPSCI 100E, Program Design & Analysis II	1. ECE 51L, Microelectronic Devices & Circuits
2. ECE 52L, Digital Systems	2. ECE 54L, Signals & Systems
3. MATH 103, Intermediate Calculus	3. MATH 107, Linear Algebra & Differential Equations
4. PHYSICS 62L, Electricity, Magnetism & Optics	4. SS-H 2
5. Free Elective	
JUNIOR YEAR	
Fall Semester in Beaufort, NC	Spring Semester
1. BIOLOGY 25L, Principles of Biology	1. ECE 53L, Electromagnetic Fields
2. ECE 191/2, Independent Study, an ECE-relevant Marine Lab application	2. ECE Concentration Elective (1)
3. ENV 175, Marine Policy (SS-H 3)	3. MATH 108, Ordinary & Partial Differential Equations
4. SS-H 3	4. STA 113, Probability & Statistics (See NOTE)
	5. SS-H 4
SENIOR YEAR	
Fall Semester	Spring Semester
1. ECE Concentration Elective (2) <i>or</i> Approved ECE Design Elective	1. Approved ECE Design Elective <i>or</i> ECE Concentration Elective (2)
2. ECE Concentration Elective (3)	2. ECE Concentration Elective (4)
3. ECE Elective	3. SS-H 5
4. Free Elective	4. Free Elective

NOTES:

- WRITING 20: University Writing Program, required in first year.
- CHEM 31L: AP credit CHEM 19 is also acceptable. Students who have successfully completed CHEM 21L need not take CHEM 31L.
- PHYSICS 61L & 62L: Matriculating students who have AP credit for PHYSICS 61L (but not 62L) take PHYSICS 62L; those who have AP credit for PHYSICS 61L and 62L take PHYSICS 63L; and international students who have credit for the equivalent of PHYSICS 51L & 52L take PHYSICS 143L.
- STA 113 is recommended but students may substitute MATH 135, Probability, or ECE 255, Mathematical Methods for Systems Analysis I.
- SS-H: Social Sciences and Humanities, 5 required semester-course electives, appropriately distributed.
- ECE Concentration Elective: Selected from the set of concentration courses approved for the ECE program as needed to complete the four-course ECE Concentration requirement.
- Approved Design Elective: Approved ECE Design Elective, required in Junior or Senior year. Currently ECE 122, 135, 154, 164, 251, and 261 are approved. The same course may not be used as a required Concentration Elective, a required ECE Elective, or the required Approved Design Elective.
- Independent Study: Accepted for up to two of the ECE-Elective Courses and for any of the Free Electives, but not for any other required course in the ECE Program. The ECE 191/2 Independent Study at the Marine Lab is an ECE Elective that meets the acceptance criteria.

Sample ECE Programs for a Junior-Year Semester Abroad

Junior-Year FALL Semester Abroad

JUNIOR YEAR	
Fall Semester Abroad	Spring Semester in Durham
1. ECE 53L, Electromagnetic Fields	1. ECE Concentration Course (2)
2. ECE Concentration Course (1)	2. ECE Elective
3. SS-H 3	3. MATH 108, Ordinary & Partial Differential Equations
4. SS-H 4	4. SS-H 5
SENIOR YEAR	
Fall Semester in Durham	Spring Semester in Durham
1. ECE Concentration Course (3)	1. ECE Concentration Course (4)
2. STA 113, Probability & Statistics or MATH 135, Probability or ECE 255, Probability for ECEs	2. Approved ECE Design Elective or ECE Elective
3. ECE Elective or Approved ECE Design Elective	3. Free Elective
4. Free Elective	4. Free Elective

Junior-Year SPRING Semester Abroad

JUNIOR YEAR	
Fall Semester in Durham	Spring Semester Abroad
1. ECE 53L, Electromagnetic Fields	1. ECE Concentration Course (2)
2. ECE Concentration Course (1)	2. ECE Elective
3. MATH 108, Ordinary & Partial Differential Equations	3. SS-H 4
4. SS-H 3	4. SS-H 5
SENIOR YEAR	
Fall Semester in Durham	Spring Semester in Durham
1. ECE Concentration Course (3)	1. ECE Concentration Course (4)
2. STA 113, Probability & Statistics or MATH 135, Probability or ECE 255, Probability for ECEs	2. Approved ECE Design Elective
3. ECE Elective	3. Free Elective
4. Free Elective	4. Free Elective

NOTES:

- Study-Abroad Program Students interested in studying abroad should explore possibilities at the [Duke Study Abroad Office](#) and then discuss their personal interests and options with their Pratt Faculty Advisor and with the ECE Director of Undergraduate Studies (DUS).
- FIRST and SOPHOMORE YEARS: Follow standard Durham sample programs. See NOTES in sample programs for additional guidance.
- Full-Year Abroad: A full two-semester Junior Year Abroad is also possible, but is usually only feasible for students entering Duke with multiple Advanced Placement (AP) credits and a demonstrated interest in a specific overseas country and its culture.
- Approved ECE Design Elective: This required course must be taken at Duke in Durham; it may not be taken abroad.
- Courses taken abroad: Courses shown are their Duke equivalents as certified by the ECE Director of Undergraduate Studies (DUS). Options vary by university and semester.

Many universities abroad have courses equivalent to ECE 53L, ECE 141, ECE 180, and other first courses among the ECE Concentration Electives. The above Sample Program for the Fall Semester Abroad assumes that courses equivalent to ECE 53L and a Concentration Elective exist and that such courses have been elected. If appropriate courses are not available in the relevant semester, students should investigate course alternatives, discuss options with the ECE Director of Undergraduate Studies (DUS) to verify that these are ECE-approved equivalents, and adjust the above program accordingly, usually by substituting the missing ECE-required courses for the Senior-year Electives. It is feasible to take more than one Concentration Elective in a semester.

Slightly different assumptions are built into the Sample Program for the Spring Semester Abroad, but similar comments apply *mutatis mutandis*.