Foundation Courses required of all Majors:
  
i. **MATHEMATICS**
   - The full sequence of Calculus (MATH 111, 121, 211)

  
ii. **PHYSICS**
   - Mechanics and Thermodynamics (PHYS 131 or 141 and 152)
     *Students majoring in Physics at Carleton should take PHYS 131 or 141 and PHYS 151 and PHYS 346 as one of the applied physics courses. Note that PHYS 346 is only offered in alternate years. PHYS 152 can be taken, but will not fulfill the applied physics requirement for the major.*
   - Electricity, Magnetism, and Optics (PHYS 165, formerly called PHYS161/162)
     *Students majoring in Physics at Carleton should take PHYS 235 and consider taking PHYS341 or PHYS344 as an applied physics courses.*

  
iii. **CHEMISTRY**
   - General Chemistry I (CHEM 123)
     *Some programs require a second term of General Chemistry. Please see individual programs below for details.*

  
iv. **LAB REQUIREMENT**
   - Either one term of physics lab or one term of chemistry lab is generally required.
     *Please see individual programs for details.*

  
v. **COMPUTER SCIENCE**
   - Introduction to Computer Science (CS 111)
     *Some programs require a specific programming language, which Carleton does not offer. Please see individual programs below for details. However, if programming in JAVA is preferred you should take Data Structures (CS 201) to complete Programming in JAVA requirement.*

  
vi. **HUMANITIES AND SOCIAL SCIENCES**
   - Twenty-seven credit hours (*49 Carleton credits*) nontechnical requirement is satisfied by the course work taken for the bachelor’s degree awarded by the home institution. Among those courses the student must include
     - Principles of Economics (ECON 111)
     - English Composition (ENGL 109)
Major Requirements

NOTE: Courses in *italics* modify the general requirements that are listed on page 1. Additional, major-specific requirements are bulleted (•) Courses that are *underlined* are not available at Carleton College but may be available at St. Olaf or may be taken during summer at another institution. St. Olaf or summer courses must be pre-approved.

**APPLIED MATHEMATICS or APPLIED PHYSICS**

**MATHEMATICS**
- Ordinary Differential Equations (MATH 241)

**PHYSICS**
- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)

**CHEMISTRY / BIOLOGY** (choose one course listed below)
- General Chemistry I (CHEM 123)
- Environmental Biology (BIO 126)
- Introduction to Molecular and Cellular Biology (BIO 125)

**BIOMEDICAL ENGINEERING**

**MATHEMATICS**
- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

**PHYSICS**
- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)

**CHEMISTRY**
- General Chemistry II (CHEM 230)
- Organic Chemistry I (CHEM 233)

**ELECTRICAL ENGINEERING**
- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)

**ENGINEERING MECHANICS**
- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)

**COMPUTER SCIENCE**
*Programming in MATLAB preferred*

**CHEMICAL ENGINEERING**

**MATHEMATICS**
- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

**CHEMISTRY**
- General Chemistry II with lab (CHEM 230)
- Organic Chemistry I with lab (CHEM 233)
CIVIL ENGINEERING
MATHEMATICS
- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)
ENGINEERING MECHANICS
- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)
COMPUTER SCIENCE
- Programming in MATLAB preferred

COMPUTER ENGINEERING
MATHEMATICS
- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)
COMPUTER SCIENCE (Programming in JAVA IS REQUIRED)
- Data Structures in JAVA (CS 201)
ELECTRICAL ENGINEERING
- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)

COMPUTER SCIENCE
COMPUTER SCIENCE
- Computer Programming in JAVA (CS 111 and CS 201)
- Data Structures in JAVA (CS 201)
- Discrete Mathematics (CS 202)
- Scientific Computation (CS 252)

EARTH AND ENVIRONMENTAL ENGINEERING
MATHEMATICS
- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)
CHEMISTRY
- General Chemistry II with lab (CHEM 230)
OTHER SCIENCE ELECTIVE (choose one course listed below)
- Organic Chemistry I (CHEM 233)
- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)
- Introduction to Molecular and Cellular Biology (BIO 125)
EARTH AND ENVIRONMENTAL SCIENCES (choose one course listed below)
- Advanced General Geology (EESC W4001 may be taken at Columbia)
- The Climate System (EESC V2100 may be taken at Columbia)
- The Solid Earth System (EESC V2200 may be taken at Columbia)
EARTH AND ENVIRONMENTAL ENGINEERING
- Alternative Energy Resources (EAEE E2002 may be taken at Columbia)
ELECTRICAL ENGINEERING
MATHEMATICS
- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

PHYSICS
- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)

COMPUTER SCIENCE
- Programming in JAVA is recommended (CS 111 and CS 201)

ELECTRICAL ENGINEERING
- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)

IEOR: ENGINEERING MANAGEMENT SYSTEMS
MATHEMATICS
- Linear Algebra (MATH 232)

COMPUTER PROGRAMMING
(The Department strongly recommends JAVA over C)
- Computer Programming in JAVA (CS 111 and CS 201)
- Data Structures in JAVA (CS 201)
- or
- Computer Programming in C
- Data Structures in C

ECONOMICS
- Introduction to Accounting and Finance

PROBABILITY AND STATISTICS
- Introduction to Mathematical Statistics and Probability Theory/Application (MATH 265 and 275)

IEOR: FINANCIAL ENGINEERING
MATHEMATICS
- Linear Algebra (MATH 232)

COMPUTER PROGRAMMING
(The Department strongly recommends JAVA over C)
- Computer Programming in JAVA (CS 111 and CS 201)
- Data Structures in JAVA (CS 201)
- or
- Computer Programming in C
- Data Structures in C

ECONOMICS
- Introduction to Accounting and Finance

PROBABILITY AND STATISTICS
- Introduction to Mathematical Statistics and Probability Theory/Application (MATH 265 and 275)
IEOR: INDUSTRIAL ENGINEERING

MATHEMATICS
- Linear Algebra (MATH 232)

COMPUTER PROGRAMMING
(The Department strongly recommends JAVA over C)
- Computer Programming in JAVA (CS 111 and CS 201)
- Data Structures in JAVA (CS 201)
  or
- Computer Programming in C
- Data Structures in C

ECONOMICS
- Introduction to Accounting and Finance

PROBABILITY AND STATISTICS
- Introduction to Mathematical Statistics and Probability Theory/Application (MATH 265 and 275)

IEOR: OPERATIONS RESEARCH

MATHEMATICS
- Linear Algebra (MATH 232)

COMPUTER PROGRAMMING
(The Department strongly recommends JAVA over C)
- Computer Programming in JAVA (CS 111 and CS 201)
- Data Structures in JAVA (CS 201)
  or
- Computer Programming in C
- Data Structures in C

ECONOMICS
- Introduction to Accounting and Finance

PROBABILITY AND STATISTICS
- Introduction to Mathematical Statistics and Probability Theory/Application (MATH 265 and 275)

ENGINEERING MECHANICS

ENGINEERING MECHANICS
- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)

MATERIALS SCIENCE AND ENGINEERING

PHYSICS
- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)

CHEMISTRY
- General Chemistry II with lab (CHEM 230)

MATHEMATICS
- Ordinary Differential Equations (MATH 241)
MECHANICAL ENGINEERING

MATHEMATICS
- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

PHYSICS/BIOLOGY (choose one course listed below)
- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)
- Environmental Biology (BIO 126)
- Introduction to Molecular and Cellular Biology (BIO 125)

ENGINEERING MECHANICS
- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)

ELECTRICAL ENGINEERING
- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)