Foundational Courses required of all majors

Mathematics
Calculus I – Math 211
Calculus II – Math 212 (232)
Calculus III – Math 235

Physics
Introductory physics with calculus and Lab I – Phys 131 or IQS 191
Introductory physics with calculus and Lab II – Phys 132

Chemistry
General Chemistry I – Chem 141 or IQS 191

Computer Science
Introduction to Computing of Scientific Computing – CMSC 150 (some majors may require CMSC 105)

Humanities and Social Sciences
Principles of Economics - ECON 101
English Composition – FYS
English Composition – FYS
6 other non-technical full unit courses: Non-technical courses should help a student to learn perspectives and principles of the humanities and social sciences through discussion, debate and writing. Courses considered professional, workshop, lab, project, scientific, studio, and music instruction do not count towards the non-technical requirement. Examples and exclusion can be found at: http://bulletin.engineering.columbia.edu/b-elective-nontechnical-courses. Please contact Dr. Helms (chelms@richmond.edu) for approval for any course you would like to count that does not clearly fulfill the requirements before taking the course.
Major-Specific Courses

Courses with an * may be taken either before or during enrollment at Columbia

**Applied Mathematics and Applied Physics**

- Differential Equations – MATH 312
- Intro to classical and quantum waves – PHYS 205
- Choose one: General Chemistry - CHEM 141
  - Environmental Biology - BIO 202 (prerequisites BIOL 199, BIOL 200)
  - Introductory Biology - BIO 200 (prerequisites BIOL 199)
- Introduction to Scientific Computing… – CMSC 105 (Python - strongly recommended)

**Biomedical Engineering**

- Differential Equations – MATH 312
- Linear Algebra – MATH 245
- Modern Physics – PHYS 205
- General Chemistry II and Lab – CHEM 317 (prerequisite CHEM 206)
- Introduction to Scientific Computing… - CMSC 105 (Python)
- Introduction to Biology I – BIOL 200 (prerequisite BIOL 199)
- Introduction to Biology II – BIOL 200 (prerequisite BIOL 199)
  *Introduction to Electrical Engineering - not offered at UR may be taken the summer before or during first semester at Columbia

**Chemical Engineering**

- Differential Equations – MATH 312
- General Chemistry II and Lab – CHEM 317 (prerequisite CHEM 206)
- Organic Chemistry I and Lab – CHEM 205
- Introduction to Scientific Computing… - CMSC 105 (Python strongly recommended)
  *Organic Chemistry II Lab – CHEM 206
  *Optional: Linear Algebra – MATH 245

**Civil Engineering**

- Differential Equations – MATH 312
- Linear Algebra – MATH 245
- Earth: Origin, Evolution, Processes and Future - not offered at UR, must be taken the summer before enrollment or at another university prior to starting at Columbia
  *Engineering Mechanics - not offered at UR may be taken the summer before or during first semester at Columbia
  *Department strongly encourages experience with MATLAB
**Computer Engineering**
- Differential Equations – MATH 312
- Linear Algebra – MATH 245
- Discrete Mathematics – CMSC 222
- Introduction to Electrical Engineering - not offered at UR must be taken the summer before enrollment or at another university prior to starting at Columbia

**Computer Science**
- Discrete Mathematics – CMSC 222
- Data Structures – CMSC 221
  *Optional: Data Structures and Algorithms – CMSC 315

**Earth and Environmental Engineering**
- Differential Equations – MATH 312
- Linear Algebra – MATH 245
  *Intro to Probability and Statistics – MATH 329 and MATH 330
- General Chemistry II and Lab – CHEM 317 (prerequisite CHEM 206)
- Choose one: Organic Chemistry I – CHEM 205
  - Intro to classical and quantum waves – PHYS 205
  - Introduction to Biology I – BIOL 200 (prerequisite BIOL 199)
- *A Better Planet by Design - not offered at UR may be taken the summer before or during first semester at Columbia
- *Earth’s environmental systems - not offered at UR may be taken the summer before or during first semester at Columbia

**Electrical Engineering**
- Differential Equations – MATH 312
- Linear Algebra – MATH 245
  *Computer science proficiency to take advance courses at Columbia
- Intro to classical and quantum waves – PHYS 205
  *Engineering Mechanics - not offered at UR may be taken the summer before or during first semester at Columbia
- *Department strongly encourages experience with MATLAB

**Engineering Mechanics**
- Differential Equations – MATH 312
- Optional - Linear Algebra – MATH 245
  *Engineering Mechanics - not offered at UR may be taken the summer before or during first semester at Columbia
  *Department strongly encourages experience with MATLAB
Industrial Engineering, Engineering Management Systems or Operations Research
* Differential Equations – MATH 312 (must be taken prior to Columbia if interested in Financial Engineering)
  Linear Algebra – MATH 245
  Probability – MATH 329
  Statistics – MATH 330 or BUAD 202
  Data Structures – CMSC 221
* Introduction to Accounting and Finance – ACCT 201 and FIN 360 (must be taken prior to Columbia if interested in Financial Engineering)

Materials Science and Engineering
  Differential Equations – MATH 312
  Linear Algebra – MATH 245
  Intro to classical and quantum waves – PHYS 205
  Introduction to Scientific Computing… - CMSC 105 (Python - required)
  Choose one: General Chemistry I – CHEM 141
  Organic Chemistry – CHEM 205

Mechanical Engineering
  Differential Equations – MATH 312
  Linear Algebra – MATH 245
  Choose one: Intro to classical and quantum waves – PHYS 205
  Environmental Biology - BIO 202 (prerequisites BIOL 199, BIOL 200)
  Introductory Biology - BIO 200 (prerequisites BIOL 199)
* Foundations of Data Science - not offered at UR may be taken the summer before or during first semester at Columbia
* Engineering Mechanics - not offered at UR may be taken the summer before or during first semester at Columbia
* Introduction to Electrical Engineering - not offered at UR may be taken the summer before or during first semester at Columbia