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.

Ultimately the pre-engineering advisor, Dr. Helms (chelms@richmond.edu) must approve all nontechnical course work. Please contact Dr. Helms if you would like clarity on which courses count as nontechnical 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)

  (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 preferred when available - Python
- Introduction to Biology I – BIOL 200 (prerequisite BIOL 199)
- Introduction to Biology II – BIOL 200 (prerequisite BIOL 199)
  *Introduction to Electrical Engineering – PHYS 216

**Chemical Engineering**
- Differential Equations – MATH 312
- General Chemistry II and Lab – CHEM 317 (prerequisite CHEM 206)
- Organic Chemistry I and Lab – CHEM 205
  *Organic Chemistry II Lab – CHEM 206
  *Optional: Linear Algebra – MATH 245
  *Department strongly encourages experience with Python

**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 - PHYS 216

**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
- Intro to classical and quantum waves – PHYS 205
  *Computer science proficiency to take advance courses at Columbia
- Introduction to Electrical Engineering – PHYS 216 or taken at another university prior to starting at Columbia

**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
- Choose one: General Chemistry I – CHEM 141
- Organic Chemistry – CHEM 205
*Department strongly encourages experience with Python

**Mechanical Engineering**
- Differential Equations – MATH 312
- Linear Algebra – MATH 245
- Introduction to Data Science - MATH 289
- 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)
*Engineering Mechanics - not offered at UR may be taken the summer before or during first semester at Columbia
*Introduction to Electrical Engineering – PHYS 216