**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 prefer other programming languages such as python)

**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](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)
Introduction to Computing – CMSC 105 (if possible as Python is 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 - 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
Introduction to Computing - CMSC 105 (if possible as Python is 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 - 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
- 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 - MATH 289
- *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