2015-2016 PRE-COMBINED PLAN CURRICULUM GUIDE

In order to be considered for guaranteed admission, students must successfully complete the equivalents of the following Columbia courses at Davidson College. Please see the Course Descriptions document for course descriptions. You should touch base with the liaison at your school in order to determine which classes fulfill these Columbia prerequisite courses. You should also speak with your liaison about other ways to fulfill prerequisites if your institution does not offer a required course listed in this guide. Please note that all courses in this guide (except for the 27 non-technical credit hours) count towards the calculated pre-engineering GPA. Also, please note that our articulation agreement provides for only one opportunity to be considered for guaranteed admission.

For more information, please visit our website at http://www.studentaffairs.columbia.edu/admissions/engineering/combined or e-mail us combinedplan@columbia.edu.

FOUNDATION COURSES REQUIRED OF ALL MAJORS:

i. MATHEMATICS
   - The full sequence of MAT 111 or 112, 113, and 140 or 160.

ii. PHYSICS
    - Mechanics and Thermodynamics (PHY130 – Calculus-based Physics I)
    - Electricity, Magnetism, and Optics (PHY230 – Calculus-based Physics II)

iii. CHEMISTRY
    - Principles of Chemistry (CHE115) or an equivalent General Chemistry I with Lab course
    - Please see individual programs below for details. Some programs require an additional second semester of General Chemistry (CHE220-Introduction to Analytical Chemistry or CHE240-Introduction to Inorganic Chemistry) and/or an Introduction to Organic Chemistry (CHE250).

iv. LAB REQUIREMENT
    - Either one-semester physics lab or one-semester chemistry lab is generally required. Please see individual programs below for more details, but note that PHY130, PHY230, and all foundational chemistry courses at Davidson (CHE 115, 220, 230, 240, 250, and 260) have required labs that must be taken with the course.

v. COMPUTER SCIENCE
   - Introduction to computer science and programming in C++, JAVA, Python, or MATLAB (CSC121 or PHY200)
   - Some majors require a specific programming language (see requirements for majors below).

vi. HUMANITIES AND SOCIAL SCIENCES
    - Twenty-seven-(27) non-technical credit hours. The Davidson Distribution Requirements, along with the Composition Requirement, satisfy this prerequisite. Among these courses the students must include:
      - Principles of Economics (ECO101)
      - English Composition (W-course)
REQUIRED MAJOR SPECIFIC COURSES
(Notes in italics clarify requirements.)

APPLIED MATHEMATICS or APPLIED PHYSICS

MATHEMATICS
- Ordinary Differential Equations (MAT235)

PHYSICS
- Modern Physics (PHY320)
- Physics Laboratory portions of PHY130 & 230

CHEMISTRY / BIOLOGY (choose one course listed below. Chemistry/Biology labs not required.)
- Principles of Chemistry (CHE115) or an equivalent General Chemistry I course
- Environmental Biology: Molecules to Cells (BIO112)
- Introduction to Molecular and Cellular Biology (BIO111)
- Please note that the combined sequence of BIO113 and BIO114 are equivalent to BIO111 and BIO112

BIOMEDICAL ENGINEERING (ALL TRACKS)

MATHEMATICS
- Introduction to applied mathematics: Ordinary Differential Equations & Linear Algebra (PHY201 or MAT150 plus MAT235). Students who take an ODE course must also take a Linear Algebra course.

PHYSICS
- Classical and Quantum Waves (PHY320)

CHEMISTRY
- Either CHE220 or CHE240 at Davidson or an equivalent General Chemistry II course with lab
- Introduction to Organic Chemistry I (CHE250) or an equivalent Organic Chemistry I course

ELECTRICAL ENGINEERING
- Electronics and Instrumentation PHY310 [Introduction to Electrical Engineering (ELEN E1201) may be taken the summer before entering or while at Columbia]

ENGINEERING MECHANICS
- Mechanics (PHY330) [ENME3105 may be taken the summer before entering or while at Columbia]

COMPUTER SCIENCE
- Introduction to Computer Science and Programming (CSC121 or PHY200)
CHEMICAL ENGINEERING

MATHEMATICS (choose one course listed below)
- Ordinary Differential Equations (MAT235)
- Introduction to applied mathematics

Ordinary Differential Equations & Linear Algebra (PHY201 or MAT150 plus MAT235)

PHYSICS
- PHY130 and PHY230 Labs

CHEMISTRY
- Either CHE220 or CHE240 at Davidson or an equivalent General Chemistry II course with lab
- Introduction to Organic Chemistry I (CHE250) or an equivalent Organic Chemistry I course with lab

CIVIL ENGINEERING

MATHEMATICS
- Introduction to applied mathematics
- Ordinary Differential Equations & Linear Algebra (PHY201 or MAT150 plus MAT235).
  Students who take an ODE course must also take a Linear Algebra course.

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

ENGINEERING MECHANICS
- Mechanics (PHY330) [ENME3105 may be taken the summer before entering or while at Columbia]

COMPUTER SCIENCE
- Introduction to Computer Science and Programming (CSC121 or PHY200)

COMPUTER ENGINEERING

MATHEMATICS
- Introduction to applied mathematics
  Ordinary Differential Equations & Linear Algebra (PHY201 or MAT150 plus MAT235). Students who take an ODE course must also take a Linear Algebra course.

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

COMPUTER SCIENCE (CSC221, Computer Programming in JAVA is required)
- Discrete Mathematics (MAT220)

ELECTRICAL ENGINEERING
- Electronics and Instrumentation PHY310 [Introduction to Electrical Engineering (ELEN E1201) may be taken the summer before entering or while at Columbia]
### COMPUTER SCIENCE

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

COMPUTER SCIENCE (CSC221, Computer Programming in JAVA is required)
- Data Structures and Algorithms (CSC221)
- Discrete Mathematics (MAT220)
- Scientific Computation (MAT/CSC315)

### EARTH AND ENVIRONMENTAL ENGINEERING

MATHEMATICS
- Introduction to applied mathematics Ordinary Differential Equations & Linear Algebra (PHY201 or MAT150 plus MAT235). Students who take an ODE course must also take a Linear Algebra course.

CHEMISTRY
- Either CHE220 or CHE240 at Davidson or an equivalent General Chemistry II course with lab

OTHER SCIENCE ELECTIVE (choose one course listed below)
- Introduction to Organic Chemistry I (CHE250) or an equivalent Organic Chemistry I course with lab
- Classical & quantum waves (PHY 320)
- Introduction to Molecular and Cellular Biology (BIO111)

EARTH AND ENVIRONMENTAL SCIENCES (choose one course listed below)
- Advanced General Geology (EESC W4001) [may be taken while at Columbia.] [no Davidson equivalent]
- The Climate System (EESC V2100) [may be taken while at Columbia.] [no Davidson equivalent]
- The Solid Earth System (ENV120) [EESC V2200 may be taken while at Columbia.]

EARTH AND ENVIRONMENTAL ENGINEERING
- Alternative Energy Resources (EAEE E2002) [may be taken at Columbia] [no Davidson equivalent]

### ELECTRICAL ENGINEERING

MATHEMATICS
- Introduction to applied mathematics Ordinary Differential Equations & Linear Algebra (PHY201 or MAT150 plus MAT235). Students who take an ODE course must also take a Linear Algebra course.

PHYSICS
- Classical and Quantum Waves (Phy320)
- PHY130 and PHY230 Labs

COMPUTER SCIENCE
Computer Programming in JAVA (CSC221) is recommended.

ELECTRICAL ENGINEERING
- Electronics and Instrumentation (PHY310) [Introduction to Electrical Engineering (ELEN E1201) may be taken the summer before entering or while at Columbia]
IEOR: ENGINEERING MANAGEMENT SYSTEMS

MATHEMATICS (choose one course listed below)
- Linear Algebra (MAT150)

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

COMPUTER SCIENCE (choose one set of courses below)
- Computer Programming in C (W1003) [no Davidson equivalent]
- Data Structures in C (W3133) [no Davidson equivalent]
  -or-
- Computer Programming in JAVA (PHY200)
- Data Structures in JAVA (CSC221)

The Department strongly recommends JAVA over C.

ECONOMICS
- Introduction to Accounting and Finance (ECO211)

PROBABILITY AND STATISTICS
- Introduction to Probability and Statistics (MAT340 and MAT341)
  Please note that the course must have calculus as a pre-requisite. The Department strongly suggests taking two separate courses: one in Probability and one in Statistics.

IEOR: FINANCIAL ENGINEERING

Students cannot apply directly to IEOR: Financial Engineering because this concentration in Operations Research requires an application after one semester of study at Columbia. Entrance into this program is very competitive. Students interested in this concentration must adhere to the following pre-requisite requirements:

MATHEMATICS
- Linear Algebra (MAT150)
- Ordinary Differential Equations (MAT235)

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

COMPUTER SCIENCE (choose one set of courses below)
- Computer Programming in C (W1003) [no Davidson equivalent]
- Data Structures in C (W3133) [no Davidson equivalent]
  -or-
- Computer Programming in JAVA (PHY200)
- Data Structures in JAVA (CSC221)

The Department strongly recommends JAVA over C.
ECONOMICS
- Introduction to Accounting and Finance (ECO211)

PROBABILITY AND STATISTICS
- Probability (MAT340)
- Statistical Inference (MAT341)
Please note that the course must have calculus as a pre-requisite.

IEOR: INDUSTRIAL ENGINEERING

MATHEMATICS (choose one course listed below)
- Linear Algebra (MAT150)

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

COMPUTER SCIENCE (choose one set of courses below)
- Computer Programming in C (W1003) [no Davidson equivalent]
- Data Structures in C (W3133) [no Davidson equivalent]
  -or-
- Computer Programming in JAVA (PHY200)
- Data Structures in JAVA (CSC221)

The Department strongly recommends JAVA over C.

ECONOMICS
- Introduction to Accounting and Finance (ECO211)

PROBABILITY AND STATISTICS
- Introduction to Probability and Statistics (MAT 340 and MAT341)
  Please note that the course must have calculus as a pre-requisite. The Department strongly suggests taking two separate courses: one in Probability and one in Statistics.
IEOR: OPERATIONS RESEARCH

MATHEMATICS (choose one course listed below)
- Linear Algebra (MAT150)

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

COMPUTER SCIENCE (choose one set of courses below)
- Computer Programming in C (W1003) [no Davidson equivalent]
- Data Structures in C (W3133) [no Davidson equivalent]
  -or-
- Computer Programming in JAVA (PHY200)
- Data Structures in JAVA (CSC221)

  The Department strongly recommends JAVA over C.

ECONOMICS
- Introduction to Accounting and Finance (ECO211)

PROBABILITY AND STATISTICS
- Introduction to Probability and Statistics (MAT 340 and MAT341)
  Please note that the course must have calculus as a pre-requisite. The Department strongly suggests taking two separate courses: one in Probability and one in Statistics.

ENGINEERING MECHANICS

MATHEMATICS
- Ordinary Differential Equations (MAT235)

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

ENGINEERING MECHANICS
- Mechanics (PHY330) [ENME E3105 may be taken the summer before entering or while at Columbia]

MATERIALS SCIENCE AND ENGINEERING

MATHEMATICS
- Ordinary Differential Equations (MAT235)

PHYSICS
- Classical and Quantum Waves (PHY320)
- PHY130 and PHY230 Labs

CHEMISTRY
- General Chemistry II (CHE215)
- General Chemistry Lab (lab portion of CHE215)
MECHANICAL ENGINEERING

MATHEMATICS
- Introduction to applied mathematics: Ordinary Differential Equations & Linear Algebra (PHY201 or MAT150 plus MAT235). Students who take an ODE course must also take a Linear Algebra course.

PHYSICS/ BIOLOGY (choose one course listed below)
- Classical and Quantum Waves (PHY320)
- Environmental Biology: Molecules to Cells (BIO112)
- Introduction to Molecular and Cellular Biology (BIO111)
- The combined sequence of BIO113 and BIO114 are equivalent to BIO111 and BIO112

PHYSICS/CHEMISTRY LAB (fulfilled with one course listed below)
- General Physics Lab (included in PHY130 and PHY230)
- General Chemistry Lab (included in CHE115)

ENGINEERING MECHANICS
- Mechanics (PHY330) [ENME E3105 may be taken the summer before entering or while at Columbia]

ELECTRICAL ENGINEERING
- Electronics and Instrumentation PHY310 [Introduction to Electrical Engineering (ELEN E1201) may be taken the summer before entering or while at Columbia]