

Columbia University
The Fu Foundation School of Engineering and Applied Science

PRE - COMBINED PLAN CURRICULUM GUIDE

Fall 2008 – Final

The equivalents of the following Columbia courses are required. Please see the SEAS Bulletin for course and program descriptions: <http://www.engineering.columbia.edu/bulletin/>. Students must complete the Combined Plan program in four (4) consecutive semesters. Please e-mail combinedplan@columbia.edu with questions regarding course equivalencies. If your institution does not offer a course listed in this guide, please have your liaison indicate this in their recommendation letter.

FOUNDATION COURSES REQUIRED OF ALL MAJORS:

- i. MATHEMATICS
 - ❑ The full sequence of Calculus I, II, III, IV (V1101, V1102, V1201, V1202).
 - ❑ Ordinary Differential Equations (E1210)
or APMA E2101 Introduction to applied mathematics (ODE & linear algebra) - preferred by some programs. See individual program for details.
Please note that Computer Science majors are exempt from ODE requirement.

- ii. PHYSICS
 - ❑ Mechanics and Thermodynamics (C1401)
 - ❑ Electricity, Magnetism, and Optics (C1402)

- iii. CHEMISTRY
 - ❑ General Chemistry I (C1403)

Some programs require an additional second semester of General Chemistry (C1404). For Applied Physics and Applied Mathematics programs, General Chemistry I can be substituted by one semester of Biology (W2001). Furthermore, either one-semester physics lab or one-semester chemistry lab is generally required. Please see individual programs below for details.

- iv. COMPUTER SCIENCE
 - ❑ Introduction to computer science and programming in C++ JAVA , or MATLAB (W1003, W1004, W1005, W1007 or W1009)

Some majors require a specific programming language (see requirements for majors below).

- v. HUMANITIES AND SOCIAL SCIENCES
 - ❑ Twenty-seven-(27)-point nontechnical requirement is satisfied by the course work taken for the bachelor's degree awarded by the home institution. Among those courses the students must include:
 - Principles of Economics (ECON W1105)
 - English Composition (ENGL C1010 University Writing).

REQUIRED FOR MAJORS IN:

(Notes in *italics* clarify general requirements, listed on p. 1. Additional, major-specific, requirements are bulleted (□).)

APPLIED MATHEMATICS or APPLIED PHYSICS

PHYSICS

- Physics Lab (C1493/4)
- Classical and Quantum Waves (C1403)

CHEMISTRY / BIOLOGY

Either 1) one-term lecture CHEM C1403, CHEM C1404, or higher, or 2) one-term lecture BIOL W2001 or higher. Chemistry / Biology labs are not required.

BIOMEDICAL ENGINEERING

ALL TRACKS

PHYSICS

- Classical and Quantum Waves (C1403)

CHEMISTRY

- General Chemistry II (C1404)
- General Chemistry Lab (C1500)
- Organic Chemistry I (C3443)

ELECTRICAL ENGINEERING

- Intro. to Electrical Engineering (ELEN E1201)

ENGINEERING MECHANICS

- Mechanics (ENME E3105)

COMPUTER SCIENCE

Intro. to Computer Science and Programming in MATLAB (COMS W1005) preferred

MATHEMATICS

- APMA E2101 Introduction to applied mathematics (ODE & linear algebra)
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CHEMICAL ENGINEERING

PHYSICS

- Physics Lab (C1493/4)

CHEMISTRY

- General Chemistry II (C1404)
 - General Chemistry Lab (C1500)
 - Organic Chemistry I (C3443)
 - Organic Chemistry Lab (C3543)
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CIVIL ENGINEERING

- Physics Lab (C1493/4)

or

- ❑ General Chemistry Lab (C1500)

- ❑ Mechanics (ENME E3105) *[may be taken while at Columbia]*

COMPUTER SCIENCE

Programming in MATLAB preferred.

MATHEMATICS

- ❑ APMA E2101 Introduction to applied mathematics (ODE & linear algebra)
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COMPUTER ENGINEERING

- ❑ Physics Lab (C1493/4)
- or-
- ❑ General Chemistry Lab (C1500)

MATHEMATICS

- ❑ Students who take ODE (MATH E1210 instead of APMA E2101 must also take a Linear Algebra course (APMA E3101 or MATH V2010)
- ❑ Classical and Quantum Waves (C1403)

- ❑ Discrete Mathematics (COMS W3203)

COMPUTER SCIENCE

Computer Programming in JAVA (W1007 or W1009) is required.

ELECTRICAL ENGINEERING

- ❑ Intro. to Electrical Engineering (ELEN E1201) or equivalent
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COMPUTER SCIENCE

- ❑ Physics Lab (C1493/4)
- or-
- ❑ General Chemistry Lab (C1500)

MATHEMATICS

Ordinary Differential Equations (E1210) is NOT required.

COMPUTER SCIENCE

Computer Programming in JAVA (W1007 or W1009) is required. JAVA programming skills must be acquired before arriving at Columbia. (continued on next page)

- ❑ Scientific Computation (COMS W3210)
 - ❑ Discrete Mathematics (COMS W3203)
 - ❑ Data Structures and Algorithms (COMS W3139)
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EARTH AND ENVIRONMENTAL ENGINEERING

CHEMISTRY

- ❑ General Chemistry II (C1404)

- ❑ General Chemistry Lab (C1500)
- ❑ Organic Chemistry C3443 or Classical & quantum waves C1403 or Molecular and cellular biology I C2005

EARTH AND ENVIRONMENTAL SCIENCES

- ❑ Advanced General Geology (EESC W4001) or The Climate System (EESC V2100) or The Solid Earth System (EESC V2200)
[may be taken while at Columbia.]

ELECTRICAL ENGINEERING

MATHEMATICS

- ❑ Students who take ODE (MATH E1210 instead of APMA E2101 must also take a Linear Algebra course (APMA E3101 or MATH V2010)

PHYSICS

- ❑ Physics Lab (C1493/4)
- ❑ Classical and Quantum Waves (C1403)

COMPUTER SCIENCE

Computer Programming in JAVA (W1007) is recommended.

ELECTRICAL ENGINEERING

- ❑ Intro. to Electrical Engineering (ELEN E1201) or equivalent

ENGINEERING MANAGEMENT SYSTEMS

- ❑ Physics Lab (C1493/4)
- or-
- ❑ General Chemistry Lab (C1500)

MATHEMATICS

- ❑ Linear Algebra (MATH V2010 or APMA E3101)
Please note that APMA E2101 Introduction to applied mathematics is *not* acceptable.

COMPUTER SCIENCE

- ❑ Computer Programming in C (W1003)
- ❑ Data Structures in C (W3133) (continued on next page)
- or-
- ❑ Computer Programming in JAVA (W1007)
- ❑ Data Structures in JAVA (W3134)

ECONOMICS

- ❑ Introduction to Accounting and Finance (W2261)

PROBABILITY AND STATISTICS

- ❑ Introduction to Probability and Statistics (W3600)
Please note that the course must have calculus as a pre-requisite. Alternatively, the Department suggests to take two separate courses: one in Probability and one in Statistics.

ENGINEERING MECHANICS

- ❑ Physics Lab (C1493/4)
- or-

- ❑ General Chemistry Lab (C1500)

ENGINEERING MECHANICS

- ❑ Mechanics (ENME E3105) *[may be taken while at Columbia]*
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FINANCIAL ENGINEERING

This concentration in Operations Research requires an application after one semester of study at Columbia. Students interested in this concentration must adhere to the following pre-requisite requirements:

- ❑ Physics Lab (C1493/4)

-or-

- ❑ General Chemistry Lab (C1500)

MATHEMATICS

- ❑ Linear Algebra (MATH V2010 or APMA E3101)

Please note that APMA E2101 Introduction to applied mathematics is *not* acceptable.

COMPUTER SCIENCE

- ❑ Computer Programming in C (W1003)
- ❑ Data Structures in C (W3133)

-or-

- ❑ Computer Programming in JAVA (W1007)
- ❑ Data Structures in JAVA (W3134)

ECONOMICS

- ❑ Introduction to Accounting and Finance (W2261)

PROBABILITY AND STATISTICS

- ❑ Probability (W3600)
 - ❑ Statistical Inference (W3659)
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INDUSTRIAL ENGINEERING

- ❑ Physics Lab (C1493/4)
- or-
- ❑ General Chemistry Lab (C1500) (continued on next page)

MATHEMATICS

- ❑ Linear Algebra (MATH V2010 or APMA E3101)
Please note that APMA E2101 Introduction to applied mathematics is *not* acceptable.

COMPUTER SCIENCE

- ❑ Computer Programming in C (W1003)
- ❑ Data Structures in C (W3133)
- or-
- ❑ Computer Programming in JAVA (W1007)
- ❑ Data Structures in JAVA (W3134)

ECONOMICS

- ❑ Introduction to Accounting and Finance (W2261)

PROBABILITY AND STATISTICS

- ❑ Introduction to Probability and Statistics (W3600)
Please note that the course must have calculus as a pre-requisite. Alternatively, the Department suggests that students take two separate courses: one in Probability and one in Statistics.
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MATERIALS SCIENCE AND ENGINEERING

PHYSICS

- ❑ Physics Lab (C1493/4)
- ❑ Classical and Quantum Waves (C1403)

CHEMISTRY

- ❑ General Chemistry II (C1404)
 - ❑ General Chemistry Lab (C1500)
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MECHANICAL ENGINEERING

MATHEMATICS

- ❑ Linear Algebra (MATH V2010 or APMA E3101 or APMA E2101)

PHYSICS

- ❑ Classical and quantum waves
- Or may substitute Biology (W2001 or higher)

CHEMISTRY

- ❑ General Chemistry Lab (C1500)

ENGINEERING MECHANICS

- ❑ Mechanics (ENME E3105) [*may be taken while at Columbia*]

ELECTRICAL ENGINEERING

- ❑ Intro. to Electrical Engineering (ELEN E1201) or equivalent [*may be taken while at Columbia*]
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OPERATIONS RESEARCH

- ❑ Physics Lab (C1493/4)
- OR-
- ❑ General Chemistry Lab (C1500)

MATHEMATICS

- ❑ Linear Algebra (MATH V2010 or APMA E3101)
Please note that APMA E2101 Introduction to applied mathematics is *not* acceptable.

COMPUTER SCIENCE

- ❑ Computer Programming in C (W1003)
- ❑ Data Structures in C (W3133)
- OR-
- ❑ Computer Programming in JAVA (W1007)
- ❑ Data Structures in JAVA (W3134)

ECONOMICS

- ❑ Introduction to Accounting and Finance (W2261)

PROBABILITY AND STATISTICS

- ❑ Introduction to Probability and Statistics (W3600)
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