

# **COLUMBIA PRE-COMBINED PLAN**

## **CURRICULUM GUIDE**

### **for Carleton College students**

#### **Foundation Courses required of all Majors:**

i. MATHEMATICS

- The full sequence of Calculus (MATH 111, 120, and 210 or 211)

ii. PHYSICS

- Mechanics and Thermodynamics (PHYS 131 and 152 – Fall Term only)

Note: PHYS 131 is a 1<sup>st</sup> 5-week course and PHYS 152 is a 2<sup>nd</sup> 5-week course both taught in the fall. Students can also take 143 and 144 to cover PHYS 131, but must still take PHYS 152.

*Students majoring in Physics should take PHYS 131 and PHYS 151 (not 152), or the equivalent PHYS 143 or 144, and PHYS 346. Note that PHYS 346 is only offered in alternate years. PHYS 152 can be taken, but will not fulfill the applied physics requirement for the major and does not fill pre-reqs for the physics major.*

- Electricity, Magnetism, and Optics (PHYS 165, formerly called PHYS161/162)

*Students majoring in Physics at Carleton should take PHYS 235 and either PHYS341 or PHYS344.*

iii. CHEMISTRY

- General Chemistry I (CHEM 123)

*Students interested in pursuing Earth & Environmental Engineering are encouraged to take CHEM 128 instead of CHEM 123.*

Some programs require a second term of General Chemistry. Please see individual programs below for details.

iv. LAB REQUIREMENT

- Either one term of physics lab or one term of chemistry lab is generally required. Please see individual programs for details.

v. COMPUTER SCIENCE

- Introduction to Computer Science (CS 111)

Some programs require a specific programming language that Carleton may not offer. Please see individual programs below for details. If programming in JAVA is required (or preferred), you should take Data Structures (CS 201) to fulfill the programming in JAVA requirement.

vi. HUMANITIES AND SOCIAL SCIENCES

- Twenty-seven credit hours (*49 Carleton credits*) non-technical requirement is satisfied by the course work taken for the bachelor's degree awarded by the home institution.

Among those courses the student must include:

– Principles of Economics (ECON 111)

– English Composition (ENGL 109, or Writing Portfolio with *55 Carleton Credits total*)

*AP Credits that show up on your Carleton transcript may be used to count towards satisfying this requirement. Columbia may require accepted students to submit their scores prior to enrollment. S/Cr/NC class will not count for this requirement*

## Major Requirements

**NOTE:** Courses in *italics* modify the general requirements that are listed on page 1 or are optional courses recommended as electives by the Carleton engineering liaison. Additional, major-specific requirements are bulleted (•) Courses that are underlined are not available at Carleton College but may be available at St. Olaf or may be taken during summer at another institution. St. Olaf or summer courses must be pre-approved.

### APPLIED MATHEMATICS or APPLIED PHYSICS

#### MATHEMATICS

- Ordinary Differential Equations (MATH 241)

#### PHYSICS

- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)

#### CHEMISTRY / BIOLOGY (choose one course listed below)

- General Chemistry I (CHEM 123)
  - Environmental Biology (BIO 126)
  - Introduction to Molecular and Cellular Biology (BIO 125)
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### BIOMEDICAL ENGINEERING

#### MATHEMATICS

- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)
- Probability (MATH 265)
- Introduction to Statistical Inference (MATH 275)

#### PHYSICS

- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)

#### CHEMISTRY

- General Chemistry II (CHEM 230)
- Organic Chemistry I (CHEM 233)

#### ELECTRICAL ENGINEERING

- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)

#### ENGINEERING MECHANICS

- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)

#### COMPUTER SCIENCE

- *Programming in MATLAB preferred*
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### CHEMICAL ENGINEERING

#### MATHEMATICS

- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

#### CHEMISTRY

- General Chemistry II with lab (CHEM 230)
  - Organic Chemistry I with lab (CHEM 233)
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## **CIVIL ENGINEERING**

### **MATHEMATICS**

- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

### **ENGINEERING MECHANICS**

- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)

### **COMPUTER SCIENCE**

- *Programming in MATLAB preferred*
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## **COMPUTER ENGINEERING**

### **MATHEMATICS**

- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

### **COMPUTER SCIENCE** (*Programming in JAVA IS REQUIRED*)

- Data Structures in JAVA (CS 201)
- Discrete Mathematics (CS 202)

### **ELECTRICAL ENGINEERING**

- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)
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## **COMPUTER SCIENCE**

### **COMPUTER SCIENCE**

- Computer Programming in JAVA (CS 201)
  - Data Structures in JAVA (CS 201)
  - Discrete Mathematics (CS 202)
  - Scientific Computation (CS 252)
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## **EARTH AND ENVIRONMENTAL ENGINEERING**

### **MATHEMATICS**

- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

### **CHEMISTRY**

- General Chemistry II with lab (CHEM 230)

### **OTHER SCIENCE ELECTIVE** (*choose one course listed below*)

- Organic Chemistry I (CHEM 233)
- Classical and Quantum Waves
  - Physics Majors: PHYS 341 or PHYS 344 and PHYS 335
  - Other Majors: PHYS 153 and CHEM 344

- Introduction to Molecular and Cellular Biology (BIO 125)

### **EARTH AND ENVIRONMENTAL SCIENCES** (*choose one course listed below*)

- Advanced General Geology (*EESC W4001 may be taken at Columbia*)
- The Climate System (*EESC V2100 may be taken at Columbia*)
- The Solid Earth System (*EESC V2200 may be taken at Columbia*)

### **EARTH AND ENVIRONMENTAL ENGINEERING**

- Alternative Energy Resources (*EAE E2002 may be taken at Columbia*)
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## **ELECTRICAL ENGINEERING**

### MATHEMATICS

- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

### PHYSICS

- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)

### COMPUTER SCIENCE

- Programming in JAVA is recommended (CS 201)

### ELECTRICAL ENGINEERING

- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)

### RECOMMENDED COURSES

- *Electronics and Lab (PHYS 343)*
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## **IEOR: ENGINEERING MANAGEMENT SYSTEMS**

### MATHEMATICS

- Linear Algebra (MATH 232)
- Ordinary Differential Equations (MATH 241)

### COMPUTER PROGRAMMING

(The Department **strongly** recommends JAVA over C)

- Computer Programming in JAVA (CS 201)
- Data Structures in JAVA (CS 201)

or

- Computer Programming in C
- Data Structures in C

### ECONOMICS

- Introduction to Accounting and Finance

### PROBABILITY AND STATISTICS

- Intro to Mathematical Statistics and Probability Theory/Application (MATH 265 and 275)
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## **IEOR: FINANCIAL ENGINEERING**

### MATHEMATICS

- Linear Algebra (MATH 232)

### COMPUTER PROGRAMMING

(The Department strongly recommends JAVA over C)

- Computer Programming in JAVA (CS 201)
- Data Structures in JAVA (CS 201)

or

- Computer Programming in C
- Data Structures in C

### ECONOMICS

- Introduction to Accounting and Finance

### PROBABILITY AND STATISTICS

- Introduction to Mathematical Statistics and Probability Theory/Application (MATH 265 and MATH 275)
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## **IEOR: INDUSTRIAL ENGINEERING**

### MATHEMATICS

- Linear Algebra (MATH 232)

### COMPUTER PROGRAMMING

(The Department strongly recommends JAVA over C)

- Computer Programming in JAVA (CS 201)
- Data Structures in JAVA (CS 201)

or

- Computer Programming in C
- Data Structures in C

### ECONOMICS

- Introduction to Accounting and Finance

### PROBABILITY AND STATISTICS

- Introduction to Mathematical Statistics and Probability Theory/Application (MATH 265 and 275)
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## **IEOR: OPERATIONS RESEARCH**

### MATHEMATICS

- Linear Algebra (MATH 232)

### COMPUTER PROGRAMMING

(The Department strongly recommends JAVA over C)

- Computer Programming in JAVA (CS 201)
- Data Structures in JAVA (CS 201)

or

- Computer Programming in C
- Data Structures in C

### ECONOMICS

- Introduction to Accounting and Finance

### PROBABILITY AND STATISTICS

- Introduction to Mathematical Statistics and Probability Theory/Application (MATH 265 and 275)
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## **ENGINEERING MECHANICS**

### MATHEMATICS

- Ordinary Differential Equations (MATH 241)

### ENGINEERING MECHANICS

- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)
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## **MATERIALS SCIENCE AND ENGINEERING**

### PHYSICS

- Classical and Quantum Waves
  - Physics Majors: PHYS 341 or PHYS 344 and PHYS 335
  - Other Majors: PHYS 145 and CHEM 344

### CHEMISTRY

- General Chemistry II with lab (CHEM 230)

### MATHEMATICS

- Ordinary Differential Equations (MATH 241)
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## **MECHANICAL ENGINEERING**

### **MATHEMATICS**

- Ordinary Differential Equations (MATH 241)
- Linear Algebra (MATH 232)

### **PHYSICS/BIOLOGY** (*choose one course listed below*)

- Classical and Quantum Waves (PHYS 341 or PHYS 344 and PHYS 335)
- Environmental Biology (BIO 126)
- Introduction to Molecular and Cellular Biology (BIO 125)

### **ENGINEERING MECHANICS**

- Mechanics PHYS 355 (or ENME E3105 may be taken the summer before or during the first semester at Columbia)

### **ELECTRICAL ENGINEERING**

- Introduction to Electrical Engineering (ELEN E1201 may be taken the summer before or during the first semester at Columbia)
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