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Subject: **Pre-Engineering Program**

Dear Prospective Engineering Student,

Queens College does not have an engineering program of its own, but it does have one of the finest pre-engineering programs in the country. The program is administered by the Physics Department. The basis of the pre-engineering program is the formal articulation agreements it has with the Columbia University engineering school. I am the liaison officer of the program, and also a professor in the Physics Department.

The Columbia plan is a 3-2 plan. After completing your degree requirements, generally within three years at Queens College, you can transfer to the engineering school at Columbia University, provided that you have satisfied the articulated course requirements and have maintained at least a 3.30 GPA while at Queens. You then spend two years at Columbia to complete the engineering program of your choice. At the end of this five-year program you will earn an engineering B.S. degree from Columbia and a B.A. degree in any one of the disciplines from Queens College.

Specific course requirements to be satisfied for admission into Columbia are discussed in the following pages. You may get accepted to Columbia even if you do not meet the GPA requirements, however, lower grades typically means lower acceptance rate, so it is crucial that you perform well in your courses. Please also note that you can apply to transfer in your junior or your senior year of undergraduate study, so even if your junior year application is not successful, you can try again in your senior year. We have had several students in the past who have not been accepted in their first year and re-applied successfully. Others have been accepted and later chosen to defer to a Master's or a PhD program elsewhere. The curriculum requirements for pre-engineering satisfy a range of future careers and provides a smart student cohort at Queens College.

Yet the advantages for this route to an engineering degree from Columbia are cost and location. The tuition at Queens College is a fraction of the tuition at Columbia, so the cost of your engineering degree will be significantly less than if you enter Columbia as a freshman. Further, most of our 3-2 Columbia plan students live in Queens or Nassau County so the cost and time of commuting are greatly reduced.

Once you have read the following information for the program requirements, please take a look at the requirements and the sequence of classes for the Pre-engineering program available: <http://www.physics.qc.edu/undergraduate-programs/>. You will want to take Physics 145/146 and get your non-physics requirements completed as soon as possible.

If you are still interested in the Pre-engineering program, please feel free to drop by my office during my office hours (visit the physics office SB B324 for my office hours). Prior to meeting you should have your transfer credits already evaluated, either by the college, or by the physics transfer credit advisor.

Good luck, and believe in the many opportunities available to you at Queens College!

Dr. So Takei
Assistant Professor in Physics

The Pre-engineering Program

Queens College (QC) does not offer a degree in engineering, but, like many liberal arts colleges in the United States, it has a collection of courses that are the equivalent of the majority of those taken in the first years of an engineering curriculum. In addition to these traditional offerings, QC offers a number of more specialized courses designed primarily for engineering students. Thus, by choosing a proper selection of courses, QC students can usually transfer into third or fourth semester of most engineering programs in the United States.

Articulated transfer agreement has been worked out with Columbia University, one of the leading engineering schools in the country, so that QC students, after completing three years of course work at the College, can transfer to Columbia with minimum difficulty. Students who might wish to transfer to an engineering school with which QC does not have an articulated transfer plan should consult the catalog of that school when planning their academic programs at QC. You should also plan to visit any institution you think may match your interests. In any case, it is important for you to begin considering different engineering schools and start collecting their catalogs early in your time at QC.

The Columbia Plan Program is a 3-2 plan. In the first three years at QC, student must complete the major course requirements for the major of their choice, the general education requirements (including the two W courses) and the pre-engineering course requirements (which are outlined below). Most students opt for majoring in Physics at QC due to the considerable overlap between the B.A. Applied Physics option and the pre-engineering course requirements. The student can also choose to complete the courses at QC in four years rather than three. However, please note that you still must spend additional two years at Columbia in order to complete the Combined Plan in either case. At the completion of the program, the student receives two degrees: a B.S. in engineering from Columbia, and the B.A. degree in his/her chosen major from QC.

Requirements for Admission

Admission into Columbia for applicants who start full-time work at QC in Fall 2019 or later will be considered under the competitive review process. This is a holistic process (see below) that evaluates a candidate's preparation for Columbia's Engineering curriculum, fit for the university, character and recommendations, among other factors. Columbia strongly recommends that candidates meet the following requirements to increase their chances of being accepted:

1. Full-time enrollment at QC for at least the past three years.
2. Minimum **overall GPA*** of 3.50, inclusive of all coursework taken.
3. Minimum **pre-engineering GPA**** of 3.30, inclusive of all pre-engineering science and mathematics prerequisite coursework. (Your requirement here may differ depending on the year in which you started at Queens College. Please speak with the liaison for more details.)
4. A minimum grade of B (GPA of 3.0) must be obtained on the first attempt for each pre-engineering science and mathematics prerequisite course.
5. Successful completion of both the foundational and major-specific prerequisite coursework for your intended major (as listed below) by the end of the spring semester of application.
6. Successful completion of the major and degree coursework prescribed by QC by the end of the spring semester of application.
7. Three favorable recommendation letters: one each from the Combined Plan liaison, a science instructor and a math instructor at QC.
8. Demonstration of English language proficiency (as listed below).

*The overall GPA will be calculated by Columbia using all postsecondary courses for which a student has received credit on the QC transcript.

**The pre-engineering GPA will be calculated by Columbia using all of the prerequisite coursework listed below, with the exception of the courses fulfilling the lab requirement and humanities and social science requirements.

All prerequisite coursework must appear on the QC transcript. **Columbia requires all official transcripts, and the liaison must approve all coursework not taken at QC.**

Advanced Placement, International Baccalaureate, and other standardized exams for placement will be accepted as fulfillment of prerequisite coursework as long as the course credit appears on the QC transcript and is approved by the liaison.

All prerequisite coursework **must be completed by the spring semester of application.** As indicated in the list below, some courses are excluded from this requirement and can be taken once at Columbia.

Noteworthy dates & deadlines:

- **Early December:** Application available online
- **Mid-February:** Deadline to submit application materials
- **Early March:** Deadline to submit financial aid materials
- **April:** Admissions decisions are released to candidates

Students should consult <http://undergrad.admissions.columbia.edu/apply/combined-plan> (and the *Pre-Combined Plan Curriculum Guide*) for further information on the Program. The website also contains information on:

- English proficiency requirements;
- Financial aid policies;
- Housing at Columbia.

Holistic Review Process

The admissions process at Columbia is a holistic one, which means that every part of the application matters to help inform their judgment. They will read personal statements to try to understand each candidate and what motivates them. They will read professor recommendations carefully to understand a candidate's contributions in the classroom and what that candidate might offer their Columbia classmates.

A variety of factors inform Columbia's decision on a candidate:

- **Curriculum and Grades:** a student is avidly pursuing intellectual growth with a rigorous course load.
- **Context:** family circumstances, secondary school, community, interests and access to resources.
- **Extracurricular Activities:** the quality of a student's involvement in activities beyond the classroom.
- **Character:** a student's personality, and the impact they will make on our diverse, residential campus.
- **Fit:** the student's fit for the distinctive Columbia experience, which includes the Core Curriculum; a both traditionally collegiate and unmistakably urban campus life; and an Ivy League school where curious thinkers come to grow.
- **Recommendations:** evidence of intellectual curiosity and promise, classroom and school and community participation, and overall potential for the candidate to make an impact at Columbia, in the classroom and beyond.

Prerequisite coursework

FOUNDATION COURSES REQUIRED OF ALL MAJORS:

MATHEMATICS

- Calculus sequence (Math 151, 152, 201, 202); (alternative: Math 141, 142, 143, 201, 202) [the Math 141/142/143 sequence likely will delay your transfer to Columbia from the end of the junior year to the end of the senior year. Talk to the Liaison if you plan on following this sequence.]

PHYSICS

- Mechanics and Thermodynamics (Phys 145.4/145.1)
- Electricity, Magnetism and Optics (Phys 146.4/146.1)

CHEMISTRY

- General Chemistry I (Chem 113.4/113.1)

COMPUTER SCIENCE

- Introduction to computer science and programming (CSCI 111) [Students interested in majors requiring Java later can take CSCI 212 in addition to CSCI 111.]

HUMANITIES AND SOCIAL SCIENCES

- Principles of Economics (ECON 101).
- English Composition (ENGL 110).
- 27 non-technical credit hours required, including courses that fulfill Economics and English Composition. *Non-technical requirement is satisfied by the course work taken for the bachelor's degree awarded by the home institution. Also, the writing requirements for QC should be met.*

MAJOR-SPECIFIC COURSEWORK REQUIRED:

In addition to the above courses required for all engineering majors, the following are a list of additional courses that are required for specific engineering programs along with the QC course numbers.

APPLIED MATHEMATICS OR APPLIED PHYSICS

MATHEMATICS

- Ordinary Differential Equations (Phys 233)

PHYSICS

- Classical and Quantum Waves (Phys 260)
- Physics Lab (Phys 235)

CHEMISTRY/BIOLOGY [choose one of the following. Chemistry/Biology labs are not required.]

- General Chemistry II (Chem 114.4)
- Physiology and Cell Biology (Biol 105)

BIOMEDICAL ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys233)
- Linear Algebra (Math 231/237).

PHYSICS

- Classical and Quantum Waves (Phys 260)

CHEMISTRY

- General Chemistry II (Chem 114.4)
- General Chemistry II Lab (Chem 114.1)

BIOLOGY

- Introduction to biology I (Biol 105)
- Introduction to biology II (Biol 106)

ELECTRICAL ENGINEERING

- Introduction to Electrical Engineering [this course is not offered at QC but may be taken while at Columbia (the course at Columbia: ELEN 1201).]

COMPUTER SCIENCE

- Introduction to Computer Science and Programming in Python required

CHEMICAL ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys 233)
- Linear Algebra (Math 231/237)

PHYSICS

- Physics Lab (Phys 235)

CHEMISTRY

- General Chemistry II (Chem 114.4)
- General Chemistry Lab (Chem 114.1)
- Organic Chemistry I (Chem 251.4)
- Organic Chemistry Lab (Chem 251.1) [may be taken the summer before entering or while at Columbia (the equivalent course at Columbia: CHEM UN2943).]

COMPUTER SCIENCE

- Introduction to Computer Science and Programming in Python required

CIVIL ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys233)
- Linear Algebra (Math 231/237)

GEOLOGY

- Earth: Origin, Evolution, Processes Future (Geol 101)

ENGINEERING MECHANICS

- Mechanics (Phys 237) [may be taken the summer before entering or while at Columbia (the equivalent course at Columbia: ENME E3105).]

COMPUTER SCIENCE

- Introduction to MATLAB Programming required

COMPUTER ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys 233)

- Linear Algebra (Math 231/237).
- Discrete Math (Math 220)

COMPUTER SCIENCE

- Introduction to Computer Science and Programming in Java (CSCI 212)

ELECTRICAL ENGINEERING

- Introduction to Electrical Engineering [this course is not offered at QC but may be taken while at Columbia (the course at Columbia: ELEN 1201).]

COMPUTER SCIENCE

MATHEMATICS

- Discrete Math (Math 220)

COMPUTER SCIENCE

- Introduction to Computer Science and Programming in Java (CSCI 212)
- Data Structures (CSCI 313) [pre-requisites: CSCI 211, 212, and 220]

EARTH AND ENVIRONMENTAL ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys233)
- Linear Algebra (Math 231/237).

PROBABILITY AND STATISTICS [may be taken the summer before entering or while at Columbia (the equivalent course at Columbia: W3600).]

- Introduction to Probability and Statistics (Math 241)
- Methods of Mathematical Statistics (Math 242)

CHEMISTRY

- General Chemistry II (Chem 114.4)
- General Chemistry Lab (Chem 114.1)

ADDITIONAL SCIENCE ELECTIVE [choose one of the following]

- Organic Chemistry (Chem 251.4)
- Classical and Quantum Waves (PHYS 260)
- Physiology and Cell Biology (Biol 105)

ADDITIONAL COURSES [all to be taken at Columbia.]

- The Climate System (the course at Columbia: EESC UN2100) or The Solid Earth System (the course at Columbia: EESC UN2200)
- A Better Planet By Design (the course at Columbia: EAEE E2100)

ELECTRICAL ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys 233)
- Linear Algebra (Math 231/237)

PHYSICS

- Classical and Quantum Waves (Phys 260)

COMPUTER SCIENCE

- Object-oriented programming (CSCI 211)
- Object-oriented programming (CSCI 212)
- Discrete Structures (CSCI 220)

ELECTRICAL ENGINEERING

- Introduction to Electrical Engineering [this course is not offered at QC but may be taken while at Columbia (the course at Columbia: ELEN 1201).]

ENGINEERING MECHANICS

MATHEMATICS

- Ordinary Differential Equations (Phys 233)

ENGINEERING MECHANICS

- Mechanics (Phys 237) [may be taken the summer before entering or while at Columbia (the equivalent course at Columbia: ENME E3105).]

IEOR: INDUSTRIAL ENGINEERING, ENGINEERING MANAGEMENT SYSTEMS OR OPERATIONS RESEARCH

MATHEMATICS

- Linear Algebra (MATH 231/237)
- Ordinary Differential Equations (Phys 233) [may be taken the summer before entering or while at Columbia (the equivalent course at Columbia: MATH UN2030).] *This course must be taken prior to Columbia for any student with interests in the Financial Engineering major. Students cannot apply to this major until they are already enrolled at Columbia (after the first semester in Columbia Engineering).*

PROBABILITY AND STATISTICS

- Introduction to Probability and Statistics (Math 241)
- Methods of Mathematical Statistics (Math 242)
- Statistical Inference (Math 633)

COMPUTER SCIENCE

- Object-oriented Programming in Java (CSCI 212)
- Data Structures (CSCI 313) [this course has CSCI 211, CSCI 212 and CSCI 220 as prerequisites.]

ECONOMICS

- Introduction to Accounting and Finance (Acct 100) [may be taken the summer before entering or while at Columbia (the equivalent course at Columbia: E2261).] *This course must be taken prior to Columbia for any student with interests in the Financial Engineering major. Students cannot apply to this major until they are already enrolled at Columbia (after the first semester in Columbia Engineering).*

MATERIALS SCIENCE AND ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys 233)
- Linear Algebra (Math 231/237)

PHYSICS

- Classical and Quantum Waves (Phys 260)
- Physics Lab (Phys 235)

CHEMISTRY

- General Chemistry II (Chem 114.4)
- General Chemistry Lab (Chem 114.1)

COMPUTER SCIENCE

- Introduction to Computer Science and Programming in Python required

MECHANICAL ENGINEERING

MATHEMATICS

- Ordinary Differential Equations (Phys 233)
- Linear Algebra (Math 231).

COMPUTER SCIENCE

- Introduction to Computer Science and Programming in Java (CSCI 212)
- Foundations of Data Science [Students must take a substantial equivalent to Foundations of Data Science ORCA E2500 before coming to Columbia. Talk to the Liaison about this equivalent.]

PHYSICS/BIOLOGY [choose one of the following]

- Classical and Quantum Waves (Phys 260)
- Physiology and Cell Biology (Biol 105)

ENGINEERING MECHANICS

- Mechanics (Phys 237) [may be taken the summer before entering or while at Columbia (the equivalent course at Columbia: ENME E3105).]

ELECTRICAL ENGINEERING

- Introduction to Electrical Engineering [this course is not offered at QC but may be taken while at Columbia (the course at Columbia: ELEN 1201).]