

THE ROLLINS COLLEGE

PRE-ENGINEERING PROGRAM

**A GUIDE FOR STUDENTS AND ADVISORS
2022 – 2023**

COOPERATIVE AGREEMENTS WITH

- **CASE WESTERN RESERVE UNIVERSITY**
- **WASHINGTON UNIVERSITY in ST. LOUIS**

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THE COOPERATIVE PRE-ENGINEERING PLAN

Do I want a degree in the liberal arts and sciences or engineering? Why not pursue both and open up new career possibilities?

Rollins College provides students with the opportunity to combine a three-year, well-rounded program in the liberal arts and sciences with two years of professional academic work in engineering at one of the cooperative institutions. Students who successfully complete the program receive the Bachelor of Arts degree from Rollins and the Bachelor of Science degree from the cooperative engineering program.

Pre-Engineering students bring a diversity of knowledge that allows them to solve more complex problems in more creative ways than the average engineering student. The additional time spent broadening their educational experience in the arts, social sciences, and humanities allows pre-engineering students to find wide-ranging careers compared to the average engineering student.

Furthermore, in-depth study in the natural and mathematical sciences (beyond the core requirements) provides students with a scientific background, which better prepares them for a career in engineering. Perhaps the greatest advantage of the cooperative pre-engineering plan is that it affords students the opportunity to explore a number of academic disciplines, while at the same time preparing for a potential career in engineering. The program of study during the first two years is compatible with that of students majoring in mathematics, physics, or chemistry. In addition, after one year, a student can decide to pursue a major in the arts, social sciences, or humanities and still complete all degree requirements for the Rollins BA within four years.

DEGREE REQUIREMENTS

In order to receive the BA degree in pre-engineering from Rollins College, students must complete a set of core requirements in the sciences and mathematics, satisfy the general education requirements of the College, complete an approved area of concentration within one of the established majors offered by the College, and complete a total of at least 105 semester hours during the three years at Rollins. In addition, students must successfully complete at least 35 semester hours at one of the cooperating institutions.

To earn the BS degree from one of the cooperating institutions, students must satisfy all the degree requirements of the engineering school. These requirements are normally met by the end of the fifth year of study. In order to satisfy the requirements of this program they must complete at least 35 hours of study at one of the cooperative engineering schools. A 4-2 is possible if the student needs to satisfy pre-reqs before entering the pre-engineering required classes. However, it is very important for students to understand that they should not complete all requirements for a degree other than pre-engineering or they will be forced to graduate from Rollins prior to attending the partner school. This would void the agreement with the partner school. If the student has questions about this please contact the program coordinator.

PROGRAM OF STUDY

Area of Concentration

Each student must complete an area of concentration approved by the Coordinator of the Cooperative Pre-Engineering Program. These concentrations are normally quite similar to a minor in the field and usually are in one of the following areas: physics, chemistry, mathematics, or computer science. Although other areas are possible, it is difficult for the student to complete a sufficient number of courses in a three-year period unless some of the introductory courses in the area of concentration are also included in the core requirements. The required courses in the approved areas of concentration can be seen below:

Physics

PHY 130 Principles of Physics I
PHY 131 Principles of Physics II
PHY 220 Mathematical Methods for Physical Sciences I
PHY 221 Mathematical Methods for Physical Sciences II
PHY 230 Modern Physics
PHY 232 Experimental Physics
PHY 300 Thermodynamics
PHY 308 Mechanics
PHY 314 Electricity and Magnetism

Chemistry

CHM 120 Chemistry I
CHM 121 Chemistry II
CHM 220 Organic Chemistry I
CHM 221 Organic Chemistry II
CHM 305 Physical Chemistry I
CHM 306 Physical Chemistry II
plus two approved courses in chemistry at the 300 or 400 level.

Mathematics

MAT 111 Calculus I
MAT 112 Calculus II
MAT 140 Introduction to Discrete Mathematics
MAT 211 Calculus III
MAT 219 Probability and Statistics
MAT 230 Linear Algebra
MAT 305 Ordinary Differential Equations
One additional course in mathematics at the 300 or 400 level.

Computer Science

MAT 140 Introduction to Discrete Mathematics
CMS 310 Applied Discrete Mathematics
CMS 120 Intro to Computer Science
CMS 121 Programming and Software Development
CMS 230 Introduction to Computer Systems
CMS 270 Object-Oriented Design & Development
CMS 330 System Software Principles

The choice of the area of concentration will depend on a student's interests and the sub-discipline of engineering they intend to pursue at a cooperative institution. Students interested in the pre-engineering program should consult with the program coordinator when selecting a concentration as there may be multiple options leading to the student's eventual field of interest. **NOTE: the PHYSICS track (plus a few electives) will set the student up for success in most areas of engineering.**

CORE REQUIREMENTS

1. Mathematics (5 courses)
MAT 111- 112 Calculus I and II
MAT 211 Calculus III
MAT 230 Linear Algebra
MAT 305 Ordinary Differential Equations

Or

MAT 111- 112 Calculus I and II
PHY 220 and PHY 221

2. Physics (4 courses)
PHY 130 Principles of Physics I
PHY 131 Principles of Physics II
PHY 230 Modern Physics
PHY 232 Experimental Physics II
3. Chemistry (2 courses)
CHM 120 Chemistry I
CHM 121 Chemistry II
4. Computer Programming (1 course)
CMS 120 + CMS 120L Intro to Computer Science

Or

PHY 425 Computational Physics

GENERAL EDUCATION REQUIREMENTS

In addition to completing the General Education requirements of Rollins College, pre-engineering students must also satisfy any general education requirements of the cooperative engineering program to which they intend to apply. It is important to plan the elective and general education courses taken at Rollins College, in order to satisfy as many of the cooperative program-specific general education requirements as possible. The cooperative program general education requirements are listed below:

- **Case Western Reserve**
 1. Twenty-one (21) semester hours in Humanities and Social Sciences
 2. One English composition course

- **Washington University in St. Louis**
 1. Fifteen semester hours in the humanities and social sciences. This sequence must include at least two courses in humanities, at least two courses in the social sciences.
 2. English composition: One course, acceptable examination scores, or college certification of proficiency.

For additional information on these requirements, the student should meet with the Pre-Engineering program coordinator.

Suggested sequence of courses

One of the most important courses to begin for students interested in engineering is Calculus. While there is some flexibility in the order of other courses, many depend on students successfully navigating the calculus 1 and 2 sequence. An example sequence of courses used to satisfy the core requirements is given below. Students should contact the pre-engineering coordinator to build a 3-year plan that best suits the student's situation.

First Year

Fall

PHY 130¹
MAT 111¹
RCC
Elective

Spring

PHY 131
MAT 112
ENG 140
rFLA 100

Second Year

Fall

CHM 120
PHY 220
PHY 230
rFLA 200
Elective³

Spring

CHM 121
PHY 221
rFLA 200
Language²
Elective

Third Year

Fall

PHY 232
Elective
Elective
Language
rFLA 300

Spring

CMS 120 or PHY 425
Elective
Elective
Language

1. Students who have had AP Physics and AP calculus in high school and have done well in their AP exams in those subjects, with consent, may be able to start their physics and calculus studies at the sophomore level.
2. Students may test into higher levels of language courses to satisfy the language competency at the 200-level.
3. Electives will depend on the engineering field of choice. This choice should, at the least, be narrowed down, by spring of the student's sophomore year.

ENGINEERING DISCIPLINES

There is a wide variety of engineering disciplines available to students through the three cooperating institutions. The descriptions of and requirements for these programs are given at the three university Web sites. Studying the requirements of these programs should help students in the selection of their area of concentration, as well as their elective courses. A list of these disciplines by institution is given below:

- **Case Western Reserve** (<https://engineering.case.edu>)
 - Biomedical Engineering
 - Civil Engineering
 - Electrical Engineering
 - Materials Science
 - Systems & Control Engineering
 - Chemical Engineering
 - Computer Engineering
 - Macromolecular Science
 - Mechanical & Aerospace Engineering
- **Washington University in St. Louis** (<http://engineering.wustl.edu/>)
 - Biomedical Engineering
 - Computer Science & Engineering
 - Data Science Engineering
 - Electrical & Systems Engineering
 - Energy, Environmental & Chemical Engineering
 - Mechanical Engineering & Materials Science

APPLICATION PROCEDURE

Students should begin the application procedure for admission to engineering school early in the fall term of their junior year. The deadlines for receipt of materials vary by institution, but in general, we encourage students, especially those interested in financial aid, to submit their applications by the end of the fall term.

The minimum grade-point average required for admission will vary by engineering program. **Case Western Reserve requires a minimum 3.0 GPA overall and in science and mathematics courses. Washington University in St. Louis requires a 3.25 GPA. Most applicants have a GPA substantially above these minima.**

To initiate the application procedure, students should contact the Coordinator of the Cooperative Pre-Engineering Program. Students are, in general, encouraged to apply to more than one institution.

GRADUATE ENGINEERING

In addition to the programs leading to the BS degree, there are several programs that allow a student to also earn a masters degree within a total period of six years. Students interested in graduate engineering may major in any field, but must complete the same core requirements of the cooperative pre-engineering program.

Washington University in St. Louis offers a plan by which a student may complete the BA degree from Rollins, the BS degree in engineering and an engineering Master's degree on a 3-3 or 4-3 schedule. For details on all of these options, see the Coordinator of the Cooperative Pre-Engineering Program.