PRE-ENGINEERING PROGRAMS

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Introduction

The 2+2 Pre-Engineering program covers the first two years of a four-year engineering major and is staffed by faculty from the Pre-Engineering Program in the Department of Quantitative Sciences. After two years at Canisius students transfer to an Engineering School of their choice to complete the engineering degree. The 2+2 program covers the science, mathematics and computer programming that form the basis of study for the first two years of most engineering school curricula. This program is perhaps better suited to students closely focused on a specific engineering field or career path. Many students pursue their engineering degree at University at Buffalo (UB), and Canisius maintains close contact with UB. For a more detailed description of the program and faculty, visit the Pre-engineering website (https://www.canisius.edu/academics/programs/undergraduate/pre-engineering-22-transfer-program/).

Double Majors

Students who wish to expand their educational opportunities may decide to declare a double major. This decision may be based on career goals, planned graduate studies, and/or other student interests. Before a student declares a double major, it is important to meet with the appropriate academic departments for advisement. In order to declare a double major, the student must complete the Major/Minor Declaration form. This form will be submitted electronically and reviewed and approved by each department chairperson as well as the appropriate associate dean.

Per university policy, each additional major requires a minimum of 15 credits that do not apply to the student's first or subsequent major. Some double major combinations can be completed within the minimum 120 credit hour degree requirement, but in other cases, additional coursework may be required. Please note that students will only receive **one** degree unless completing the dual degree (https://catalog.canisius.edu/undergraduate/academics/curricular-information/) requirement, including at least 150 undergraduate credit hours, regardless of the number of majors they complete. Both (all) majors appear on a student's transcript.

Qualifications

Transfer and completion of the engineering degree at the second institution requires an admissions process at the second institution and satisfaction of the degree requirements, including core and/ or general education requirements, of that institution. **Entering students should be prepared to take Calculus 1 (**MAT 111**) their first semester.**

Advisement

All students should have an advisor in the major and should contact the department directly to have an advisor assigned if they do not already have one. Meetings with academic advisors are required prior to students receiving their PIN for course registration each semester. All majors should work closely with their advisor in discussing career expectations, choosing their major electives, developing their entire academic program and planning their co-curricular or supplemental academic experiences.

Careful consultation with an advisor is particularly important due to the tremendous number of pre-requisites in most engineering courses and the varied requirements of different engineering majors.

Free Electives

Students should consult with an advisor in Pre-Engineering to discuss any elective-course choices to ensure timely completion of the program. **Careful advising is a must in this program**. The Introduction to the Makerspace (EGR 107), Linear Algebra (MAT 219), Organic Chemistry (CHM 227- CHM 228) or additional computer science courses (CSC 111, CSC 112, CSC 213) may be valuable electives depending on the Engineering discipline that the student will transfer into.

Minors in Other Disciplines

Minors provide students the opportunity to pursue additional interests but generally do not require as many courses as a major. Minors generally range from five to eight required courses. To receive a minor, the student must complete at least 9 credit hours of coursework distinct from their other credentials (i.e., majors, other minors). The complete list of minors is available on the Canisius website (https://www.canisius.edu/academics/programs/undergraduate/?type%5B%5D=17) and in the catalog (https://catalog.canisius.edu/undergraduate/minors/) and provides links to each minor. Some majors and minors can be completed within the minimum 120 credit hour degree requirement, but in some cases additional coursework may be required. Students must complete the appropriate minor request form.

- 2+2 Program (http://catalog.canisius.edu/undergraduate/division-arts-education-sciences/school-natural-environmental-animal-sciences/pre-engineering-programs/2-2-program/)
  Note: Students in this program (The Pre-Engineering 2+2 program) do not complete a degree at Canisius, but transfer to an engineering institution. Instead of completing the Core Curriculum at Canisius, students complete the general studies requirements at the engineering institution.
- Pre-Engineering Minor (http://catalog.canisius.edu/undergraduate/division-arts-education-sciences/school-natural-environmental-animal-sciences/pre-engineering-minor/)
- Applied Physics Certificate (http://catalog.canisius.edu/undergraduate/division-arts-education-sciences/school-natural-environmental-animal-sciences/pre-engineering-programs/applied-physics/)

EGR 107 An Introduction to the Makerspace **3 Credits**
A makerspace is a communal workshop where people can come together to create, invent, and work on projects using various tools and technologies, ranging from traditional crafts to high-tech equipment like 3D printers and laser cutters. These spaces encourage collaboration, learning, and exploration among individuals of all ages (makerspaces.com). This course will introduce a couple of common makerspace tools like 3D printers and Arduino microprocessors. No background is required. A key skill in engineering is design. More time spent in designing and prototyping leads to less time and expense with the final product. This course will introduce students to Computer Assisted Design (CAD) programs. For the 3D printers, the students will learn how to produce STL and gcode files. For the Arduino, the students will learn about electronics sketching and some rudimentary C ++ programming.
Prerequisite: None. **Corequisite:** None.
Offered: every spring.

EGR 111 Introduction to Engineering Design **3 Credits**
This first course is an introduction to the field of engineering. Students are introduced to engineering analysis and design through projects in robotics. The students will gain an overview of the various engineering fields and will be instructed in professional ethics and etiquette.
Offered: fall.

EGR 207 Engineering Statics **3 Credits**
Students study forces and torques on rigid bodies, couples, moments, centroids and moments of inertia. They consider equilibrium conditions, friction, free body diagrams, applications to beams, trusses, frames, and other structures.
Prerequisite: PHY 223 & MAT 112.
Offered: fall.

EGR 208 Engineering Dynamics **3 Credits**
Students learn about the kinematics of particles and rigid objects. Topics include D'Alembert's Principle, moving reference frames, work-energy methods, impulse, and momentum vibration with applications to engineering problems.
Prerequisite: EGR 207.
Offered: spring.

EGR 211 Engineering Thermodynamics **3 Credits**
Students learn the fundamental concepts and laws of thermodynamics, equilibrium with applications to physical and chemical systems.
Prerequisite: PHY 223.
Offered: fall.

EGR 214 Strength of Materials **3 Credits**
Students investigate the behavior of materials under mechanical loading. The topics include stress and strain relationships, shear, bending moments, torsion, deflection, beams, columns, energy methods, and failure criteria.
Prerequisite: EGR 207.
Offered: spring.