

# PRE-ENGINEERING PROGRAMS

Director: Michael Wood (wood5@canisius.edu), PhD

## 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 Physics Department. 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. The 3+2 dual degree program allows students to complete a physics major from Canisius, providing an extensive grounding in both science and engineering that can open the doors to advanced engineering and technology studies in a wide range of fields. The 2+2 program is perhaps better suited to students closely focused on a specific engineering field or career path. The 3+2 program is particularly suited to students who are strongly interested in demanding scientific or industrial research and development careers, particularly in an interdisciplinary area. The dual degree program includes an articulation agreement for students interested in pursuing Mechanical Engineering at the Pennsylvania State University at Erie, The Behrend College. Many students also 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 Physics website (<https://www.canisius.edu/academics/programs/physics>).

## Double Majors

Students who wish to expand their educational opportunities may decide to declare a double major. The decision may be based on career goals or planned graduate studies. Before a student declares a double major, it is important to meet with the appropriate academic departments for advisement. Some double major combinations can be completed within the minimum 120 credit hour degree requirement, but in some cases additional course work may be required. In order to declare a double major, the student must complete the appropriate double major request form and get the signature of each department chairperson and the appropriate associate dean. Please note that students will receive only one degree, regardless of the number of majors they complete.

Students interested in advanced scientific or engineering study may be best served by the dual degree Engineering and Physics program, while students clearly focused on a specific engineering discipline are encouraged to pursue the 2+2 program. It is possible to switch between the two programs easily in the first year of study. Some students choose to remain at Canisius after completing the program to pursue other majors such as physics, mathematics, chemistry or computer science, and the transfer into these other majors is simple and straightforward.

## 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 Physics or Engineering to discuss their elective course choices to ensure timely completion of both degrees. Careful advising is a must in this program. 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.

## 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. The minors page (<http://catalog.canisius.edu/undergraduate/minors>) provides a complete list of 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/college-arts-sciences/physics/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.
- 3+2 Program (<http://catalog.canisius.edu/undergraduate/college-arts-sciences/physics/pre-engineering-programs/3-2-program>)  
Students in the 3+2 dual degree program complete the general education requirements as part of their overall Canisius education. These requirements can be found in the Core Curriculum (<http://catalog.canisius.edu/undergraduate/academics/curricular-information/core-curriculum>) or All-College Honors Curriculum (<http://catalog.canisius.edu/undergraduate/academics/curricular-information/all-college-honors-program>) sections of the catalog.

### 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.