

# Binary Engineering Program



Department  
of Physics

*Mind, heart and spirit.*



DEPARTMENT OF PHYSICS  
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**Binary Engineering** is a **five year dual degree** program between the Department of Physics at Duquesne University and the School of Engineering at either the University of Pittsburgh or Case Western Reserve University. The program leads to a **Bachelor of Arts in Physics** from Duquesne University and a **Bachelor of Science in Engineering** from either Pitt or Case Western Reserve.

**The 3/2 model.** Years 1, 2 and 3 are spent at Duquesne University for a minimum of 100 credits, 25 of them in physics. At the end of year 3 students formally transfer to Pitt or Case Western, for years 4 and 5 of the program. Depending on the engineering major of choice, between 74 and 86 credits are transferable from the Physics major to the Engineering major. Most engineering majors can be completed in years 4 and 5 without the need to take summer classes. In all cases, close advisement and proper planning of the five years is required, which is accomplished under the simultaneous guidance of advisors from both Schools. At the completion of the requirements for the engineering degree, 20 credits transfer back to Duquesne in order to complete the physics degree.

**The Physics major.** Binary engineering students at Duquesne receive the attention that every student in the major enjoys. They are also entitled to every opportunity open to Physics majors, such as **student employment** as tutors or lab assistants, and **undergraduate research**.

**The advantage.** When binary engineering students transfer to Engineering School, they take with them a solid foundation of rigorous study habits and problem solving skills. They also carry with them a unique perspective to approach engineering problems where physics is involved. The physics degree enhances the marketability of the engineering degree by combining it with hard skills that are very rare in the job market.

**Zero risk.** Even if you change your mind about the Physics degree soon enough, if you qualify for admission, you may transfer directly from the freshman year at Duquesne into the sophomore year at Engineering school, because the **freshman year is common to both**. There is nothing to lose for the opportunity to experience learning of the highest quality in a liberal arts setting.

If your mind is set on engineering, but there is still room for physics in your heart, ask us about our Binary Engineering program. Chances are you'll find it just right for you.





## Binary Engineering Program

The binary engineering program is a **five-year dual-degree** program leading simultaneously to

- A Bachelor of Arts degree in **physics** from Duquesne University and
- A Bachelor of Science degree in an **engineering major** from the University of Pittsburgh or from Case Western Reserve University

The program begins at Duquesne University and requires candidates to transfer to the participating university for completion. Articulation agreements between Duquesne University and the engineering schools of the participating universities guarantee admission into engineering school to all Duquesne candidates who meet the specified requirements:

- Completion of at least 100 Duquesne credits counting towards the physics major
- Completion of all prerequisite courses for transfer
- Meeting minimum GPA requirements for each engineering school or major
- A favorable recommendation from the Duquesne binary engineering liaison

At the completion of all engineering requirements, candidates must transfer engineering credits back to Duquesne to complete the physics degree.

During the Duquesne phase of the program, candidates may need to cross-register for engineering pre-requisite courses at the University of Pittsburgh, depending on the engineering major of choice. Cross-registration benefits are limited to one free course in addition to twelve Duquesne credits per semester.

This document describes the requirements for the physics degree and for transfer to engineering school at the end of the third year of the program.

### Requirements for the Bachelor of Arts degree in physics

The bachelor of arts degree requires a **total of 120 credits**, with a minimum of 32 credits in grade-carrying physics courses. A minimum grade of C is required in all physics courses. In addition to the physics coursework, there are mathematics, computer science, and chemistry requirements as well as the university core of general education requirements common to all Duquesne programs.

<b>Basic Physics Sequence</b>	<b>15</b>	<b>Math and Computer science</b>	<b>24</b>
PHYS 211 General Analytical Physics 1	3	MATH 115 Calculus 1	4
PHYS 211L General Analytical Physics 1 lab	1	MATH 116 Calculus 2	4
PHYS 212 General Analytical Physics 2	3	MATH 215 Calculus 3	4
PHYS 212L General Analytical Physics 2 lab	1	MATH 210 Matrix Algebra or MATH 310 Linear Algebra	3
PHYS 302 Optics	3	MATH 314 Differential Equations	3
PHYS 312 Optics lab	1	Elective math: numerical analysis or statistics	3
PHYS 374 Modern Physics	3	Programming: C++ or Java	3
<b>Advanced physics electives</b>	<b>17</b>	<b>Chemistry</b>	<b>10</b>
Choose from:		CHEM 121 General Chemistry 1 (or honors)	4
PHYS 332 Electronics (3)		CHEM 121L General Chemistry 1 lab (or honors)	1
PHYS 350 Math Methods in Science (3)		CHEM 122 General Chemistry 2 (or honors)	4
PHYS 364 Modern Physics lab (1)		CHEM 122L General Chemistry 2 lab (or honors)	1
PHYS 401 Thermal Physics (3)		<b>Bayer School Core</b>	<b>13</b>
PHYS 404 Solid State Physics (3)		ENLG 302W Science Writing	3
PHYS 405 Gravitational Astrophysics (3)		Science&Society requirement (HIST 309/307 or PHIL 259)	3
PHYS 461 Mechanics (4)		SPRG 105 Career development seminar	1
PHYS 470 Electricity and Magnetism (3)		Free electives	6
PHYS 473 Electrodynamics (3)		<b>University Core</b>	<b>28</b>
PHYS 474 Quantum Mechanics (3)		Information literacy, English 1, English 2, Ethics, Theology, Philosophy, Creative Arts, Social Justice, Global Diversity, Faith & Reason.	
PHYS 475 Advanced Quantum Mechanics (3)			
PHYS 482W Particle Physics (3)			
PHYS 485 Relativity (3)		<b>Free electives</b>	<b>13</b>
PHYS 491 Introductory Materials Science 1 (3)			
Any advanced elective in PCHE with departmental approval			
<b>Total = 120 credits</b>			



## Requirements for transfer

In order to be admitted into the second phase of the program at the participating engineering school, candidates must meet the following requirements:

Minimum Duquesne credits	Minimum Duquesne GPA
100 credits counting towards the physics degree: Basic physics sequence (15 credits) Advanced physics electives: <b>at least</b> 10 credits Chemistry (10 credits) Math and computer science: 24 credits BSNES core (13) University Core: 25-28 credits including <b>UCOR 151 Philosophical Ethics</b> (Ethics) <b>COMM 102 Public Speaking</b> (Faith & Reason) <b>ECON 201 Micro Economics</b> (Social Justice and social science)	Pitt bioengineering: 3.50 GPA and 3.00 average in science and math Pitt all other majors: 3.00 GPA and 3.00 average in science and math Case all majors: 3.00 GPA and 3.00 average in science and math
	Pre-requisite coursework
	As per articulation agreements, see curriculum guides.
	Recommendation letter
	Positive recommendation from Dr. Simonetta Frittelli to be included in the candidate's application to Pitt or Case

## Instructions for cross-registration

Pre-requisite engineering courses must be taken by cross-registration and are limited to one per semester. Early planning is strongly recommended. Candidates must decide for one of the engineering majors NO LATER than the spring semester of the sophomore year. To make a decision, candidates must learn about **engineering majors** by visiting the participating school websites:

- Case School of Engineering – Case Western Reserve University: <http://engineering.case.edu/delpp/dualdegree>
- Swanson School of Engineering – University of Pittsburgh: [www.engineering.pitt.edu](http://www.engineering.pitt.edu)

Once a major is chosen, and the corresponding pre-requisite courses are identified, candidates must obtain the **numerical code** necessary to be admitted into all engineering courses at Pitt. This code can be obtained through the Bayer School academic advisor, Ms. Dorothy Rigby. The numerical code **must be used** when registering or enrollment will be denied in that class.

## Instructions for transfer

It is the candidate's responsibility to apply for transfer to the participating engineering school during the spring semester of the junior year. Instructions for transfer, including deadlines and application requirements, are found online at:

- Case School of Engineering – Case Western Reserve University: <https://case.edu/admission/>
- Swanson School of Engineering – University of Pittsburgh: [oafa.pitt.edu/apply/admissions-process/transfers/](http://oafa.pitt.edu/apply/admissions-process/transfers/)

## Articulation agreements and curriculum guides

As a candidate in the binary engineering program, you have two schools to call home: Duquesne and the participating engineering school. Both schools work together to make your path as smooth as possible through their liaisons. Visit the binary engineering links of both schools to become familiar with all the resources available to you, including the articulation agreements, curriculum guides, and advisement:

- Case School of Engineering – Case Western Reserve University: [engineering.case.edu/delpp/dualdegree](http://engineering.case.edu/delpp/dualdegree)  
Liaison: **Ms. Debbie Fatica, dxf3@case.edu**
- Swanson School of Engineering – University of Pittsburgh: visit [www.academic.pitt.edu/articulation/aa2001.htm](http://www.academic.pitt.edu/articulation/aa2001.htm) and click on **Duquesne University**.  
Liaison: **Mr. Chris Kirchof, chk63@pitt.edu**

Curriculum guides and articulation agreements are also available from your Duquesne binary engineering liaison: **Dr.**

**Simonetta Frittelli.**

## Frequently asked questions

- *Does my scholarship transfer to the partner university?* No, once you transfer you are eligible for financial aid through the partner university only.
- *Will I be eligible for cooperative internships?* Yes, after you transfer you become eligible for all opportunities at the partner institution.
- *If I am declined for transfer, can I just take my Duquesne degree?* Yes! But only after you complete the requirements for the bachelor of arts.



### Typical course sequence

Because the pre-requisite courses differ with the engineering major of choice, course sequences for all majors will also be slightly different. However, all common requirements will follow the same typical sequence:

Common requirements				total credits: 100
Freshman year	<i>Fall</i>	17	<i>Spring</i>	16
PHYS 211+211L GAP 1 + lab		4	PHYS 212+212L GAP 2 + lab	4
MATH 115 Calculus 1		4	MATH 116 Calculus 2	4
CHEM 121+121L Gen Chem 1 + lab		5	CHEM 122+122L Gen Chem 2+ lab	5
English 1		3	COSC 150 Programming C++ (recommended option)	3
UCOR 030 Information Literacy		1		
Sophomore year	<i>Fall</i>	17	<i>Spring</i>	16
PHYS 302 Optics		3	PHYS 374 Modern Physics	3
PHYS 312 Optics lab		1	Basic philosophical questions	3
MATH 215 Calculus 3		4	MATH 314 Differential Equations	3
MATH 210 Matrix Algebra		3	ENGL 302W Science writing	3
English 2		3	Math elective: statistics or numerical analysis	3
PHYS 332 Electronics (recommended PHYS elective 1)		3	SPRG 105 Career seminar	1
Junior year	<i>Fall</i>	16	<i>Spring</i>	18
PHYS elective 2		4	PHYS elective 3	3
Creative Arts		3	Social Justice	3
UCOR 151 Philosophical Ethics		3	Global Diversity	3
COMM 102 Public Speaking		3	HIST 307/309 or PHIL 254 Science and society requirement	3
PHYS elective 4 (or X-reg if required)		3	Theology	3
			PHYS elective 5 (or X-reg if required)	3

All university core requirements can be taken at any time and in any order. The physics electives are also somewhat flexible. Pre-requisite engineering courses that are specific to the engineering major as prescribed by the curriculum guide must be accommodated as free electives or as additional credits around this typical schedule. If an engineering major has no mandatory engineering pre-requisites, **the priority is for PHYS electives.**

### Engineering majors

	Case	Pitt
Aerospace engineering	x	
Biomedical engineering	x	x
Chemical engineering	x	x
Civil engineering	x	x
Computer engineering	x	x
Electrical engineering	x	x
Engineering science	x	x
Industrial engineering		x
Materials science engineering	x	x
Mechanical engineering	x	x
Mining engineering		x
Petroleum engineering		x
Macromolecular science & engineering	x	
Systems and Control engineering	x	