

# BACHELOR OF SCIENCE IN APPLIED PHYSICS

According to the *Princeton Review*: "With technology's constantly expanding influence in our society, a major in applied physics could place you at the forefront of the next technology revolution." Applied physics combines fundamental research in physics with knowledge of how to solve real-world problems, thus putting graduates of this major in high demand by employers. Through research in applied physics, lasers in DVD players, flash memories in iPods, diagnostic tools for medicine, and many other cutting edge technologies have been developed. With this degree, graduates will be prepared to immediately begin a career in a multitude of different areas or to enter into a graduate program in physics, engineering, or a non-physics related field. College Board sums up this degree in one word: flexibility.

The Bachelor of Science in Applied Physics degree provides an option for students who have a strong affinity for physics but who wish to pursue a career in application of basic scientific principles to the design of equipment, which includes electronic and electro-mechanical systems for use in measurements, communications, and data acquisition. The program is recommended for students interested in newly developing areas of physics, high technology, instrumentation, and communications. It provides students with a solid physics background while allowing for a significant engineering or other technical concentration.

## Required Courses

Code	Title	Credit Hours
<b>Physics Requirements</b>		<b>(49)</b>
PHYS 100	Intro to the Profession	2
PHYS 123	General Physics I: Mechanics	4
PHYS 221	General Physics II: Electricity and Magnetism	4
PHYS 223	General Physics III	4
PHYS 240	Computational Science	3
PHYS 300	Instrumentation Laboratory	4
PHYS 301	Mathematical Methods of Physics	3
PHYS 304	Thermodynamics and Statistical Physics	3
PHYS 308	Classical Mechanics I	3
PHYS 309	Classical Mechanics II	3
PHYS 405	Fundamentals of Quantum Theory I	3
PHYS 406	Fundamentals of Quantum Theory II	3
PHYS 413	Electromagnetism I	3
PHYS 414	Electromagnetism II	3
PHYS 427	Advanced Physics Laboratory I	3
PHYS 485	Physics Colloquium	1
<b>Specialization Requirements</b>		<b>(27)</b>
Select 27 credit hours in a specific engineering, math, or science discipline <sup>1</sup>		27
<b>Mathematics Requirements</b>		<b>(18)</b>
MATH 151	Calculus I	5
MATH 152	Calculus II	5
MATH 251	Multivariate and Vector Calculus	4
MATH 252	Introduction to Differential Equations	4
<b>Technical Electives</b>		<b>(6)</b>
Select six credit hours, approved by the advisor, from the physics, mathematics, computer science, or engineering departments		6
<b>Chemistry Requirement</b>		<b>(4)</b>
CHEM 124	Principles of Chemistry I with Laboratory	4
<b>Computer Science Requirement</b>		<b>(2)</b>
Select one of the following:		2
CS 104	Introduction to Computer Programming for Engineers	2
CS 105	Introduction to Computer Programming	2
CS 115	Object-Oriented Programming I	2
<b>Interprofessional Projects (IPRO)</b>		<b>(6)</b>
See Illinois Tech Core Curriculum, section E		6

<b>Humanities and Social Science Requirements</b>	<b>(21)</b>
See Illinois Tech Core Curriculum, sections B and C	21
<b>Total Credit Hours</b>	<b>133</b>

<sup>1</sup> See the Specializations tab for a few recommended specializations.

## Bachelor of Science in Applied Physics Curriculum

		Year 1	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 100	2	MS 201 <sup>1</sup>	3
PHYS 123	4	PHYS 221	4
CHEM 124	4	MATH 152	5
MATH 151	5	Humanities 200-level Course	3
		Humanities or Social Sciences Elective	3
<b>15</b>		<b>18</b>	
		Year 2	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 223	4	PHYS 240	3
MATH 251	4	PHYS 304	3
Specialization Course <sup>2</sup>	4	MATH 252	4
Social Sciences Elective	3	Specialization Course <sup>2</sup>	4
Computer Science Course <sup>3</sup>	2	Humanities Elective (300+)	3
<b>17</b>		<b>17</b>	
		Year 3	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 300 <sup>4</sup>	4	PHYS 309	3
PHYS 301	3	Technical Elective <sup>5</sup>	3
PHYS 308	3	I PRO Elective I	3
Specialization Course <sup>2</sup>	3	Specialization Course <sup>2</sup>	4
Social Sciences Elective (300+)	3	Humanities Elective (300+)	3
<b>16</b>		<b>16</b>	
		Year 4	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 405	3	PHYS 406	3
PHYS 413	3	PHYS 414	3
PHYS 427	3	PHYS 485	1
I PRO Elective II	3	Technical Elective <sup>5</sup>	3
Specialization Course <sup>2</sup>	3	Specialization Course <sup>2</sup>	3
Social Sciences Elective (300+)	3	Specialization Course <sup>2</sup>	3
<b>18</b>		<b>16</b>	

**Total Credit Hours: 133**

<sup>1</sup> MS 201 is only required for the aerospace engineering and mechanical engineering specializations. For other specializations, students should choose one of the specialization course options.

<sup>2</sup> A minimum of 27 credit hours are required in a specific engineering, math, or science discipline. See the Specializations tab for a few examples of engineering specializations. Courses should be chosen in consultation with an academic adviser.

<sup>3</sup> Choose from: CS 104, CS 105, or CS 115 based on your specialization.

<sup>4</sup> For students who choose the electrical engineering specialization, PHYS 300 is satisfied by ECE 211, ECE 213, and ECE 218.

<sup>5</sup> See the Specializations tab for technical electives listed in some approved engineering specializations.

## Engineering Specializations for Applied Physics

Courses should be chosen in consultation with an academic adviser. Approved specializations for the Bachelor of Science in Applied Physics degree include, but are not limited to, the following:

### Aerospace Engineering

Code	Title	Credit Hours
<b>Required course</b>		<b>(27)</b>
MS 201	Materials Science	3
Students should take the following courses:		
MMAE 200		3
MMAE 202	Mechanics of Solids	3
MMAE 304	Mechanics of Aerostructures	3
MMAE 311	Compressible Flow	3
MMAE 312	Aerodynamics of Aerospace Vehicles	3
MMAE 313	Fluid Mechanics	3
MMAE 320	Thermodynamics	3
MMAE 372	Aerospace Materials Lab	3
The three credit hours of technical electives may be chosen from the following:		
MMAE 352	Aerospace Propulsion	3
MMAE 410	Aircraft Flight Mechanics	3
MMAE 411	Spacecraft Dynamics	3
MMAE 412	Spacecraft Design I	3
MMAE 414	Aircraft Design I	3
MMAE 443	Systems Analysis and Control	3
<b>Total Credit Hours</b>		<b>27</b>

### Electrical Engineering

Code	Title	Credit Hours
Students should take the following courses:		
ECE 211	Circuit Analysis I	3
ECE 213	Circuit Analysis II	4
ECE 218	Digital Systems	4
ECE 308	Signals and Systems	3
ECE 311	Engineering Electronics	4
ECE 319	Fundamentals of Power Engineering	4
MATH 333	Matrix Algebra and Complex Variables	3
The remaining six credit hours may be chosen from the following:		6
ECE 408	Introduction to Computer Networks	3
ECE 411	Power Electronics	4
ECE 412	Hybrid Electric Vehicle Drives	4
ECE 417	Power Distribution Engineering	3
ECE 418	Power System Analysis	3
ECE 429	Introduction to VLSI Design	4
ECE 436 or ECE 437	Digital Signal Processing I with Laboratory Digital Signal Processing I	3-4
ECE 438	Control Systems	3
ECE 446	Advanced Logic Design	4
<b>Total Credit Hours</b>		<b>31</b>

In addition, three credit hours of technical electives may be chosen from the ECE courses listed above if the required course, PHYS 300, is satisfied by ECE 211, ECE 213, and ECE 218.

**Mechanical Engineering**

<b>Code</b>	<b>Title</b>	<b>Credit Hours</b>
<b>Required course</b>		<b>(21-28)</b>
MS 201	Materials Science	3
Students should take the following courses:		
MMAE 202	Mechanics of Solids	3
MMAE 232	Design for Innovation	0 OR 3
MMAE 302	Advanced Mechanics of Solids	3
MMAE 313	Fluid Mechanics	3
MMAE 319	Mechanical Laboratory I	0 OR 4
MMAE 323	Heat and Mass Transfer	3
MMAE 332	Design of Machine Elements	3
The remaining three credit hours may be chosen from below. The applied physics technical elective may be chosen from below as well.		3
MMAE 419	Mechanical Laboratory II	4
MMAE 432	Design of Mechanical Systems	3
MMAE 440	Introduction to Robotics	3
MMAE 443	Systems Analysis and Control	3
MMAE 485	Manufacturing Processes	3
<b>Total Credit Hours</b>		<b>21-28</b>