

# PHYSICS, B.S.

The physics major at Saint Louis University provides a foundation for all the natural sciences and engineering disciplines. Physics majors at SLU desire to understand the physical universe around them. They are interested in questions such as “Why do elementary particles behave the way they do?” “What is the nature of light?” or “How did the universe begin, and what will eventually happen to it?” Some physics students pursue double majors in mathematics, computer science or an engineering field.

Physicists have made many breakthrough discoveries, and the study of physics has yielded many revolutionary ideas such as relativity, quantum mechanics, and the Big Bang Theory, profoundly altering how humankind views the universe. The invention of the transistor by physicists has made the modern computer possible, while the development of lasers has led to diverse applications ranging from supermarket scanners to laser surgery. Physicists are versatile problem-solvers and excel in many technical fields.

Training in physics leads to a broad-based understanding of natural phenomena, analytical and computer skills, experience with electronics and the operation of sophisticated equipment, an understanding of measurements and their limitations, and the ability to formulate and solve complex technical problems.

Physics students who also like to explore other languages and cultures can study at Saint Louis University-Madrid. International study within the physics discipline opens your horizons and prepares you for success in an increasingly global job market. SLU-Madrid offers the required coursework for the first three semesters of the physics major, making studying abroad an exciting option for pursuing a physics degree at SLU.

## Curriculum Overview

SLU's B.S. in physics focuses on both fundamentals and applications of physics. It includes many opportunities to participate in cutting-edge research.

Physics majors gain a solid foundation in analytical, computational and laboratory skills through physics coursework. The physics curriculum includes courses in classical mechanics, quantum mechanics, electricity and magnetism, thermodynamics and statistical mechanics, optics, electronics, modern and solid-state physics, as well as nanoscience and nanotechnology.

## Fieldwork and Research Opportunities

The benefits of SLU's physics program also include several internship and career opportunities. The physics department employs some of its students as teaching and research assistants during the summer. Students have held summer internships at NASA-Langley, the Argonne National Laboratory and other laboratories. Students have worked during the summer and during the school year at local companies such as Boeing and Anheuser-Busch. Numerous opportunities exist for summer research in basic and applied physics in the School of Science and Engineering, national laboratories and National Science Foundation-sponsored programs at universities throughout the United States.

SLU's physics program engages students in exciting research opportunities in experimental, computational or theoretical

physics. New state-of-the-art research laboratories allow students to work alongside faculty members on research projects.

## Careers

Graduates with a bachelor's degree in physics enter various careers that depend on the technical skills gained in college. Alumni work in product development and quality control for large companies such as RCA, Boeing, and Lockheed Martin. Alumni are computer specialists at Anheuser-Busch and other companies. Some are now involved in the marketing of technical products, while others are in management positions. A few graduates have entered military careers. Students frequently earn double majors, combining physics with mathematics, computer science or chemistry.

## Admission Requirements

Begin Your Application (<https://www.slu.edu/apply.php>)

Saint Louis University also accepts the Common Application.

## Freshman

All applications are thoroughly reviewed with the highest degree of individual care and consideration to all credentials that are submitted. Solid academic performance in college preparatory coursework is a primary concern in reviewing a freshman applicant's file.

To be considered for admission to any Saint Louis University undergraduate program, applicants must be graduating from an accredited high school, have an acceptable HiSET exam score or take the General Education Development (GED) test.

## Transfer

Applicants must be a graduate of an accredited high school or have an acceptable score on the GED or HiSET.

Students who have attempted fewer than 24 semester credits (or 30 quarter credits) of college credit must follow the above freshman admission requirements. Students who have completed 24 or more semester credits (or 30 quarter credits) of college credit must submit transcripts from all previously attended college(s).

In reviewing a transfer applicant's file, the Office of Admission holistically examines the student's academic performance in college-level coursework as an indicator of the student's ability to meet the academic rigors of Saint Louis University. Where applicable, transfer students will be evaluated on any courses outlined in the continuation standards of their preferred major.

## International Applicants

All admission policies and requirements for domestic students apply to international students along with the following:

- Demonstrate English Language Proficiency (<https://catalog.slu.edu/academic-policies/office-admission/undergraduate/english-language-proficiency/>)
- All academic records must include an English translation. An official course-by-course transcript evaluation may be required and accepted.

## Additional Admission Requirements

In addition to the general admission and matriculation requirements of the University, the Bachelor of Science in Physics program requires the following:

- **GPA:** Minimum cumulative 3.00 high school GPA for freshman applicants and 2.70 college GPA for transfer applicants.
- **Coursework:** 15 total units of high school work are required: three or four units of English; four or more units of mathematics, including Algebra I and II, Geometry and Precalculus (Algebra II with Trigonometry is not sufficient). Students should be prepared to start the first semester of freshman year in Calculus I or higher; three or four units of science, including general science, introduction to physical science, earth science, biology, physics or chemistry; two or three units of social sciences including history, psychology or sociology; and three units of electives.

Admission requirements are based on a combination of secondary school grades, college admission test scores, co-curricular activities and attempted college coursework, as well as other indicators of the applicant's ability, career focus and character. This process respects SLU's nondiscrimination policy and is designed to select a qualified, competent and diverse student body with high standards of scholarship and character, consistent with the University's mission.

## Tuition

Tuition	Cost Per Year
Undergraduate Tuition	\$54,760

Additional charges may apply. Other resources are listed below:

Net Price Calculator (<https://www.slu.edu/financial-aid/tuition-and-costs/calculator.php>)

Information on Tuition and Fees (<https://catalog.slu.edu/academic-policies/student-financial-services/tuition/>)

Miscellaneous Fees (<https://catalog.slu.edu/academic-policies/student-financial-services/fees/>)

Information on Summer Tuition (<https://catalog.slu.edu/academic-policies/student-financial-services/tuition-summer/>)

## Scholarships and Financial Aid

There are two principal ways to help finance a Saint Louis University education:

- **Scholarships:** Scholarships are awarded based on academic achievement, service, leadership and financial need.
- **Financial Aid:** Financial aid is provided through grants and loans, some of which require repayment.

Saint Louis University makes every effort to keep our education affordable. In fiscal year 2023, 99% of first-time freshmen and 92% of all students received financial aid (<https://www.slu.edu/financial-aid/>) and students received more than \$459 million in aid University-wide.

For priority consideration for merit-based scholarships, apply for admission by December 1 and complete a Free Application for Federal Student Aid (FAFSA) by March 1.

For more information on scholarships and financial aid, visit the Office of Student Financial Services (<https://www.slu.edu/financial-aid/>).

## Learning Outcomes

1. Graduates will be able to understand the principles of physics and apply these principles to problems of fundamental and practical interest.
2. Graduates will be able to design and conduct experiments and analyze and interpret data.
3. Graduates will be able to collaborate effectively on teams.
4. Graduates will be able to communicate effectively and professionally in oral and written formats.
5. Graduates will be able to know about contemporary issues in science and technology.
6. Graduates will be able to understand the numerical formulation of scientific problems and be able to solve such problems utilizing at least one programming language or environment.

## Requirements

Physics students must complete a minimum total of 80 credits for the major.

Code	Title	Credits
<b>University Undergraduate Core (<a href="https://catalog.slu.edu/academic-policies/academic-policies-procedures/university-core/">https://catalog.slu.edu/academic-policies/academic-policies-procedures/university-core/</a>)</b>		<b>32-35</b>
<b>Major Requirements</b>		
<i>Basic Science and Math</i>		
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
CHEM 1120 & CHEM 1125	General Chemistry 2 and General Chemistry 2 Laboratory	4
PHYS 1110	Introduction to Physics (as a career)	1
PHYS 1610 & PHYS 1620	University Physics I and University Physics I Laboratory	4
PHYS 1630 & PHYS 1640	University Physics II and University Physics II Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
<i>Required Physics &amp; Mathematics Courses</i>		
MATH 3240	Numerical Analysis	3
MATH 3270	Advanced Mathematics for Engineers	3
MATH 3550	Differential Equations	3
MATH 3850	Foundation of Statistics	3
PHYS 2610	Modern Physics	3
PHYS 2620	Modern Physics Lab	1
PHYS 3110	Classical Mechanics	3
PHYS 3610	Modern Physics II	3
PHYS 4210	Electricity & Magnetism	3
PHYS 4610	Quantum Mechanics	3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
PHYS 3410	Thermodynamics and Statistical Mechanics	3

PHYS 3510 & PHYS 3511	Analog & Digital Electronics and Analog & Digital Electronics Lab	4
<i>Additional Requirements</i>		6
Select six credits upper division physics courses, 3000-level and above		
<i>Research Experience</i>		
PHYS 3860	Physics Research I	0
PHYS 4870	Physics Research II	0
PHYS 4880	Senior Inquiry: Research Project	3
<b>General Electives</b>		<b>5-8</b>
<b>Total Credits</b>		<b>120</b>

## Non-Course Requirements

All School of Science and Engineering B.A. and B.S. students must complete an exit interview/survey near the end of their bachelor's program.

### Continuation Standards

Students must have a GPA of 2.00 in physics major/minor coursework to be retained in the major/minor.

## Roadmap

Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

Courses and milestones designated as critical (marked with !) must be completed in the semester listed to ensure a timely graduation. Transfer credit may change the roadmap.

This roadmap should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor/mentor each semester. Requirements, course availability and sequencing are subject to change.

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
CORE 1000	Ignite First Year Seminar (Must be taken in first 36 credit hours at SLU / Cannot carry attributes)	2-3
CORE 1500	Cura Personalis 1: Self in Community (Must be taken in first 36 credit hours at SLU / Cannot carry attributes / Must be taken at SLU)	1
CORE 1900	Eloquentia Perfecta 1: Written and Visual Communication (Should be taken in first 36 credit hours at SLU / Cannot carry attributes)	3
PHYS 1110	Introduction to Physics (Required for major)	1
CHEM 1110	General Chemistry 1 (satisfies CORE 3800)	3
CHEM 1115	General Chemistry 1 Laboratory	1
MATH 1510	Calculus I (satisfies CORE 3200)	4
<b>Credits</b>		<b>15-16</b>
<b>Spring</b>		
CORE 1600	Ultimate Questions: Theology	3
PHYS 1610	University Physics I (Required for major)	3

PHYS 1620	University Physics I Laboratory (Required for major)	1
MATH 1520	Calculus II (Required for major)	4
CHEM 1120	General Chemistry 2 (Required for major)	3
CHEM 1125	General Chemistry 2 Laboratory (Required for major)	1

**Credits 15**

### Year Two

#### Fall

CORE 1200	Eloquentia Perfecta 2: Oral and Visual Communication (Should be taken in first 60 credit hours at SLU / Cannot carry attributes)	3
CORE 1700	Ultimate Questions: Philosophy	3
PHYS 1630	University Physics II (Required for major)	3
PHYS 1640	University Physics II Laboratory (Required for major)	1
MATH 2530	Calculus III (Required for major)	4
CSCI 1060	Introduction to Computer Science: Scientific Programming (Required for major)	3

**Credits 17**

#### Spring

CORE 2500	Cura Personalis 2: Self in Contemplation	0
PHYS 2610	Modern Physics (Required for major)	3
PHYS 2620	Modern Physics Lab (Required for major)	1
PHYS 3110	Classical Mechanics (Required for major)	3
MATH 3550	Differential Equations (Required for major)	3
MATH 3240	Numerical Analysis (Required for major)	3
General Electives		3

**Credits 16**

### Year Three

#### Fall

CORE 2800	Eloquentia Perfecta 3: Creative Expression	2-3
CORE 3400	Ways of Thinking: Aesthetics, History, and Culture	3
PHYS 4610	Quantum Mechanics (Required for major)	3
MATH 3270	Advanced Mathematics for Engineers (Required for major)	3
PHYS 3610	Atomic, Molecular and Solid-State Physics (Required for major)	3

**Credits 14-15**

#### Spring

CORE 3600	Ways of Thinking: Social and Behavioral Sciences	3
PHYS 4210	Electricity & Magnetism I (Required for major)	3
PHYS 3410	Thermodynamics and Statistical Mechanics (Required for major)	3
PHYS 3860	Physics Research I (Required for major)	0
PHYS Upper Division Course	To total 6 credits. Required for major <sup>1</sup>	3

MATH 3850	Foundation of Statistics (Required for major)	3
<b>Credits</b>		<b>15</b>
<b>Year Four</b>		
<b>Fall</b>		
CORE 3500	Cura Personalis 3: Self in the World (May be added to a capstone for the major / Cannot carry attributes)	1
PHYS 4870	Physics Research II (Required for major)	0
PHYS 3510	Analog & Digital Electronics (Required for major)	3
PHYS 3511	Analog & Digital Electronics Lab (Required for major)	1
PHYS Upper Division Course	To total 6 credits. Required for major <sup>1</sup>	3
CORE 4000	Collaborative Inquiry	2-3
General Electives		3
<b>Credits</b>		<b>13-14</b>
<b>Spring</b>		
PHYS 4880	Senior Inquiry: Research Project (Required for major)	3
PHYS 3310	Optics (Required for major)	3
PHYS 3320	Optics Laboratory (Required for major)	1
PHYS Upper Division Course or General Elective <sup>1</sup>		3
General Electives		6
<b>Credits</b>		<b>16</b>
<b>Total Credits</b>		<b>121-124</b>

<sup>1</sup> Two additional courses can be selected from the following for PHYS Upper Division Course: PHYS 4010 Nanoscience Frontiers (3cr), PHYS 4020 Experimental Physics (3 cr), PHYS 4110 Intro to Biophysics.

## 2+SLU

2+SLU programs provide a guided pathway for students transferring from a partner institution.

Physics, B.S. (STLCC 2+SLU) (<https://catalog.slu.edu/academic-policies/office-admission/undergraduate/2plusslu/stlcc/physics/>)