PHYSICS, B.A.

Physics is the branch of science that studies the nature of matter, energy and spacetime at the most fundamental level. It provides a foundation for all the natural sciences and engineering disciplines. Physics has brought such revolutions as relativity, quantum mechanics and the Big Bang theory, profoundly altering the way mankind views the universe.

Physicists have played a major role in the discovery of many phenomena leading to whole new technologies. 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. The physicist is a versatile problem solver and able to excel in many technical fields.

An education 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 technical problems.

Physics is a great major for students who are curious about the universe and want to learn how everything works. Many Physics students also have a strong interest in mathematics, computers, and other sciences along with a desire to understand how the universe works. They are interested in questions such as "Why do elementary particles behave the way they do? What is the world made of?", "What is the nature of light?" or "How did the universe begin, and what will eventually happen to it?" Some of our students pursue double majors in mathematics, computer science or an engineering field take the courses required for entrance to law school or medical school.

Curriculum Overview

The B.A. in physics from the College of Arts and Sciences combines a firm grounding in physics with a broad liberal education. The curriculum also satisfies all of the requirements for a Minor in Mathematics.

Students of the physics program gain a solid foundation in analytical, computational and laboratory skills through course work in mathematics, computer science and physics. The physics curriculum includes courses in classical mechanics, quantum mechanics, electricity and magnetism, thermodynamics and statistical mechanics, as well as optics, electronics and modern physics.

The required courses listed below are accompanied by the Parks College core. This degree is conferred by Parks College. This curriculum also satisfies all requirements for a Minor in Engineering Mathematics.

Fieldwork and Research Opportunities

Benefits of the 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. They have worked both during the summer and during the academic year at local industries such as Boeing and Lickenbrook TechnologiesAnheuser-Busch. Numerous opportunities exist for summer research in basic and applied physics in the Parks Summer Undergraduate Research Experience (SURE) program and in national laboratories and in National Science Foundation-sponsored programs at universities throughout the United States.

The program stresses undergraduate research. and applications of computers in physics. New state-of-the-art research facilities allow for students to work directly alongside faculty members on research projects.

Careers

Graduates with a bachelor's degree in physics enter a variety of careers that depend on the technical skills they have gained in college. They are employed in product development and quality control in large industries such as RCA, Boeing or Lockheed-Martin. They 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

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 course work is a primary concern in reviewing a freshman applicant's file. College admission test scores (ACT or SAT) are used as an additional indicator of the student's ability to meet the academic rigors of Saint Louis University and are used as qualifiers for certain University scholarship programs. To be considered for admission to any Saint Louis University undergraduate program, the applicant must be graduating from an accredited high school or have an acceptable score on 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. An official high school transcript and official test scores are required only of those students who have attempted fewer than 24 transferable semester credits (or 30 quarter credits) of college credit. Those having completed 24 or more of college credit need only submit a transcript from 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.

International Applicants

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

- Demonstrate English Language Proficiency (http://catalog.slu.edu/academic-policies/office-admission/undergraduate/english-language-proficiency)
- Proof of financial support must include:
  - A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University
  - A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University
- Academic records, in English translation, of students who have undertaken postsecondary studies outside the United States must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the

grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

Scholarships and Financial Aid

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

- Scholarships: awarded based on academic achievement, service, leadership and financial need.
- Financial Aid: provided in the form of grants and loans, some of which require repayment.

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

For information on other scholarships and financial aid, visit the student financial services office online at http://finaid.slu.edu.

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 programing language or environment.

Requirements

Code	Title	Credits
Core Requirements		
College core requirements (p. 2)		57-66
For additional information about core courses (http://catalog.slu.edu/colleges-schools/arts-sciences/#policiestext)		
Prerequistes		
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
PHYS 1110	Introduction to Physics (as a career)	1
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
Required Physics & Mathematics Courses		
MATH 2660	Principles of Mathematics	3
MATH 3120	Introduction to Linear Algebra	3
MATH 3550	Differential Equations	3
MATH 4310	Introduction to Complex Variables	3
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 3110	Classical Mechanics	3
PHYS 4210	Electricity & Magnetism I	3
PHYS 4610	Quantum Mechanics	3
Additional Requirements		
Select two upper division physics courses from the following:		6
PHYS 3120	Advanced Classical Mechanics	
PHYS 3310	Optics	
PHYS 3410	Thermodynamics and Statistical Mechanics	
PHYS 3510	Analog & Digital Electronics	
PHYS 3610	Modern Physics II	
PHYS 4010	Nanoscience and Nanofabrication Frontiers	
PHYS 4020	Experimental Physics	
PHYS 4210	Electricity & Magnetism I	
PHYS 4620	Application of Quantum Mechanics	
Senior Inquiry		
Select one of the following:		0-3
PHYS 4840	Senior Inquiry: Thesis	
PHYS 4880	Senior Inquiry: Research Project	
PHYS 4890	Senior Inquiry: Comprehensive Examination	
General Electives		7-0
Total Credits		120-125

Continuation Standards

Students must have a grade point average (GPA) of 2.00 in Physics major coursework to be retained in the major.

Bachelor of Arts Core Curriculum Requirements

Code	Title	Credits
Core Components and Credits		
Foundations of Discourse (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/foundations-discourse)		3
Diversity in the U.S. (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/cultural-diversity)		3
Global Citizenship (http://catalog.slu.edu/colleges-schools/arts-sciences/bs-core/global-citizenship)		3
Foreign Language (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/foreign-language)		0-9
Fine Arts (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/fine-arts)		3
Literature (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/literature)		6
Mathematics (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/mathematics)		3
Natural Science (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/sciences)		6
Philosophy (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/philosophy)		9
Social Science (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/social-science)		6
Theology (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/theology)		9

World History (http://catalog.slu.edu/colleges-schools/arts-sciences/ba-core/world-history)	6
Total Credits	57-66

Graduation Requirements

- Complete a minimum of 120 credits (excluding pre-college level courses [numbered below 1000]).
- Complete either the College of Arts and Sciences Bachelor of Arts or Bachelor of Science Core Curriculum Requirements
- Complete Major Requirements: minimum 30 credits required.
- Complete remaining credits with a second major, minor, certificate, and/or elective credits to reach the minimum of 120 credits required for graduation.
- Courses listed under the intensive English program do not count toward graduation requirements. EAP 1500 College Composition for International Students (3 cr), EAP 1900 Rhetoric & Research Strategies (3 cr) and EAP 2850 Introduction to Literature for International Students (3 cr) count toward graduation requirements as equivalents to Department of English courses. In addition to those courses, six credits from EAP/MLNG courses at the 1000 level or higher may count toward graduation requirements
- Achieve at least a 2.00 cumulative grade point average, a 2.00 grade point average in the major(s) and a 2.00 grade point average in the minor/certificate, or related elective credits.
- Complete Dept/Program specific academic and performance requirements.
- Complete at least 50% of the coursework for the major and 75% for the minor/certificate through Saint Louis University or an approved study abroad program.
- Complete 30 of the final 36 credits through Saint Louis University or an approved study abroad program.
- Complete an online degree application by the required University deadline.

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.

Standard Track

Course	Title	Credits
Year One		
Fall		
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
ENGL 1900 or ENGL 1940	Advanced Strategies Of Rhetoric and Research or Advanced Writing	3
MATH 1510	Calculus I	4
HIST 1110	Origins of the Modern World to 1500	3
PHYS 1110	Introduction to Physics	1
	Credits	15
Spring		
PHYS 1610	Engineering Physics I	3
PHYS 1620	Engineering Physics I Laboratory	1
MATH 1520	Calculus II	4
Literature 2000 Level Course		3
HIST 1120	Origins of the Modern World, 1500 to Present	3
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
	Credits	17
Year Two		
Fall		
PHYS 1630	Engineering Physics II	3
PHYS 1640	Engineering Physics II Laboratory	1
MATH 2530	Calculus III	4
PHIL 1050	Introduction to Philosophy: Self and Reality	3
Social Science		3
Foreign Language		3
	Credits	17
Spring		
PHYS 2610	Modern Physics	3
PHYS 2620	Modern Physics Lab	1
PHYS 3110	Classical Mechanics	3
MATH 2660	Principles of Mathematics	3
THEO 1000	Theological Foundations	3
Foreign Language		3
	Credits	16
Year Three		
Fall		
Cultural Diversity – U.S. Diversity		3
PHYS Upper Level Course		3
Literature 3000 or 4000 Level Course		3
MATH 3550	Differential Equations	3
PHIL 2050	Ethics	3
	Credits	15
Spring		
PHYS 4210	Electricity & Magnetism I	3
PHYS Upper Level Course		3
MATH 3120	Introduction to Linear Algebra	3
THEO 2000 Level Course		3
Social Science		3
	Credits	15
Year Four		
Fall		
PHYS 4610	Quantum Mechanics	3
Open Elective		3
MATH 4310	Introduction to Complex Variables	3
PHIL 3000 or 4000 Level Course		3
Fine & Performing Arts		3
	Credits	15

Spring		
Open Elective		3
PHYS 4880	Senior Inquiry: Research Project	3
Cultural Diversity – Global Citizenship		3
THEO 3000 or 4000 Level Course		3
Open Elective		3
	Credits	15
	Total Credits	125

Preprofessional Health Studies Track

Course	Title	Credits
Year One		
Fall		
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
ENGL 1900	Advanced Strategies Of Rhetoric and Research	3
MATH 1510	Calculus I	4
BIOL 1240 & BIOL 1245	Principles of Biology I and Principles of Biology I Laboratory	4
PHYS 1110	Introduction to Physics	1
	Credits	16
Spring		
PHYS 1610	Engineering Physics I	3
PHYS 1620	Engineering Physics I Laboratory	1
MATH 1520	Calculus II	4
CHEM 1120 & CHEM 1125	General Chemistry 2 and General Chemistry 2 Laboratory	4
BIOL 1260 & BIOL 1265	Principles of Biology II and Principles of Biology II Laboratory	4
	Credits	16
Year Two		
Fall		
PHYS 1630	Engineering Physics II	3
PHYS 1640	Engineering Physics II Laboratory	1
Foreign Language		3
MATH 2530	Calculus III	4
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
BIOL 3020	Biochemistry and Molecular Biology	3
	Credits	17
Spring		
PHYS 2610	Modern Physics	3
PHYS 2620	Modern Physics Lab	1
Foreign Language		3
PHYS 3110	Classical Mechanics	3
MATH 2660	Principles of Mathematics	3
BIOL 3040 & BIOL 3060	Cell Structure & Function and Cell Structure & Function Laboratory	4
	Credits	17
Year Three		
Fall		
CHEM 2410	Organic Chemistry 1	3
CHEM 2415	Organic Chemistry 1 Laboratory	1
PSY 1010	General Psychology	3
SOC 1100	Introduction to Sociology	3
MATH 3550	Differential Equations	3
PHIL 1050	Introduction to Philosophy: Self and Reality	3
	Credits	16
Spring		
CHEM 2420	Organic Chemistry 2	3
CHEM 2425	Organic Chemistry 2 Laboratory	1
PHYS Upper Level Course		3
MATH 3120	Introduction to Linear Algebra	3
THEO 1000	Theological Foundations	3
PHIL 2050	Ethics	3
	Credits	16
Year Four		
Fall		
PHYS 4610	Quantum Mechanics	3
PHYS Upper Level Course		3
MATH 4310	Introduction to Complex Variables	3
Literature 2000 Level		3
HIST 1110	Origins of the Modern World to 1500	3
THEO 2000 Level Course		3
	Credits	18
Spring		
Cultural Diversity – Global Citizenship (also fine arts)		3
PHYS 4890	Senior Inquiry: Comprehensive Examination	0
PHYS 4210	Electricity & Magnetism I	3
THEO 3000 or 4000 Level Course		3
HIST 1120	Origins of the Modern World, 1500 to Present	3
PHIL 3000 or 4000 Level Course		3
Literature 3000 or 4000 (also US Div.)		3
	Credits	18
	Total Credits	134