Physics BS, General Physics Emphasis

Physicists investigate the fundamental nature of the forces and particles, and the resultant states of matter, that make up the physical world. The Department of Physics and Astronomy at UMSL is devoted to providing undergraduates with a broad-based education in the fundamental concepts of physics and with the experimental and theoretical skills essential to practicing scientists. Undergraduate education in physics prepares students for both graduate study and a wide variety of professional careers.

General Education Requirements

Majors must complete the university and college general education requirements. Any of the following courses may be used to satisfy the physical science requirement:

ASTRON 1001	Cosmic Evolution Introductory Astronomy (MOTR ASTR 100)	3
ASTRON 1011	Planets and Life in the Universe	3
ASTRON 1012	The Violent Universe and the New Astronomy	3
ASTRON 1050	Introduction to Astronomy I (MOTR ASTR 100)	3
ASTRON 1051	Introduction to Astronomy II	3
ATM SCI 1001	Elementary Meteorology	3
GEOL 1001	General Geology	3
GEOL 1002	Historical Geology	3
PHYSICS 1001	How Things Work (MOTR PHYS 100)	3
PHYSICS 1011	Basic Physics I	3
PHYSICS 1011L	Basic Physics I Laboratory	1
PHYSICS 1012	Basic Physics II	3
PHYSICS 1012L	Basic Physics II Laboratory	1
PHYSICS 2111	Physics: Mechanics and Heat	4
PHYSICS 2112	Physics: Electricity, Magnetism, and Optics	4

Degree Requirements

All physics majors in all programs must complete the physics core curriculum with the exception that majors pursuing the Physics Education option are not required to take PHYSICS 1099 and CMP SCI 1250. In addition to the core courses, each individual program has its own specific requirements. Required Physics, Mathematics, Chemistry, Biology, and Computer Science courses for a major or minor in physics may not be taken on a satisfactory/unsatisfactory grading basis.

Core Curriculum

The following physics courses are required:		23
PHYSICS 1099	Windows on Physics	
PHYSICS 2111	Physics: Mechanics and Heat	
PHYSICS 2111L	Mechanics and Heat Laboratory	
PHYSICS 2112	Physics: Electricity, Magnetism, and Optics	
PHYSICS 2112L	Electricity, Magnetism, and Optics Laboratory	
PHYSICS 3200	Mathematical Methods of Theoretical Physics	
PHYSICS 3221	Mechanics	
PHYSICS 3223	Electricity and Magnetism	
PHYSICS 3231	Introduction to Modern Physics I	
Also required are:		26
MATH 1800	Analytic Geometry and Calculus I	
MATH 1900	Analytic Geometry and Calculus II	
MATH 2000	Analytic Geometry and Calculus III	
MATH 2020	Introduction to Differential Equations	
CHEM 1111	Introductory Chemistry I (MOTR CHEM 150L)	
CMP SCI 1250	Introduction to Computing	
Total Hours		**49**

Note: Students are urged to begin the calculus sequence [MATH 1800, Analytic Geometry and Calculus I] as soon as possible to avoid delays in graduation.

Students with experience in digital computer programming may be excused from CMP SCI 1250.

General Physics Option

This option may be elected by students desiring a greater concentration in physics and mathematics and is recommended for students wishing to enter graduate study in physics. At least 50 hours are required. In addition to the core curriculum, the following physics courses are required:

Physics		
PHYSICS 4310	Modern Electronics	3
PHYSICS 4311	Advanced Physics Laboratory I	3
PHYSICS 4323	Modern Optics	3
PHYSICS 4331	Intro to Quantum Mechanics	3
PHYSICS 4341	Thermal and Statistical Physics	3
PHYSICS 4350	Computational Physics	3
Select three electives at or above the 4000 level in physics or astronomy.		9
Astronomy		
ASTRON 1050	Introduction to Astronomy I (MOTR ASTR 100)	3
or ASTRON 1051	Introduction to Astronomy II	
Mathematics		
MATH 2450	Elementary Linear Algebra	3
Select one elective in mathematics at or above the 3000 level, or in computer science at or above the 2000 level.		3
Chemistry		
CHEM 1121	Introductory Chemistry II (or equivalent)	5
Total Hours		**41**

B.S. Ed. in Secondary Education with Emphasis in Physics

The B.S. Ed. is a professional education degree designed for students who wish to pursue a teaching career in secondary schools. Much of

the discipline-specific coursework parallels the B.A. or B.S. degree in the discipline; however, the Missouri Department of Elementary and Secondary Education (DESE) requires specific coursework for teacher certification. Therefore, students interested in the B.S. Ed. should contact the advising office (OASIS) 314-516-5937 in the College of Education for discipline-specific requirements. *Note: To obtain teaching certification, DESE requires a 3.0 GPA in the discipline and professional education coursework, as well as a 2.75 GPA overall.*

B.A. or B.S. in Physics with Master's Level Coursework for Secondary Teacher Certification

In addition to the B.S. Ed., students may opt to complete a B.A. or B.S. degree in their discipline as an undergraduate, followed by admission to the Graduate School for Master's level teaching certification. The College of Education has a one-year accelerated program for post-graduate certification called Teach in 12, or students can choose a traditional path to certification. Graduate coursework for certification can apply towards a Master's Degree in Secondary Education, with additional coursework. Students interested in Master's Level teacher certification should contact the advising office (OASIS) 314-516-5937 in the College of Education. *Note: To obtain teaching certification, DESE requires a 3.0 GPA in the discipline and professional education coursework, as well as a 2.75 GPA overall.*

Program Purpose

The purpose of the B.S. in Physics (General Physics Option) program at the University of Missouri at St. Louis is to prepare students for a professional career in physics or a related field, or for graduate studies in physics.

Learning Outcomes

- Students will be able to demonstrate an understanding of basic physics concepts including classical mechanics, electricity and magnetism, thermal and statistical physics, quantum mechanics, and modern electronics
- Students will be able to design and perform basic physics experiments, assess the significance of their results, and interpret the observed outcomes
- Students will be able to demonstrate an understanding of some areas of the most recent physics research, such as advances in materials physics or nanoscience
- Students will be skilled in problem-solving, critical thinking and analytical reasoning as applied to scientific problems
- Students will be proficient in both written and oral communication of the results of scientific work
- Students will have the skills necessary for conducting original scientific research as part of a problem-solving team
- Students will have the skills necessary to identify possible errors in scientific data, and to assess the significance of observed results

Sample Four Year Plan

First Year

Fall	Hours	Spring	Hours
INTDSC 1003[1]	1	ASTRON 1051	3
PHYSICS 1099	1	CHEM 1121	5
CHEM 1111	5	MATH 1800	5
MATH 1035	2	CORE - US History and Government	3
ENGL 1100	3		
EXPLORE - Humanities and Fine Arts	3		
	15		**16**

Second Year

Fall	Hours	Spring	Hours
PHYSICS 2111	4	PHYSICS 2112	4
PHYSICS 2111L	1	PHYSICS 2111L	1
MATH 1900	5	MATH 2000	5
CMP SCI 1250	3	MATH 2450	3
EXPLORE – Social Sciences	3	CMP SCI 2XXX course or MATH 3XXX MATH course	3
	16		**16**

Third Year

Fall	Hours	Spring	Hours
PHYSICS 3200	3	PHYSICS 3221	3
PHYSICS 3231	3	PHYSICS 3223	3
MATH 2020	3	PHYSICS 4341	3
EXPLORE - Humanities and Fine Arts	3	PHYSICS/ASTRON 4XXX Physics or Astronomy Course	3
CORE - Communication Proficiency	3	EXPLORE - Social Sciences	3
	15		**15**

Fourth Year

Fall	Hours	Spring	Hours
PHYSICS 4331	3	PHYSICS 4311	3
PHYSICS 4310	3	PHYSICS 4350	3
PHYSICS 4323	3	PHYSICS/ASTRON 4XXX Physics or Astronomy Course	3
PHYSICS/ASTRON 4XXX Physics or Astronomy Course	3	EXPLORE - Humanities and Fine Arts[2]	3
ENGL 3160	3	EXPLORE - Social Sciences	3
	15		**15**

Total Hours: 123

1

INTDSC 1003 is required only for first-time freshmen and transfer students with less than 24 college credits.

2

This General Education course must also fulfill the Cultural Diversity Requirement.

Please Note: This plan is an example of what a four year plan could look like for a typical student. Placement exam scores in math as well as the completion of coursework may change the plan. It should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor each semester. All requirements are subject to change.