

# Physics BS, Biophysics Emphasis

The study of astrophysics aims to understand the universe and everything within it in terms of the fundamental nature of forces and particles. The Department of Physics and Astronomy at UMSL is devoted to providing undergraduates with a broad-based education in astrophysics with the experimental, observational, and theoretical skills essential to practicing astronomers and astrophysicists. Undergraduate education in astrophysics prepares students for both graduate study and professional careers in astronomy, atmospheric science, image processing, cosmology, and instrumentation.

## 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.

## Biophysics Option

This option is designed for students who are interested in careers in various medical fields or biophysics. This option provides a strong preparation in physics, mathematics, chemistry, and biology for students who intend to apply for admission to medical schools. At least 41 hours of physics and biology combined, but no more than 51, are required. In addition to the core curriculum, the following physics and biology courses are required:

### Physics

PHYSICS 4310	Modern Electronics	3
PHYSICS 4347	Introduction to Biophysics	3

Select two additional physics electives at the 4000 level. 6

### Biology

BIOL 1831	Introductory Biology: From Molecules to Organisms (MOTR BIOL 150L)	5
BIOL 1821	Introductory Biology: Organisms and the Environment (MOTR BIOL 150L)	5
BIOL 4732 or CHEM 4712	Principles of Biochemistry Biochemistry	3
BIOL 4713	Techniques in Biochemistry	2

### Chemistry

CHEM 1121	Introductory Chemistry II	5
CHEM 2612	Organic Chemistry I	3

**Total Hours 35**

## Program Purpose

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

interdisciplinary field, for training as a medical physicist, or for professional training such as medical school.

## Learning Outcomes

- Students will be able to demonstrate a solid understanding of basic physics concepts including classical mechanics, electricity and magnetism, thermal and statistical physics, modern electronics, and quantum mechanics
- Students will have an understanding of basic biological concepts, from organ systems to biochemistry
- Students will have an understanding of the basic concepts of biophysics, and the various areas of interdisciplinary science where biophysics concepts and techniques are applicable
- 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 an interdisciplinary 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 <sup>1</sup>		1 CHEM 1121	5
PHYSICS 1099		1 MATH 1800	5
CHEM 1111		5 BIOL 1831	5
MATH 1030		3	
MATH 1035		2	
ENGL 1100		3	
	15		15

### 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 CHEM 2612	3
BIOL 1821		5 CORE - US History and Government	3
	18		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
BIOL 4732 or CHEM 4712		3 BIOL 4713	2
CORE - Communication Proficiency		3 EXPLORE - Social Sciences	3
	15		14

### Fourth Year

Fall	Hours	Spring	Hours
PHYSICS 4310		3 PHYSICS 4347	3
PHYSICS 4331		3 EXPLORE - Humanities and Fine Arts	3
ENGL 3160		3 EXPLORE - Humanities and Fine Arts	3
EXPLORE - Humanities and Fine Arts		3 EXPLORE - Social Sciences	3
Cultural Diversity Requirement		3 EXPLORE - Social Sciences	3
	15		15

**Total Hours: 123**

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

*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.*