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 [http://bulletin.umsl.edu/generaleducationrequirements/]. Any of the following courses may be used to satisfy the physical science requirement:

- ASTRON 1001 Cosmic Evolution Introductory Astronomy 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

Declaring the Physics Major

Students seeking to major in physics are first designated as ‘pre-physics majors’ until they have completed both PHYSICS 2111 and PHYSICS 2112 or equivalent courses. Upon successful completion of PHYSICS 2111 and PHYSICS 2112 with grades of C- or better, students will be allowed to declare physics as their major. Each of these courses must be completed successfully within two attempts.

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)
- CHEM 4712 Biochemistry
- BIOL 1831 Introductory Biology: From Molecules to Organisms (MOTR BIOL 150L)
- BIOL 1821 Introductory Biology: Organisms and the Environment (MOTR BIOL 150L)
- CHEM 1121 Introductory Chemistry II

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 4

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/CHEM 4712 Biochemistry 3
- BIOL 4713 Techniques in Biochemistry 2

### Chemistry

- CHEM 1121 Introductory Chemistry II 5
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 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

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<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
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<td>PHYSICS 1099</td>
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<td>MATH 1800</td>
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<td>BIOL 1831</td>
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### Second Year

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<td>CHEM 2612</td>
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<td>BIOL 1821</td>
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<td>CORE - US History and Government</td>
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### Third Year

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$^1$ 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.