# Physics BA

Physicists investigate fundamental nature of the forces and particles, and the resultant states of matter, that make up the physical world. The Department of Mathematics, Physics and Astronomy at UMSL provides undergraduates with a broad-based education in the fundamental concepts of physics and the experimental and theoretical skills essential to practicing scientists. The BA degree offers students an opportunity to combine the rigorous study of physics with additional studies of languages and the liberal arts. This degree is an ideal preparation for a career that combines science with other fields, such as science journalism, science policy, or patent law.

## 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:

| Course Number | Title | Hours |
|---|---|---|
| ASTRON 1001 | Cosmic Evolution Introductory Astronomy (MOTR ASTR 100) | 3 |
| ASTRON 1011 | Planets and Life in the Universe | 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 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.

| Course Number | Title | Hours |
|---|---|---|
| **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.

## Bachelor of Arts in Physics

The B.A. program is tailored to students wishing to preserve the option for specialization in graduate school without sacrificing the advantages of a liberal arts education. In addition to the core curriculum, including the foreign language requirement, at least three electives at the 3000 or 4000 levels must be completed. It is recommended that at least one of these three electives include ASTRON 4322, PHYSICS 4311, or PHYSICS 4347 for the required capstone course. The Department of Physics and Astronomy will accept the three-course sequence in American Sign Language as a substitution for the foreign language requirement for the degree. At least 31 hours of physics courses, but no more than 45 hours, are required.

## Program Purpose

The purpose of the B.A. in Physics program at the University of Missouri at St. Louis is to prepare students for a professional career and/or graduate or professional studies in a field that combines the physical sciences with aspects of the humanities or other professions, such as science advocacy, science policy, patent law, or science journalism.

## Learning Outcomes

- Students will be able to demonstrate an of basic physics concepts including classical mechanics, electricity and magnetism, and modern physics
- Students will demonstrate proficiency in a foreign language
- Students will be able to demonstrate an understanding several advanced undergraduate areas of physics/astronomy, such as observational astrophysics, biophysics, quantum mechanics, or experimental design
- 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[1] | 1 | CHEM 1111 | 5 |
| PHYSICS 1099 | 1 | MATH 1800 | 5 |
| MATH 1030 | 3 | Foreign Language 1002 | 5 |
| MATH 1035 | 2 | | |
| Foreign Language 1001 | 5 | | |
| ENGL 1100 | 3 | | |
| | **15** | | **15** |

**Second Year**

| Fall | Hours | Spring | Hours |
|---|---|---|---|
| PHYSICS 2111 | 4 | PHYSICS 2112 | 4 |
| PHYSICS 2111L | 1 | PHYSICS 2112L | 1 |
| MATH 1900 | 5 | MATH 2000 | 5 |
| CMP SCI 1250 | 3 | CORE - US History and Government | 3 |
| Foreign Language 2101 | 3 | EXPLORE - Social Sciences | 3 |
| | **16** | | **16** |

**Third Year**

| Fall | Hours | Spring | Hours |
|---|---|---|---|
| PHYSICS 3200 | 3 | PHYSICS 3221 | 3 |
| PHYSICS 3231 | 3 | PHYSICS 3223 | 3 |
| MATH 2020 | 3 | ENGL 3160 | 3 |
| CORE - Communication Proficiency | 3 | EXPLORE - Social Sciences | 3 |
| EXPLORE - Humanities and Fine Arts | 3 | Global Perspectives Requirement | 3 |
| | **15** | | **15** |

**Fourth Year**

| Fall | Hours | Spring | Hours |
|---|---|---|---|
| PHYSICS/ASTRON 3000+ Physics or Astronomy Elective elective | 3 | PHYSICS/ASTRON 3000+Physics or Astronomy lective | 3 |
| PHYSICS/ASTRON 3000+ Physics or Astronomy Elective elective | 3 | EXPLORE - Humanities and Fine Arts | 3 |
| EXPLORE - Social Sciences | 3 | Elective or minor | 3 |
| EXPLORE - Social Sciences | 3 | Elective or minor | 3 |
| Elective or minor | 1-3 | Elective or minor | 3 |
| | **13-15** | | **15** |

**Total Hours: 120-122**

[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.*

## Teacher Certification

### 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.*