

# PHYSICS, BS

Physics majors are interested in understanding the nature of the physical universe. This interest may focus on more specific sub-areas, such as the physics of elementary particles; the properties of solid matter; or the evolution of stars, galaxies, and black holes. A successful physics major will develop analytical and problem-solving skills which will be useful in a wide range of possible applications and careers.

## Admission into the Major

Students are expected to formally declare a major no later than the fourth semester of full-time enrollment (or at 61 semester hours for transfer students). Students can declare a major by completing the Change of Major/Minor Application online under the Student tab of myBama.

## Special Opportunities

The department sponsors a local chapter of the Society of Physics Students. The department also has an honors program. Students are invited to apply for admission to the honors program in physics on the basis of performance in introductory courses. Physics majors participating in the Physics Honors Program must maintain a minimum 3.3 GPA in physics courses and a 3.0 cumulative GPA. Honors students must also submit an acceptable honors thesis based on research conducted under the supervision of a faculty member in physics or astronomy and participate in an Honors Seminar course. Students can inquire at the Department of Physics and Astronomy office for further information.

Students earning the bachelor of science (BS) degree with a major in physics must complete all University, College and departmental degree requirements. These include the general education requirements, the following major requirements, all requirements for an approved minor and other sufficient credits to total a minimum of 120 applicable semester hours.

The major in physics requires successful completion of 33–41 semester hours in one of four tracks: graduate school, astrophysics, biophysics or physics education.

## Grade Point Average

A 2.0 grade point average in the major is required for completion of the degree. Please see the Grades and Grade Points section of this catalog for an explanation on grade point average calculations.

## Upper-level Residency

A minimum of 12 hours of 300- and 400-level courses in the major must be earned on this campus.

## Ancillary Courses

Grades in ancillary courses are not computed into the major GPA. The major in physics for all tracks requires the successful completion of 23–39 semester hours of ancillary courses.

## Required Minor

This major requires the completion of a minor.

## Additional Major Requirements

Students are responsible for ensuring that they have met all University, college, major and minor requirements. However, each student must meet with an adviser in the major department for academic planning and to be approved for registration each semester. College advisers are also

available for additional assistance with minor, college and University requirements.

## Prerequisites

In addition to stated prerequisites, physics courses numbered 253-354 have as prerequisites PH 101 General Physics I, PH 105 General Physics W/Calc I or PH 125 Honors Gen Ph W/Calculus, **AND** PH 102 General Physics II, PH 106 General Physics W/Calc II or PH 126 Honors Gen Ph W/Calculus II. Physics courses numbered 400-499 have as prerequisites 14 hours of physics or 11 hours of physics and senior standing in addition to stated prerequisites.

## Graduate School Prep Track

Primarily designed for students considering graduate work in physics, the graduate school track requires the successful completion of the following 36 semester hours:

| Code and Title   | Hours |
|--|-------|
| Select one of the following:                             | 4     |
| PH 105 General Physics W/Calc I                          |       |
| PH 125 Honors Gen Ph W/Calculus                          |       |
| PH 101 General Physics I <sup>1</sup>                    |       |
| Select one of the following:                             | 4     |
| PH 106 General Physics W/Calc II                         |       |
| PH 126 Honors Gen Ph W/Calculus II                       |       |
| PH 102 General Physics II <sup>1</sup>                   |       |
| PH 253 Intro Modern Physics                              | 4     |
| & PH 255 and Modern Physics Lab                          |       |
| PH 302 Intermediate Mechanics                            | 3     |
| PH 331 Elect & Magnetism I                               | 3     |
| PH 332 Elect & Magnetism II                              | 3     |
| PH 441 Quantum Structure of Matter I                     | 3     |
| PH 442 Quantum Structure of Matter II                    | 3     |
| PH 471 Thermal Physics                                   | 3     |
| PH 491 Advanced Laboratory                               | 3     |
| Select three hours of PH or AY elective 300 or 400 level | 3     |
| Credit Hours Subtotal:                                   | 36    |

### Ancillary Courses

Grades in ancillary courses are not computed into the major GPA. The major in physics for the graduate school track requires the successful completion of the following courses outside the major.

|             |                          |   |
|-------------|--------------------------|---|
| CH 101 or   | General Chemistry        | 4 |
| CH 117      | Honors General Chemistry |   |
| CH 102 or   | General Chemistry        | 4 |
| CH 118      | Honors General Chemistry |   |
| MATH 125 or | Calculus I               | 4 |
| MATH 145    | Honors Calculus I        |   |
| MATH 126 or | Calculus II              | 4 |
| MATH 146    | Honors Calculus II       |   |
| MATH 227 or | Calculus III             | 4 |
| MATH 247    | Honors Calculus III      |   |
| MATH 238    | Appld Diff Equations I   | 3 |

|                        |           |
|------------------------|-----------|
| Credit Hours Subtotal: | 23        |
| <b>Total Hours</b>     | <b>59</b> |

**Footnotes**

<sup>1</sup> General physics with calculus (PH 105 General Physics W/Calc I and PH 106 General Physics W/Calc II, or honors PH 125 and PH 126 Honors Gen Ph W/Calculus II) is the preferred preparation for advanced physics courses. However, general physics (PH 101 General Physics I and PH 102 General Physics II) can substitute for students who must begin the major courses before taking calculus.

**Astrophysics Track**

Primarily designed for students interested in astronomy or space science, the astrophysics track requires the successful completion of the following 41 semester hours:

| Code and Title                                    | Hours |
|---|-------|
| AY 203      Observational Astronomy               | 2     |
| AY 204      Solar System Astronomy                | 3     |
| AY 206      Astron Beyond Solar Syst              | 3     |
| Select six hours of AY elective 300- or 400-level | 6     |
| Select one of the following:                      | 4     |
| PH 105    General Physics W/Calc I                |       |
| PH 125    Honors Gen Ph W/Calculus                |       |
| PH 101    General Physics I <sup>1</sup>          |       |
| Select one of the following:                      | 4     |
| PH 106    General Physics W/Calc II               |       |
| PH 126    Honors Gen Ph W/Calculus II             |       |
| PH 102    General Physics II <sup>1</sup>         |       |
| PH 253      Intro Modern Physics                  | 4     |
| & PH 255    and Modern Physics Lab                |       |
| PH 302      Intermediate Mechanics                | 3     |
| PH 331      Elect & Magnetism I                   | 3     |
| PH 332      Elect & Magnetism II                  | 3     |
| PH 441      Quantum Structure of Matter I         | 3     |
| PH 442      Quantum Structure of Matter II        | 3     |
| Credit Hours Subtotal:                            | 41    |

**Ancillary Courses**

Grades in ancillary courses are not computed into the major GPA. The major in physics for the astrophysics track requires the successful completion of the following courses outside the major:

|                                    |           |
|------------------------------------|-----------|
| CH 101 or    General Chemistry     | 4         |
| CH 117    Honors General Chemistry |           |
| CH 102 or    General Chemistry     | 4         |
| CH 118    Honors General Chemistry |           |
| MATH 125 or Calculus I             | 4         |
| MATH 145 Honors Calculus I         |           |
| MATH 126 or Calculus II            | 4         |
| MATH 146 Honors Calculus II        |           |
| MATH 227 or Calculus III           | 4         |
| MATH 247 Honors Calculus III       |           |
| MATH 238    Appld Diff Equations I | 3         |
| Credit Hours Subtotal:             | 23        |
| <b>Total Hours</b>                 | <b>64</b> |

**Physics Education Track**

*This track is open to all students but is primarily designed for those who want to teach in grades K–12. Please note that this track does not lead to teacher certification. Students interested in earning teacher certification must be admitted through the College of Education. For more information, visit here.*

*The physics education track requires the successful completion of the following 33 semester hours:*

| Code and Title                                   | Hours |
|--|-------|
| Select one of the following:                     | 4     |
| PH 105    General Physics W/Calc I               |       |
| PH 125    Honors Gen Ph W/Calculus               |       |
| PH 101    General Physics I <sup>1</sup>         |       |
| Select one of the following:                     | 4     |
| PH 106    General Physics W/Calc II              |       |
| PH 126    Honors Gen Ph W/Calculus II            |       |
| PH 102    General Physics II <sup>1</sup>        |       |
| PH 253      Intro Modern Physics                 | 4     |
| & PH 255    and Modern Physics Lab               |       |
| PH 301 or    Mechanics I                         | 3     |
| PH 302    Intermediate Mechanics                 |       |
| PH 331      Elect & Magnetism I                  | 3     |
| PH 354      Intermediate Modern Physics          | 3     |
| PH 405      Physics For Science Teachers         | 3     |
| PH 491      Advanced Laboratory                  | 3     |
| Select six hours of PH elective 300 or 400 level | 6     |
| Credit Hours Subtotal:                           | 33    |

**Ancillary Courses**

Grades in ancillary courses are not computed into the major GPA. The major in physics for the physics education track requires the successful completion of the following courses outside the major:

|                                    |    |
|------------------------------------|----|
| CH 101 or    General Chemistry     | 4  |
| CH 117    Honors General Chemistry |    |
| CH 102 or    General Chemistry     | 4  |
| CH 118    Honors General Chemistry |    |
| MATH 125 or Calculus I             | 4  |
| MATH 145 Honors Calculus I         |    |
| MATH 126 or Calculus II            | 4  |
| MATH 146 Honors Calculus II        |    |
| MATH 227 or Calculus III           | 4  |
| MATH 247 Honors Calculus III       |    |
| MATH 238    Appld Diff Equations I | 3  |
| Credit Hours Subtotal:             | 23 |

|                    |           |
|--------------------|-----------|
| <b>Total Hours</b> | <b>56</b> |
|--------------------|-----------|

**Footnotes**

<sup>1</sup> General physics with calculus (PH 105 General Physics W/Calc I and PH 106 General Physics W/Calc II, or honors PH 125 Honors Gen Ph W/Calculus and PH 126 Honors Gen Ph W/Calculus II) is the preferred preparation for advanced physics courses. However, general physics (PH 101 General Physics I and PH 102 General Physics II) can substitute for students who must begin the major courses before taking calculus.

## Biophysics Track

Primarily designed for students planning a career in a health profession, the biophysics track requires successful completion of the following 33 semester hours:

| Code and Title                                   | Hours |
|--|-------|
| Select one of the following:                     | 4     |
| PH 105 General Physics W/Calc I                  |       |
| PH 125 Honors Gen Ph W/Calculus                  |       |
| PH 101 General Physics I <sup>1</sup>            |       |
| Select one of the following:                     | 4     |
| PH 106 General Physics W/Calc II <sup>1</sup>    |       |
| PH 126 Honors Gen Ph W/Calculus II               |       |
| PH 102 General Physics II <sup>1</sup>           |       |
| PH 253 Intro Modern Physics                      | 4     |
| & PH 255 and Modern Physics Lab                  |       |
| PH 301 or Mechanics I                            | 3     |
| PH 302 Intermediate Mechanics                    |       |
| PH 331 Elect & Magnetism I                       | 3     |
| PH 354 Intermediate Modern Physics               | 3     |
| PH 411 Biophysics                                | 3     |
| PH 491 Advanced Laboratory                       | 3     |
| Select six hours of PH elective 300 or 400 level | 6     |
| Credit Hours Subtotal:                           | 33    |

### Ancillary Courses

Grades in ancillary courses are not computed into the major GPA. The major in physics for the biophysics track requires the successful completion of the following courses outside the major:

|                                     |    |
|-------------------------------------|----|
| Select one of the following:        | 4  |
| BSC 114 Principles Of Biology I     |    |
| & BSC 115 and Laboratory Biology I  |    |
| BSC 118 Honors General Biology I    |    |
| Select one of the following:        | 4  |
| BSC 116 Principles Biology II       |    |
| & BSC 117 and Laboratory Biology II |    |
| BSC 120 Honors Gen Biology II       |    |
| CH 101 or General Chemistry         | 4  |
| CH 117 Honors General Chemistry     |    |
| CH 102 or General Chemistry         | 4  |
| CH 118 Honors General Chemistry     |    |
| CH 231 Elem Organic Chemistry I     | 3  |
| CH 232 Elem Organic Chem II         | 5  |
| & CH 237 and Elem Organic Chem Lab  |    |
| MATH 125 or Calculus I              | 4  |
| MATH 145 Honors Calculus I          |    |
| MATH 126 or Calculus II             | 4  |
| MATH 146 Honors Calculus II         |    |
| MATH 227 or Calculus III            | 4  |
| MATH 247 Honors Calculus III        |    |
| MATH 238 Appld Diff Equations I     | 3  |
| Credit Hours Subtotal:              | 39 |

**Total Hours** **72**

### Footnotes

<sup>1</sup> General physics with calculus (PH 105 General Physics W/Calc I and PH 106 General Physics W/Calc II, or honors PH 125 and PH 126 Honors Gen Ph W/Calculus II) is the preferred preparation for advanced physics courses. However, general physics (PH 101 General Physics I and PH 102 General Physics II) can substitute for students who must begin the major courses before taking calculus.

A wide range of careers are available for people with physics degrees: academic careers in physics, astronomy, and engineering; research science in government laboratories; research and development in private industry; engineering; K-12 teaching; quantitative financial analysis for investment firms; medical research or practice; science journalism. The analytical skills developed in the course of taking a physics curriculum allow physics majors (on average) to have relatively high scores on the LSAT and MCAT admissions tests for law school and medical school. For more information, see <http://www.aps.org/careers/physicists/>.

## Types of Jobs Accepted

Most of our recent graduates go on to graduate school in physics, engineering, astronomy, mathematics, or education. Other recent graduates have gone to medical school or law school, joined research laboratories, or become high school teachers.

## Jobs of Experienced Alumni

university or college professor, engineer, research scientist in a government laboratory, researchers and developers in private industry, K-12 teacher, physician

Learn more about opportunities in this field at the Career Center