Department of Physics

(Chair of Humanities, Arts and Sciences)

www.physics.uni.edu

The Department of Physics offers the following undergraduate and graduate programs. Specific requirements for these programs are listed within this Department of Physics section in the following order:

Undergraduate Major (B.S.)
  • Physics

Undergraduate Major (B.A.)
  • Physics
  • Physics-Teaching

Minors
  • Nanoscience and Nanotechnology
  • Physics

Program Certificate
  • Physics Teaching

The Department of Physics offers major programs in two baccalaureate areas: the Bachelor of Science and the Bachelor of Arts. The B.S. Physics major is recommended for students who wish to prepare for graduate study in physics, engineering, or other sciences such as geophysics, astronomy, biophysics, or medical physics. The B.A. Physics major is ideal for a student with interdisciplinary interests who wishes to combine physics with courses from another area. The B.A. Physics-Teaching program provides students with the best qualification to teach physics in high school.

Bachelor of Science Degree Program

Emphasis-B.S. Physics Major Honors Research

Emphasis-Honors Research

Students who complete a sustained research project in physics may be invited to do Honors Research. Students must first complete 4 credit hours of PHYSICS 3000 (880:180) Undergraduate Research in Physics and then 1 credit hour of PHYSICS 4990 Senior Thesis.

Physics Major

The B.S. Physics major requires a minimum of 126 total hours to graduate. This total includes Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 126 hours.

Note: To graduate with a B.S. degree in Physics, a student must earn an overall grade point average of at least 2.50 in all courses applied toward the major.

Bachelor of Arts Degree Program

Emphasis-B.A. Physics Major-Teaching Honors Research

Emphasis-Honors Research

Students who complete a sustained research project in physics education may be invited to do Honors Research. Students must first complete 4 credit hours of PHYSICS 3000 (880:180) Undergraduate Research in Physics and then 1 credit hour of PHYSICS 4990 Senior Thesis.

### Required

<table>
<thead>
<tr>
<th>Mathematics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420 (800:060)</td>
</tr>
<tr>
<td>MATH 1421 (800:061)</td>
</tr>
<tr>
<td>MATH 2422 (800:062)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 1100</td>
</tr>
<tr>
<td>PHYSICS 1701 (880:130)</td>
</tr>
<tr>
<td>PHYSICS 1702 (880:131)</td>
</tr>
<tr>
<td>PHYSICS 2300 (880:132)</td>
</tr>
<tr>
<td>PHYSICS 2700</td>
</tr>
<tr>
<td>PHYSICS 3000 (880:180)</td>
</tr>
<tr>
<td>PHYSICS 3700 (880:187)</td>
</tr>
<tr>
<td>PHYSICS 4100/5100 (880:137g)</td>
</tr>
<tr>
<td>PHYSICS 4110/5110 (880:138g)</td>
</tr>
<tr>
<td>PHYSICS 4300/5300 (880:152g)</td>
</tr>
<tr>
<td>PHYSICS 4600/5600 (880:166g)</td>
</tr>
<tr>
<td>PHYSICS 4860/5860 (880:150g)</td>
</tr>
<tr>
<td>PHYSICS 4900/5900 (880:136g)</td>
</tr>
</tbody>
</table>

### Electives

Physics, Natural Science, or Math Electives * | 8

Total Hours | 59

* Students have the option to design an area of professional concentration by the appropriate choice of elective courses in Physics (or another Natural Science), or Mathematics. Electives must be mathematics or science courses that count toward a major of the department offering the course. Electives should be selected with the advice of an academic adviser in Physics.
## Physics Major

The B.A. Physics Major requires a minimum of 120 hours to graduate. The B.A. Physics Major is suitable for a student seeking a background in physics with less specialization and mathematical rigor than in the B.S. degree in physics. It is especially appropriate for students with interdisciplinary interests who intend to pursue a career in, for example, computer science, medicine, earth/environmental science, business, or law. It requires fewer courses in physics and mathematics than the B.S. major programs and provides an opportunity to take courses in other science areas of interest.

### Physics:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 1100</td>
<td>First-Year Projects in Physics</td>
<td>1</td>
</tr>
<tr>
<td>PHYSICS 1701 (880:130)</td>
<td>Physics I for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 1702 (880:131)</td>
<td>Physics II for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 2300 (880:132)</td>
<td>Physics III: Theory and Simulation</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 4100/5100 (880:137g)</td>
<td>Modern Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 4110/5110 (880:138g)</td>
<td>Modern Physics Laboratory</td>
<td>2</td>
</tr>
</tbody>
</table>

### Mathematics:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420 (800:060)</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1421 (800:061)</td>
<td>Calculus II</td>
<td>4</td>
</tr>
</tbody>
</table>

### Electives:

- **Physics:**
  - 3000-level and above
  - No more than 2 hours of PHYSICS 3000 (880:180)
  - Courses from the departments of Biology (BIOL), Chemistry and Biochemistry (CHEM), Computer Science (CS), Earth Science and Environmental Sciences (EARTHSCI, ENV SCI), Mathematics (MATH, STAT, ACT SCI), Physics (PHYSICS), or Technology (TECH)

  Elective courses must count toward a major in the department that offers the course.

  Mathematics courses must be higher level than MATH 1421 (800:061).

Total Hours: 42

## Physics Major-Teaching

The B.A. Physics major in teaching requires a minimum of 120 total hours to graduate. This total includes Liberal Arts Core requirements, the Professional Education Requirements, and the following specified major requirements, plus electives to complete the minimum of 120 hours.

### Required

- **Mathematics:**
  - MATH 1420 (800:060) Calculus I: 4 hours
  - MATH 1421 (800:061) Calculus II: 4 hours

- **Science and Science Education:**
  - SCI ED 3300/5300 (820:190g) Orientation to Science Teaching: 4 hours
  - SCI ED 4700/5700 (820:193g) Methods for Teaching Physical Science: 3 hours

### Teaching:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHING 3129</td>
<td>Secondary and Special-Area Classroom Management</td>
<td>1</td>
</tr>
</tbody>
</table>

### Physics:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 1100</td>
<td>First-Year Projects in Physics</td>
<td>1</td>
</tr>
<tr>
<td>PHYSICS 1701 (880:130)</td>
<td>Physics I for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 1702 (880:131)</td>
<td>Physics II for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 2300 (880:132)</td>
<td>Physics III: Theory and Simulation</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 4080/5080</td>
<td>Resources for Teaching Physics</td>
<td>2</td>
</tr>
<tr>
<td>PHYSICS 4100/5100 (880:137g)</td>
<td>Modern Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 4110/5110 (880:138g)</td>
<td>Modern Physics Laboratory</td>
<td>2</td>
</tr>
</tbody>
</table>

### Electives:

- Physics: all 3000+ level courses: 6 hours
- Mathematics or non-physics science courses from the College of Humanities, Arts and Sciences: 4 hours

Total Hours: 46

* Excluding all 820:xxx and mathematics below MATH 1420 (800:060).

It is recommended that sufficient work including current curricula should be taken for licensure approval in a second area. Common teaching combinations are physics-chemistry or physics-mathematics.

Completion of this major will satisfy the requirements of the Iowa Department of Education for licensure.

## Minors

### Nanoscience and Nanotechnology Minor

#### Required

**Chemistry and Biochemistry:**
- CHEM 1110 (860:044) General Chemistry I & CHEM 1120 (860:048) General Chemistry II: 5-8 hours
- CHEM 1130 (860:070) General Chemistry I-II: 3 hours

Select one of the following:

- PHYSICS 1511 (880:054) General Physics I: 4 hours
- PHYSICS 1701 (880:130) Physics I for Science and Engineering: 4 hours

- PHYSICS 1512 (880:056) General Physics II: 4 hours
- PHYSICS 1702 (880:131) Physics II for Science and Engineering: 4 hours

- PHYSICS 4200/5200 (880:144g) Nanoscience: 3 hours
- PHYSICS 4200/5200 (860:144g) Nanoscience: 3 hours
- PHYSICS 4210/5210 (880:148g) Nanotechnology: 3 hours

It is recommended that sufficient work including current curricula should be taken for licensure approval in a second area. Common teaching combinations are physics-chemistry or physics-mathematics.
Department of Physics

or CHEM 4210/5210 (860:148g) Nanotechnology

Total Hours 19-22

Physics Minor

Required

Physics:
Select one of the following: 8

PHYSICS 1511 (880:054) & PHYSICS 1512 (880:056) General Physics I and General Physics II (required)

PHYSICS 1701 (880:130) & PHYSICS 1702 (880:131) Physics I for Science and Engineering and Physics II for Science and Engineering (required)

Electives: 12

Physics:
3000-level electives in Physics, with no more than 3 hours earned in the following: *

PHYSICS 3000 (880:180) Undergraduate Research in Physics (and/or)

PHYSICS 4450/5450 (880:148g) Laboratory Projects

Total Hours 20

* See course descriptions to reference 4-digit numbers associated with these 3000-level courses.

Program Certificate

The University of Northern Iowa makes available, in addition to traditional programs, the opportunity for students to earn program certificates. Program certificates provide an alternative to programs leading to a degree, a major, or a minor; they certify that an individual has completed a program approved by the university. For information on the following certificates, contact the Department of Physics or the Office of the Registrar, which serves as the centralized registry.

Physics Teaching Certificate

Completion of the certificate for the following majors meets the requirements of the State of Iowa Grades 5-12 Physics Teaching Endorsement.

Required:

Physics:

PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130) General Physics I Physics I for Science and Engineering 4

PHYSICS 1512 (880:056) or PHYSICS 1702 (880:131) General Physics II Physics II for Science and Engineering 4

PHYSICS 4080/5080 Resources for Teaching Physics 2

Science Education:

SCI ED 3300/5300 (820:190g) Orientation to Science Teaching 3

Electives chosen from the following: 3-5

Elective hours vary by major program. Mathematics Teaching majors and Chemistry Teaching majors must select three hours from the following: other secondary science teaching majors including All Science Teaching, Middle/Junior High School Science Teaching, Biology Teaching, and Earth Science Teaching must select five hours from the following:

PHYSICS 1100 First-Year Projects in Physics
PHYSICS 1800 (880:080) Projects in Basic Robotics and Sensors

PHYSICS 2300 (880:132) Physics III: Theory and Simulation
PHYSICS 3000 (880:180) Undergraduate Research in Physics *

PHYSICS 4050/5050 (880:140g) Optical Science
PHYSICS 4100/5100 (880:137g) Modern Physics
PHYSICS 4110/5110 (880:138g) Modern Physics Laboratory

PHYSICS 4200/5200 (880:144g) Nanoscience
PHYSICS 4210/5210 (880:148g) Nanotechnology

PHYSICS 4290/5290 Project Lead The Way: Digital Electronics

PHYSICS 4300/5300 (880:152g) Introduction to Electronics

Total Hours 16-18

* A maximum of 2 hours are allowed.
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Helvetica was used instead of Arial.

The editor may contact Leepfrog for a draft with the correct fonts in place.