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.

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### Required

<table>
<thead>
<tr>
<th>Mathematics:</th>
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<tbody>
<tr>
<td>MATH 1420 (800:060) Calculus I</td>
<td>4</td>
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<tr>
<td>MATH 1421 (800:061) Calculus II</td>
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<tr>
<td>MATH 2422 (800:062) Calculus III</td>
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<tr>
<th>Physics:</th>
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<tbody>
<tr>
<td>PHYSICS 1100 First-Year Projects in Physics</td>
<td>1</td>
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<tr>
<td>PHYSICS 1701 (880:130) Physics I for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 1702 (880:131) Physics II for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 2300 (880:132) Physics III: Theory and Simulation</td>
<td>3</td>
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<tr>
<td>PHYSICS 2700 Mathematical Methods of Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 3000 (880:180) Undergraduate Research in Physics or PHYSICS 3500 (880:184) Internship in Applied Physics</td>
<td>2</td>
</tr>
<tr>
<td>PHYSICS 3700 (880:187) Physics Seminar</td>
<td>1</td>
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<tr>
<td>PHYSICS 4100/5100 (880:137g) Modern Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 4110/5110 (880:138g) Modern Physics Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>PHYSICS 4300/5300 (880:152g) Introduction to Electronics</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 4600/5600 (880:166g) Classical Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 4860/5860 (880:150g) Computational Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 4900/5900 (880:136g) Thermodynamics and Statistical Mechanics</td>
<td>4</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:
- PHYSICS 1100 First-Year Projects in Physics 1
- PHYSICS 1701 (880:130) Physics I for Science and Engineering 4
- PHYSICS 1702 (880:131) Physics II for Science and Engineering 4
- PHYSICS 2300 (880:132) Physics III: Theory and Simulation 3
- PHYSICS 4100/5100 (880:137g) Modern Physics 4

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

Electives:
- 3000-level and above 7
- 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) 9
- 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
  - MATH 1421 (800:061) Calculus II 4
- Science and Science Education:
  - SCI ED 3300/5300 (820:190g) Orientation to Science Teaching 4
  - SCI ED 4700/5700 (820:193g) Methods for Teaching Physical Science 3

Teaching:
- TEACHING 3129 Secondary and Special-Area Classroom Management 1

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

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

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: 5-8
- Select one of the following:
  - CHEM 1110 (860:044) & CHEM 1120 (860:048) General Chemistry I and General Chemistry II
  - CHEM 1130 (860:070) General Chemistry I-II
- Physics:
  - PHYSICS 1511 (880:054) General Physics I 4
  - PHYSICS 1512 (880:056) General Physics II 4
  - PHYSICS 4200/5200 (880:144g) Nanoscience 3
  - PHYSICS 4210/5210 (880:148g) Nanotechnology 3
## Physics Minor

**Required**

**Physics:**

Select one of the following:

- PHYSICS 1511 (880:054) and PHYSICS 1512 (880:056)  
  General Physics I and General Physics II (required)  
  **8**

- PHYSICS 1701 (880:130) and PHYSICS 1702 (880:131)  
  Physics I for Science and Engineering and Physics II for Science and Engineering (required)  
  **8**

**Electives:**

- 3000-level electives in Physics, with no more than 3 hours earned in the following:  
  **12**

- PHYSICS 3000 (880:180)  
  Undergraduate Research in Physics (and/or)  
  **3**

- PHYSICS 4450/5450 (880:185g)  
  Laboratory Projects  
  **2**

Total Hours: 19-22

* 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  
  **4**

- PHYSICS 1512 (880:056) or PHYSICS 1702 (880:131)  
  General Physics II  
  **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  
  **4**

- PHYSICS 1800 (880:080)  
  Projects in Basic Robotics and Sensors  
  **3**

- PHYSICS 2300 (880:132)  
  Physics III: Theory and Simulation  
  **3**

- PHYSICS 3000 (880:180)  
  Undergraduate Research in Physics  
  **3**

- PHYSICS 4050/5050 (880:140g)  
  Optical Science  
  **3**

- PHYSICS 4100/5100 (880:137g)  
  Modern Physics  
  **3**

- PHYSICS 4110/5110 (880:138g)  
  Modern Physics Laboratory  
  **3**

- PHYSICS 4200/5200 (880:144g)  
  Nanoscience  
  **3**

- PHYSICS 4210/5210 (880:148g)  
  Nanotechnology  
  **3**

- PHYSICS 4290/5290  
  Project Lead The Way: Digital Electronics  
  **3**

- PHYSICS 4300/5300 (880:152g)  
  Introduction to Electronics  
  **3**

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.