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

**Undergraduate Major (B.S.)**
- Physics (p. 1)

**Undergraduate Major (B.A.)**
- Physics (p. 2)
- Physics-Teaching (p. 3)

**Minors**
- Nanoscience and Nanotechnology (p. 3)
- Physics (p. 3)

**Program Certificate**
- Physics Teaching (p. 4)

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.

The dual-degree program in physics and engineering in cooperation with Iowa State University (ISU) is also offered. The first three years of coursework in liberal arts and physics B.S. are completed at UNI. During the fourth and fifth years, engineering courses are completed at ISU. When finished, a student will have a bachelor’s degree in Physics from UNI and bachelor’s degree in Engineering from ISU.

**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.

**Required**

<table>
<thead>
<tr>
<th>Mathematics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420 (800:060) Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1421 (800:061) Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2422 (800:062) Calculus III</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 1100 First-Year Projects in Physics</td>
<td>1</td>
</tr>
<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>
</tr>
<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>
</tr>
<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>

<table>
<thead>
<tr>
<th>Electives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics, Natural Science, or Math Electives</td>
<td>8</td>
</tr>
<tr>
<td>Total Hours</td>
<td>59</td>
</tr>
</tbody>
</table>

* 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.
Bachelor of Arts Degree Program

Physics Major

The B.A. Physics Major is suitable for students who are interested in physics but are looking for a more interdisciplinary experience than the B.S. Physics Major. Potential careers include, for example, computer science, data science, medicine, business, or law. The B.A. Physics Major requires a minimum of 120 total hours for graduation. This includes the major requirements and electives specified below, as well as Liberal Arts Core requirements.

The B.A. Physics major has two emphases: Custom Emphasis and Data Science Emphasis. Students should choose one emphasis. Each emphasis requires completion of a common physics core, a common mathematics core and electives. The Data Science Emphasis has an additional core of data science-related courses and a required project.

Custom Emphasis

The Custom Emphasis is designed to combine a core understanding of physics with additional course work from other disciplines. The flexibility of this major makes it ideal for students interested in dual majors or one or more minors. The rigor of the program allows students to better prepare themselves for careers in any field, especially those related to science or technology. Students work with an advisor to create an individualized emphasis to best meet their needs.

Required Physics Core:
- 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 4100/5100 (880:137g): Modern Physics 4
- PHYSICS 4110/5110 (880:138g): Modern Physics Laboratory 2

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

Required Data Science Core:
- STAT 1772 (800:072): Introduction to Statistical Methods 3
- STAT 4772/5772 (800:122g): Statistical Computing I 3
- ECON 1011 (920:070): Statistics for Business Analytics 3
- ECON 1021 (920:020): Decision Analytics 3
- PHYSICS 3000 (880:180): Undergraduate Research in Physics 1
- or PHYSICS 3500 (880:184): Internship in Applied Physics

Electives: 3-4

Elective requirements should be chosen from the following: (Other choices will need departmental approval)
- CS 1510 (810:051): Introduction to Computing
- CS 1520 (810:052): Data Structures
- GEOG 3310 (970:164): Geographic Information Systems I
- GEOG 4320/5320 (970:174g): Geographic Information Systems II
- ACT SCI 3780/5780 (800:145g): Mathematics of Finance
- STAT 3752/5752 (800:152g): Introduction to Probability
- STAT 3771/5771 (800:121g): Applied Statistical Methods for Research
- STAT 3775/5775 (800:174g): Introduction to Mathematical Statistics *

Total Hours: 42-43

* STAT 3775/5775 (800:174g) has the following:
MATH 3752/5752 (800:152g) is a prerequisite;
MATH 2422 (800:062) is a pre-or-co-requisite.

Data Science Emphasis

The Data Science Emphasis integrates significant course work in physics, statistics and business analytics with electives from other areas such as Geographic Information Systems and computer programming. The goal is for students to develop broad-based skills in the analysis of data and the extraction of gainful information about a variety of systems.

Required Physics Core
- 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 4100/5100 (880:137g): Modern Physics 4
- PHYSICS 4110/5110 (880:138g): Modern Physics Laboratory 2

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

Required Data Science Core
- STAT 1772 (800:072): Introduction to Statistical Methods 3
- STAT 4772/5772 (800:122g): Statistical Computing I 3
- ECON 1011 (920:070): Statistics for Business Analytics 3
- ECON 1021 (920:020): Decision Analytics 3
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- or PHYSICS 3500 (880:184): Internship in Applied Physics

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- STAT 3775/5775 (800:174g): Introduction to Mathematical Statistics *

Total Hours: 42-43

* STAT 3775/5775 (800:174g) has the following:
MATH 3752/5752 (800:152g) is a prerequisite;
MATH 2422 (800:062) is a pre-or-co-requisite.
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.

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.

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Minors

Nanoscience and Nanotechnology Minor

**Required**

Chemistry and Biochemistry: 5-8

Select one of the following:
- CHEM 1110 (860:044) General Chemistry I
- CHEM 1120 (860:048) General Chemistry II
- CHEM 1130 (860:070) General Chemistry III

**Physics:**
- PHYSICS 1511 (880:054) General Physics I
- PHYSICS 1512 (880:056) General Physics II
- PHYSICS 1701 (880:130) Physics I for Science and Engineering
- PHYSICS 1702 (880:131) Physics II for Science and Engineering
- PHYSICS 4200/5200 (880:144g) Nanoscience
- PHYSICS 4210/5210 (880:148g) Nanotechnology

**Total Hours** 19-22

Physics Minor

**Required**

Physics:

Select one of the following: 8

- PHYSICS 1511 (880:054) General Physics I
- PHYSICS 1512 (880:056) General Physics II
- PHYSICS 1701 (880:130) Physics I for Science and Engineering
- PHYSICS 1702 (880:131) Physics II for Science and Engineering

**Electives:** 12

- 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 (880:185g) 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 majors mentioned below meets the requirements of the State of Iowa Grades 5-12 Physics Teaching Endorsement.

**Required:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physics:</strong></td>
<td>PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>General Physics I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or PHYSICS 1702 (880:131)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics I for Science and Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 1512 (880:056) or PHYSICS 1702 (880:131)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>General Physics II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or PHYSICS 1702 (880:131)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics II for Science and Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 4080/5080</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Resources for Teaching Physics</td>
<td></td>
</tr>
</tbody>
</table>

**Science Education:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SCI ED 3300/5300 (820:190g) Orientation to Science Teaching</td>
<td>4</td>
</tr>
</tbody>
</table>

**Electives chosen from the following:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PHYSICS 1100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>First-Year Projects in Physics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 1800 (880:080) projects in Basic Robotics and Sensors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 2300 (880:132) Physics III: Theory and Simulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 3000 (880:180) Undergraduate Research in Physics</td>
<td></td>
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<tr>
<td></td>
<td>PHYSICS 4050/5050 (880:140g) Optical Science</td>
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<tr>
<td></td>
<td>PHYSICS 4100/5100 (880:137g) Modern Physics</td>
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</tr>
<tr>
<td></td>
<td>PHYSICS 4110/5110 (880:138g) Modern Physics Laboratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 4200/5200 (880:144g) Nanoscience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 4210/5210 (880:148g) Nanotechnology</td>
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<tr>
<td></td>
<td>PHYSICS 4290/5290 Project Lead The Way: Digital Electronics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYSICS 4300/5300 (880:152g) Introduction to Electronics</td>
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</table>

**Total Hours:**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-19</td>
</tr>
</tbody>
</table>

* 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.