**PHYSICS, B.S.**

**REQUIREMENTS**

**UNIVERSITY GENERAL EDUCATION REQUIREMENTS**

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements section of the Guide.

**General Education**

- Breadth—Humanities/Literature/Arts: 6 credits
- Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits
- Breadth—Social Studies: 3 credits
- Communication Part A & Part B *
- Ethnic Studies *
- Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

**COLLEGE OF LETTERS & SCIENCE DEGREE REQUIREMENTS: BACHELOR OF SCIENCE (B.S.)**

Students pursuing a Bachelor of Science degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either the Bachelor of Arts or the Bachelor of Science degree requirements.

**BACHELOR OF SCIENCE DEGREE REQUIREMENTS**

**Mathematics**

Complete two courses of 3+ credits at the Intermediate or Advanced level in MATH, COMP SCI, or STAT subjects. A maximum of one course in each of COMP SCI and STAT subjects counts toward this requirement.

**Foreign Language**

Complete the third unit of a foreign language.

**L&S Breadth**

Complete:

- 12 credits of Humanities, which must include at least 6 credits of Literature; and
- 12 credits of Social Science; and
- 12 credits of Natural Science, which must include 6 credits of Biological Science and 6 credits of Physical Science.

**Liberal Arts and Science Coursework**

Complete at least 108 credits.

**Depth of Intermediate/Advanced Coursework**

Complete at least 60 credits at the Intermediate or Advanced level.

**Major**

Declare and complete at least one major.

**Total Credits**

Complete at least 120 credits.

**UW-Madison Experience**

Complete both:

- 30 credits in residence, overall, and
- 30 credits in residence after the 86th credit.

**Quality of Work**

- 2.000 in all coursework at UW–Madison
- 2.000 in Intermediate/Advanced level coursework at UW–Madison

**NON–L&S STUDENTS PURSUING AN L&S MAJOR**

Non–L&S students who have permission from their school/college to pursue an additional major within L&S only need to fulfill the major requirements. They do not need to complete the L&S Degree Requirements above.

**REQUIREMENTS FOR THE MAJOR**

The physics major requires 35 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 247</td>
<td>A Modern Introduction to Physics (recommended)</td>
<td>5</td>
</tr>
<tr>
<td>PHYSICS 207</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 201</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>E M A 201 &amp; E M A 202</td>
<td>Statics and Dynamics</td>
<td></td>
</tr>
<tr>
<td>E M A 201 &amp; M E 240</td>
<td>Statics and Dynamics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 248</td>
<td>A Modern Introduction to Physics (recommended)</td>
<td>5</td>
</tr>
<tr>
<td>PHYSICS 208</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 202</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 249</td>
<td>A Modern Introduction to Physics (recommended)</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 205</td>
<td>Modern Physics for Engineers (not recommended for majors)</td>
<td></td>
</tr>
<tr>
<td>PHYSICS/ E C E 235</td>
<td>Introduction to Solid State Electronics (not recommended for majors)</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 241</td>
<td>Introduction to Modern Physics</td>
<td></td>
</tr>
</tbody>
</table>
Intermediate Mechanics

Physics 311 Mechanics 3

Electromagnetism (complete one): 3-9

Physics 322 Electromagnetic Fields
ECE 220 Electrodynamics I
& ECE 320 and Electrodynamics II
& ECE 420 and Electromagnetic Wave Transmission 3

Thermal Physics (complete one): 3-6

Physics 415 Thermal Physics 4
Chem 561 Physical Chemistry
& Chem 562 and Physical Chemistry 5
ME 361 Thermodynamics

Quantum Mechanics (complete one): 3-6

Physics 448 & Physics 449 and Atomic and Quantum Physics
Physics 531 Introduction to Quantum Mechanics

Laboratory

Full registered credit per course:

Physics 307 Intermediate Laboratory-Mechanics and Modern Physics
Physics 407 Advanced Laboratory

Two credits apply from each of the following:

Physics 321 Electric Circuits and Electronics 6
Physics 325 Optics 6
Physics 623 Electronic Aids to Measurement 6
Physics 625 Applied Optics 6
NE 427 Nuclear Instrumentation Laboratory 7
NE 428 Nuclear Reactor Laboratory 7

One credit applies from each of the following:

ECE 305 Semiconductor Properties Laboratory 7
ECE 313 Optoelectronics Lab 7

Advanced Physics Electives 0-4

Total Credits 35

1

The introductory course sequence consists of three courses: Physics 247/Physics 248/Physics 249 in the honors sequence recommended for prospective physics majors, Physics 201/Physics 202/Physics 205 is recommend for engineers, and Physics 207/Physics 208/Physics 241 is intended for life sciences and chemistry majors, and is a suitable alternative for physics majors. Although the department recommends following one of these sequences, students are allowed to mix them, with the exception that transfers into the Physics 247/Physics 248/Physics 249 honors sequence are not permitted.

2

Both courses must be taken and together count 5 credits toward the 35 required for the major. These credits can be counted toward the 35 required for the major only if these courses are used to satisfy this requirement.

3

All three of ECE 220 and ECE 320 and ECE 420 must be taken, and together count 3 credits toward the 35 required for the major. These credits can be counted toward the 35 required for the major only if these courses are used to satisfy this requirement.

4

Physics 415 is strongly recommend as the course to satisfy the Thermal Physics Requirement, except for students pursuing additional majors in physics.

5

Both courses CHEM 561 and CHEM 562 must be taken and together count 3 credits toward the 35 required for the major. These credits can be counted toward the 35 required for the major only if these courses are used to satisfy this requirement.

6

All four credits for each course count toward 35-credit total.

7

For non-Physics courses, students will receive only the credit applied as lab toward the 35-credit requirement.

ADVANCED PHYSICS ELECTIVE COURSES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 301</td>
<td>Physics Today (recommended)</td>
<td>1</td>
</tr>
<tr>
<td>PHYSICS 307</td>
<td>Intermediate Laboratory-Mechanics and Modern Physics</td>
<td>2</td>
</tr>
<tr>
<td>PHYSICS 311</td>
<td>Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 321</td>
<td>Electric Circuits and Electronics</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 531</td>
<td>Introduction to Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 535</td>
<td>Introduction to Particle Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 545</td>
<td>Introduction to Atomic Structure</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 546</td>
<td>Lasers</td>
<td>2-3</td>
</tr>
<tr>
<td>PHYSICS 551</td>
<td>Solid State Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 623</td>
<td>Electronic Aids to Measurement</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 625</td>
<td>Applied Optics</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 681</td>
<td>Senior Honors Thesis</td>
<td>3</td>
</tr>
</tbody>
</table>
 PHYSICS 682  Senior Honors Thesis  3
 PHYSICS 691  Senior Thesis  2-3
 PHYSICS 692  Senior Thesis  2-3

It is recommended that the student’s program include the seminar PHYSICS 301 Physics Today.

RESIDENCE AND QUALITY OF WORK IN THE MAJOR

- 2.000 GPA in all PHYSICS and all major courses
- 2.000 on at least 15 credits in Upper Level work, taken in residence
- 15 credits in PHYSICS, taken on campus

Courses that meet the Core and Laboratory requirements, and Advanced level PHYSICS courses, count as upper-level in the major.

HONORS IN THE MAJOR

Students may declare Honors in the Major in consultation with their major advisor and the Honors Program.

HONORS IN THE MAJOR REQUIREMENTS

To earn Honors in the Major, students must satisfy both the requirements for the major (above) and the following additional requirements:

- Earn a 3.300 University GPA
- Earn a 3.300 GPA in all PHYSICS and all major courses
- 12 credits of Honors PHYSICS courses with grades of B or better, to include:
  - PHYSICS 681 – PHYSICS 682, for a total of 6 credits
  - 3 additional credits of Advanced level PHYSICS for Honors, with a grade of B or better
  - 3 credits at any level in PHYSICS for Honors, with a grade of B or better

DISTINCTION IN THE MAJOR

Distinction in the Major requires no declaration, and is awarded at the time of graduation. Students may not receive Distinction and Honors in the same major. To receive Distinction in the Major, students must have met the following requirements and notify a departmental advisor:

- 3.300 University GPA
- 3.300 GPA in all PHYSICS and all major courses
- 6 additional credits in Advanced level PHYSICS beyond the minimum required for the major.

UNIVERSITY DEGREE REQUIREMENTS

Total Degree  To receive a bachelor’s degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.