

# 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 (<http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext>) section of the *Guide*.

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| General Education | <ul style="list-style-type: none"> <li>• Breadth–Humanities/Literature/Arts: 6 credits</li> <li>• 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</li> <li>• Breadth–Social Studies: 3 credits</li> <li>• Communication Part A &amp; Part B *</li> <li>• Ethnic Studies *</li> <li>• Quantitative Reasoning Part A &amp; Part B *</li> </ul> |
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\* 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

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| 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. |
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| Foreign Language | Complete the third unit of a foreign language. |
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| L&S Breadth | Complete: <ul style="list-style-type: none"> <li>• 12 credits of Humanities, which must include at least 6 credits of Literature; and</li> <li>• 12 credits of Social Science; and</li> <li>• 12 credits of Natural Science, which must include 6 credits of Biological Science and 6 credits of Physical Science.</li> </ul> |
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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: <ul style="list-style-type: none"> <li>• 30 credits in residence, overall, and</li> <li>• 30 credits in residence after the 86th credit.</li> </ul>
Quality of Work	<ul style="list-style-type: none"> <li>• 2.000 in all coursework at UW–Madison</li> <li>• 2.000 in Intermediate/Advanced level coursework at UW–Madison</li> </ul>

### 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:

Code	Title	Credits
<b>Introductory Physics <sup>1</sup></b>		
<i>First Introductory Course (complete one): <sup>1</sup></i>		5
PHYSICS 247	A Modern Introduction to Physics (recommended)	
PHYSICS 207	General Physics	
PHYSICS 201	General Physics	
E M A 201 & E M A 202	Statics and Dynamics <sup>2</sup>	
E M A 201 & M E 240	Statics and Dynamics <sup>2</sup>	
<i>Second Introductory Course (complete one):</i>		5
PHYSICS 248	A Modern Introduction to Physics (recommended)	
PHYSICS 208	General Physics	
PHYSICS 202	General Physics	
<i>Third Introductory Course (complete one):</i>		3–4
PHYSICS 249	A Modern Introduction to Physics (recommended)	
PHYSICS 205	Modern Physics for Engineers (not recommended for majors)	
PHYSICS/ E C E 235	Introduction to Solid State Electronics (not recommended for majors)	
PHYSICS 241	Introduction to Modern Physics	

**Intermediate Mechanics**

PHYSICS 311	Mechanics	3
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**Electromagnetism (complete one): 3-9**

PHYSICS 322	Electromagnetic Fields	
E C E 220 & E C E 320 & E C E 420	Electrodynamics I and Electrodynamics II and Electromagnetic Wave Transmission <sup>3</sup>	

**Thermal Physics (complete one): 3-6**

PHYSICS 415	Thermal Physics <sup>4</sup>	
CHEM 561 & CHEM 562	Physical Chemistry and Physical Chemistry <sup>5</sup>	
M E 361	Thermodynamics	

**Quantum Mechanics (complete one): 3-6**

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

**Laboratory 6**

*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 <sup>6</sup>	
PHYSICS 325	Optics <sup>6</sup>	
PHYSICS 623	Electronic Aids to Measurement <sup>6</sup>	
PHYSICS 625	Applied Optics <sup>6</sup>	
N E 427	Nuclear Instrumentation Laboratory <sup>7</sup>	

N E 428	Nuclear Reactor Laboratory <sup>7</sup>	
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*One credit applies from each of the following:*

E C E 305	Semiconductor Properties Laboratory <sup>7</sup>	
E C E 313	Optoelectronics Lab <sup>7</sup>	

**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 E C E 220 and E C E 320 and E C E 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**

Code	Title	Credits
PHYSICS 301	Physics Today (recommended) <sup>8</sup>	1
PHYSICS 307	Intermediate Laboratory-Mechanics and Modern Physics	2
PHYSICS 311	Mechanics	3
PHYSICS 321	Electric Circuits and Electronics	4
PHYSICS 322	Electromagnetic Fields	3
PHYSICS 323	Electromagnetic Fields	3
PHYSICS 325	Optics	4
PHYSICS 406	Special Topics in Physics	1-4
PHYSICS 407	Advanced Laboratory	2-4
PHYSICS 415	Thermal Physics	3
PHYSICS 448	Atomic and Quantum Physics	3
PHYSICS 449	Atomic and Quantum Physics	3
PHYSICS/ ENVIR ST 472	Scientific Background to Global Environmental Problems	3
PHYSICS 498	Directed Study	1-3
PHYSICS 499	Directed Study	1-3
PHYSICS/B M E/ H ONCOL/ MED PHYS 501	Radiation Physics and Dosimetry	3
PHYSICS/E C E/ N E 525	Introduction to Plasmas	3
PHYSICS/E C E/ N E 527	Plasma Confinement and Heating	3
PHYSICS 531	Introduction to Quantum Mechanics	3
PHYSICS 535	Introduction to Particle Physics	3
PHYSICS 545	Introduction to Atomic Structure	3
PHYSICS/E C E 546	Lasers	2-3
PHYSICS 551	Solid State Physics	3
PHYSICS 623	Electronic Aids to Measurement	4
PHYSICS 625	Applied Optics	4
PHYSICS 681	Senior Honors Thesis	3

PHYSICS 682	Senior Honors Thesis	3
PHYSICS 691	Senior Thesis	2-3
PHYSICS 692	Senior Thesis	2-3

**8**

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<sup>9</sup>
- 15 credits in PHYSICS, taken on campus

**9**

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.

**Residency** Degree candidates are required to earn a minimum of 30 credits in residence at UW-Madison. "In residence" means on the UW-Madison campus with an undergraduate degree classification. "In residence" credit also includes UW-Madison courses offered in distance or online formats and credits earned in UW-Madison Study Abroad/Study Away programs.

**Quality of Work** Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.