

# PHYSICS, B.A.

## WELCOME TO THE UW–MADISON DEPARTMENT OF PHYSICS

We have a long history of providing our students with a great educational experience. Our physics department awarded its first Ph.D. in 1899. Since then, our students have earned degrees in virtually every area of physics, and our faculty have played key roles in a myriad of important research efforts.

Physics is the science of the properties of matter, radiation, and energy in all forms. As such, it is the most fundamental of the sciences. It provides the underlying framework for the other physical sciences and engineering and for understanding physical processes in biological and environmental sciences.

## CHOOSE TO BE A PHYSICS MAJOR

### WHY STUDY PHYSICS?

- **Intellectual Satisfaction.** First, and foremost, physics satisfies our deep desire to understand how the universe works. Physics is interesting.
- **Intellectual Challenge.** By striving for fundamental understanding, the physicist accepts the challenge to move past a merely descriptive approach of our world and probes deeply into how and why it works.
- **Physics Produces New Technology.** Today's esoteric physics research will become tomorrow's technological advances.
- **Technical Expertise.** Physicists exploit forefront technologies in their pursuits.
- **Flexibility.** In a fast-paced and changing world, it is much more important to have a broad substantive education than to be trained in a specific skill. We teach people how to think, and how to apply and extend what they know to new types of problems.
- **Physics is Analytical and Quantitative.** People who can reason analytically and quantitatively are essential for the success of almost any pursuit.

The undergraduate physics program will provide an overall view of both classical and modern physics with the flexibility to continue learning in fields that interest you. It will also help you develop skills in analysis, problem-solving, and quantitative reasoning that will aid you in whatever career you pursue after graduation.

Your education can:

- Prepare you for employment in industrial or governmental laboratories.
- Prepare you for graduate studies for master's or doctoral degrees in experimental or theoretical physics.
- Provide a broad background for further work in other sciences, such as materials sciences, aerospace, astronomy, computer science, geophysics, meteorology, radiology, medicine, biophysics, engineering, and environmental studies.
- Provide a science-oriented liberal education. This training can be useful in some areas of business administration, law, or other fields where a basic knowledge of science is useful.

- Provide part of the preparation you need to teach physics. To teach physics in high school, you will also take education courses to become certified. You will need a doctoral degree to become a college or university professor.

Interested in the undergraduate physics program? Check out the physics undergraduate page (<https://www.physics.wisc.edu/academics/undergrads/>) or browse the Undergraduate Physics Majors Handbook (<https://www.physics.wisc.edu/undergrads/handbook.pdf>).

## OTHER PROGRAMS

### AMEP

A program in applied mathematics, engineering and physics (AMEP) (<http://guide.wisc.edu/undergraduate/letters-science/mathematics/applied-mathematics-engineering-physics-bs-amep/>) is described in its own section of the *Guide*.

### Astronomy–Physics

Students interested in an astronomy–physics major should contact the astronomy department (<http://guide.wisc.edu/undergraduate/letters-science/astronomy/>).

### Education–Physics

A student working toward the Bachelor of Science–Education degree may major or minor in physics. Interested students should contact the School of Education (<http://guide.wisc.edu/undergraduate/education/>). Upon request, the physics department will assign an advisor.

### Medical Physics

A suggested curriculum for students interested in graduate study in medical physics is available on the medical physics webpage (<https://www.medphysics.wisc.edu/graduate-program/admissions/#requirements>).

## HOW TO GET IN

### TO DECLARE A PHYSICS MAJOR

Students should discuss declaration with one of the undergraduate advisors (p. 5) as early as possible and bring a What-If DARS for the Physics major to their meeting.

To be eligible to declare the major, students must have a combined MATH and PHYSICS GPA of at least a 2.500. Eligible students can declare the physics major anytime by completing the department's major declaration form (<https://www.physics.wisc.edu/sites/default/files/Physics%20Declaration%20Form.pdf>) and having it signed by a physics undergraduate advisor.

There are additional steps to declaring Physics as an Additional Major. Section C of the major declaration form (<https://www.physics.wisc.edu/sites/default/files/Physics%20Declaration%20Form.pdf>) has important information about this process. Students should consult the Guide page of their home school or college for more information about declaring an Additional Major in L&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/#requirementsforundergraduatestudyttext>) 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 ARTS (B.A.)

Students pursuing a bachelor of arts 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 a bachelor of arts or a bachelor of science curriculum.

#### BACHELOR OF ARTS DEGREE REQUIREMENTS

**Mathematics** Complete the University General Education Requirements for Quantitative Reasoning A (QR-A) and Quantitative Reasoning B (QR-B) coursework.

Foreign Language	<ul style="list-style-type: none"> <li>• Complete the fourth unit of a foreign language; OR</li> <li>• Complete the third unit of a foreign language and the second unit of an additional foreign language.</li> </ul>
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L&S Breadth	<ul style="list-style-type: none"> <li>• 12 credits of Humanities, which must include 6 credits of literature; and</li> <li>• 12 credits of Social Science; and</li> <li>• 12 credits of Natural Science, which must include one 3+ credit Biological Science course and one 3+ credit Physical Science course.</li> </ul>
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Liberal Arts and Science Coursework	Complete at least 108 credits.
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Depth of Intermediate/Advanced work	Complete at least 60 credits at the intermediate or advanced level.
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Major	Declare and complete at least one major.
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Total Credits	Complete at least 120 credits.
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UW-Madison Experience	<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>
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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>
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### 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	
<b>Intermediate Mechanics</b>		
PHYSICS 311	Mechanics	3
<b>Electromagnetism (complete one):</b>		<b>3-9</b>
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>
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**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
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PHYSICS 407	Advanced Laboratory
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*Two credits apply from each of the following:*

PHYSICS 321	Electric Circuits and Electronics <sup>6</sup>
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PHYSICS 325	Optics <sup>6</sup>
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PHYSICS 623	Electronic Aids to Measurement <sup>6</sup>
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PHYSICS 625	Applied Optics <sup>6</sup>
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N E 427	Nuclear Instrumentation Laboratory <sup>7</sup>
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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>
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E C E 313	Optoelectronics Lab <sup>7</sup>
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**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

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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

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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.

## LEARNING OUTCOMES

1. Understand basic physical principles.
2. Solve problems proficiently using both quantitative and qualitative applications of these physical principles.
3. Appreciate the excitement of physics and be acquainted with a wide range of research areas in physics.
4. Know how to perform quantitative measurements of physical phenomena and understand the statistical significance of observations made in the presence of statistical and systematic uncertainties.
5. Be prepared for graduate study and/or careers in STEM fields.
6. Communicate effectively with scientific peers and the public, both orally and in writing.
7. Understand their own learning processes and be able to continue to educate themselves after graduation.

## FOUR-YEAR PLAN

### SAMPLE FOUR-YEAR PLAN

This Sample Four-Year Plan is a tool to assist students and their advisor(s). Students should use it—along with their DARS report, the Degree Planner, and Course Search & Enroll tools—to make their own four-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests. As students become involved in athletics, honors, research, student organizations, study abroad, volunteer experiences, and/or work, they might adjust the order of their courses to accommodate these experiences. Students will likely revise their own four-year plan several times during college.

Students should arrange a meeting with a departmental advisor as soon as they are even thinking about a physics major. It is important to get major advising as early as possible.

This is one of many paths through the physics major. For other possibilities and details on math preparation and sequence of courses, see the Advising and Careers page (<https://guide.wisc.edu/undergraduate/letters-science/physics/physics-bs/#advisingandcareerstext>).

#### First Year

Fall	Credits	Spring	Credits
PHYSICS 247 (Physics First Introductory Course)		5 PHYSICS 248 (Physics Second Introductory Course)	5
MATH 234		4 MATH 319	3
Communication A		3 MATH 340	3

Foreign Language (if needed)	4	Ethnic Studies	3
	<b>16</b>		<b>14</b>

**Second Year**

Fall	Credits	Spring	Credits
PHYSICS 249 (Physics Third Introductory Course)	4	PHYSICS 301	1
PHYSICS 311 (Mechanics)	3	PHYSICS 307 (Laboratory)	2
MATH 321	3	PHYSICS 322	3
Social Science Breadth	3	MATH 322	3
INTER-LS 210	1	Biological Science Breadth	3
		Social Science Breadth	3
	<b>14</b>		<b>15</b>

**Third Year**

Fall	Credits	Spring	Credits
PHYSICS 321	4	PHYSICS 407 (Laboratory)	2-4
PHYSICS 448 (Quantum Physics)	3	PHYSICS 415 (Thermal Physics)	3
Communication B	3-4	PHYSICS 449	3
Humanities Breadth	3	Humanities Breadth	3
Social Science Breadth	3	Social Science Breadth	3
	<b>16</b>		<b>14</b>

**Fourth Year**

Fall	Credits	Spring	Credits
Literature Breadth	3	Literature Breadth	3
Electives	12	Electives	13
	<b>15</b>		<b>16</b>

**Total Credits 120****ADVISING AND CAREERS****PHYSICS UNDERGRADUATE ADVISORS****Evan Heintz****Professor Tulika Bose****Professor Deniz Yavuz****SCHEDULING AN ADVISING APPOINTMENT WITH A PHYSICS MAJOR ADVISOR:**

To meet with a Physics major advisor, you may either email physics-advisors@wisc.edu or contact one of them directly.

**PHYSICS AMEP ADVISORS****Professor Cary Forest****Professor Robert McDermott****Professor Thad Walker****Professor Deniz Yavuz****SCHEDULING AN ADVISING APPOINTMENT WITH AN AMEP ADVISOR:**

Applied Math Engineering Physics (AMEP) students may email AMEP-advisors@wisc.edu. If you already have an assigned AMEP advisor in the physics department, please contact them directly.

**ADVISING FOR SOAR STUDENTS**

Email physics-advisors@wisc.edu or AMEP-advisors@wisc.edu, depending on your interests. Include contact information and your availability.

The Department of Physics encourages our majors to begin working on their career exploration and preparation soon after arriving on campus. We partner with SuccessWorks at the College of Letters & Science. L&S graduates are in high demand by employers and graduate programs. It is important to us that our students are career ready at the time of graduation, and we are committed to your success.

Additional Resources:

- Link to physics department student jobs and research opportunities (<https://www.physics.wisc.edu/academics/undergrads/news/>)

**ADVISORY INFORMATION****Mathematics**

There are specific math courses listed as prerequisites for our Physics courses. Depending on your interest in math (some Physics majors also major in Math as well), the courses you select may be different. A typical math sequence is: MATH 221, MATH 222, MATH 234, MATH 319, MATH 340, MATH 321, MATH 322. MATH 320 is an alternative course majors may pursue instead of taking both MATH 319 and MATH 340. Please consult with an advisor when choosing your Mathematics courses, particularly before deciding on one of the honors sequences in Math. We do not recommend the honors sequences for physics majors unless you are considering a second major in Math.

MATH 221 Calculus and Analytic Geometry 1: MATH 221 is a prerequisite to PHYSICS 247, PHYSICS 207, and PHYSICS 201.

MATH 222 Calculus and Analytic Geometry 2: MATH 222 is also a prerequisite for PHYSICS 247 but can be taken concurrently.

MATH 234 Calculus--Functions of Several Variables: MATH 234 is a prerequisite for PHYSICS 248 but can be taken concurrently. It is typically taken to complete the sequence MATH 221/MATH 222/MATH 234.

MATH 319 Techniques in Ordinary Differential Equations: Techniques for solving and approximating solutions to ordinary differential equations. You are strongly advised to take MATH 319 and MATH 340, or MATH 320 before PHYSICS 311 Mechanics.

MATH 340 Elementary Matrix and Linear Algebra: This course is a bridge between concrete and abstract math. The next step for students interested in more abstract math is MATH 521/MATH 522. MATH 340 is particularly useful for PHYSICS 311 and later for quantum mechanics and we strongly suggest taking it or MATH 320.

MATH 320 Linear Algebra and Differential Equations: This course combines topics from MATH 319 and MATH 340. It is adequate for the



rest of our undergraduate physics curriculum but is not recommended for those planning on continuing to graduate school. There is an accelerated honors section that thoroughly covers all of the material in MATH 319 and MATH 340. It is more challenging but is a good way to fit in both topics if you are unable to take MATH 319/MATH 340 before you take PHYSICS 311.

MATH 321 Applied Mathematical Analysis: Techniques for solving problems in the physical sciences, engineering, and applied mathematics, using advanced calculus and analytic function theory. It is recommended that MATH 321 be taken before taking PHYSICS 322. MATH 321 is highly recommended for physics majors but requires a significant time commitment.

MATH 322 Applied Mathematical Analysis: Techniques for solving partial differential equations, with an emphasis on practical problems in the physical sciences. Also covers special functions, Fourier Transformations, etc. MATH 321 and MATH 322 are recommended for those planning to continue on to graduate school in Physics.

### Chemistry

A college course in chemistry is useful for all physics students, but not required.

### Computing

Students should become familiar with scientific programming. The most useful languages are Python followed by C or C++. The computer sciences department offers introductory courses. The Division of Information Technology (DoIT) also offers short courses to introduce programming.

## L&S CAREER RESOURCES

Every L&S major opens a world of possibilities. SuccessWorks (<https://successworks.wisc.edu/>) at the College of Letters & Science helps students turn the academic skills learned in their major, certificates, and other coursework into fulfilling lives after graduation, whether that means jobs, public service, graduate school or other career pursuits.

In addition to providing basic support like resume reviews and interview practice, SuccessWorks offers ways to explore interests and build career skills from their very first semester/term at UW all the way through graduation and beyond.

Students can explore careers in one-on-one advising, try out different career paths, complete internships, prepare for the job search and/or graduate school applications, and connect with supportive alumni and even employers in the fields that inspire them.

- SuccessWorks (<https://careers.ls.wisc.edu/>)
- Set up a career advising appointment (<https://successworks.wisc.edu/make-an-appointment/>)
- Enroll in a Career Course (<https://successworks.wisc.edu/career-courses/>) - a great idea for first- and second-year students:
  - INTER-LS 210 L&S Career Development: Taking Initiative (1 credit)
  - INTER-LS 215 Communicating About Careers (3 credits, fulfills Comm B General Education Requirement)
- Learn about internships and internship funding (<https://successworks.wisc.edu/finding-a-job-or-internship/>)
  - INTER-LS 260 Internship in the Liberal Arts and Sciences
- Activate your Handshake account (<https://successworks.wisc.edu/handshake/>) to apply for jobs and internships from 200,000+ employers recruiting UW-Madison students

- Learn about the impact SuccessWorks has on students' lives (<https://successworks.wisc.edu/about/mission/>)

## PEOPLE

### FACULTY

Yang Bai (<https://www.physics.wisc.edu/people/yangbai/>), Professor

Baha Balantekin (<https://www.physics.wisc.edu/people/bahabalantekin/>), Eugene P. Wigner Professor

Vernon Barger (<https://www.physics.wisc.edu/people/vernon-dbarger/>), Vilas Professor and Van Vleck Professor

Keith Bechtol (<https://www.physics.wisc.edu/people/keithbechtol/>), Assistant Professor

Uwe Bergmann (<http://www.physics.wisc.edu/people/uwebergmann/>), Martin L. Perl Endowed Professor in Ultrafast X-Ray Science

Kevin Black (<https://www.physics.wisc.edu/people/kevinblack/>), Professor, Associate Chair for Graduate Program

Stas Boldyrev (<https://www.physics.wisc.edu/people/stanislavboldyrev/>), Professor

Tulika Bose (<https://www.physics.wisc.edu/people/tulikabose/>), Professor

Victor Brar (<https://www.physics.wisc.edu/people/victorbrar/>), Van Vleck Assistant Professor

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Aki Hashimoto (<https://www.physics.wisc.edu/people/akihashimoto/>), Professor

Matthew Herndon (<https://www.physics.wisc.edu/people/matthew-herndon/>), Professor

Robert Joynt (<https://www.physics.wisc.edu/people/robert-joynt/>), Professor

Albrecht Karle (<https://www.physics.wisc.edu/people/albrechtkarle/>), Professor, IceCube Associate Director, Science and Instrumentation

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Sau Lan Wu (<https://www.physics.wisc.edu/people/sau-lanwu/>), Enrico Fermi Professor and Vilas Professor

Deniz Yavuz (<https://www.physics.wisc.edu/people/denizyavuz/>), Professor

Ellen Zweibel (<https://www.physics.wisc.edu/people/ellen-gzweibel/>), William L Kraushaar Professor of Astronomy & Physics

## WISCONSIN EXPERIENCE

### PHYSICS UNDERGRADUATE COLLOQUIUM

There is a weekly series of talks in the spring semester called "Physics Today," at which a topic of local research is described by one of the physics faculty. These are open and may be attended by anyone. They can also be taken as a course, PHYSICS 301 Physics Today. See the Course Guide for location and time.

### THE PHYSICS CLUB

The University Physical Society (UPS)—also known as the Physics Club—is a student organization for people interested in physics and related fields.

#### WHAT DOES THE PHYSICS CLUB DO?

The Physics Club organizes events such as seminars, tours, trips, and socials for its members. Physics Club volunteers also offer free drop-in tutoring to students in introductory physics and astronomy classes. In addition, we maintain subscriptions to science related magazines such as *Scientific American*, *Astronomy*, and *Physics Today*, which are kept in the club's room located at 2328 Chamberlin Hall. Every Friday afternoon, we meet with the physics colloquium speaker to learn about the process of becoming a scientist. In addition, UPS sponsors a variety of other events. For example, in the past, we have taken a field trip to Fermilab, sponsored a racquetball tournament, and have frequently gathered for social events such as ice skating, movie night, and bowling.

#### WHY SHOULD YOU JOIN THE PHYSICS CLUB?

By joining the Physics Club you'll be meeting many physics majors, who are, in general, really cool people to hang out with. If you are thinking about declaring a physics major, this is the place to come for helpful advice about taking classes and finding an undergraduate job in the physics department. If you join, you can get access to the Physics Club room, 2328 Chamberlin Hall. Joining also adds you to the club email list, so you can be notified about club sponsored events.

#### PERKS OF BEING A PHYSICS CLUB MEMBER

When you join the Physics Club, you get access to an excellent room, 2328 Chamberlin Hall. This room contains a refrigerator, reference shelves of textbooks, couch, tables, and chairs, a phone, blackboards, and a microwave. We have several computers in the room. You can get your own key to the room and visit at your leisure, and stay as long as you like. Plus, you get the added bonus of knowing people who are in your classes.

#### University Physical Society

2328 Chamberlin Hall  
email: [ups.officers@gmail.com](mailto:ups.officers@gmail.com)

#### To Join:

Drop by Room 2328 Chamberlin Hall and pick up a membership form. Turn in a completed form with your annual dues to a UPS club officer.

## GENDER MINORITIES AND WOMEN IN PHYSICS

Gender Minorities and Women in Physics (GMaWiP) is a student organization open to undergraduates for the support and promotion of gender minorities and women in physics at UW-Madison. GMaWiP works to provide both professional development and support for women and gender minorities in physics at every step in their careers by taking concrete actions through the following methods:

1. Career Development
2. Mentorship
3. Fellowship
4. Outreach

In addition, they provide advocacy for other minorities in physics, including, but not limited to students of color, students with disability status, low-income students, and LGBT+ students. The group also hosts social events throughout the year aimed at building a sense of community among the members.

### GREAT IDEAS

GMaWiP also hosts a bi-weekly GREAT IDEAS (Group for Reading, Educating, And Talking about Inclusion, Diversity, Equity, & Advocacy in Science) seminar. GREAT IDEAS is a multimedia reading group dedicated to amplifying the experiences of underrepresented groups in science and academia in order to become better advocates for our peers. GREAT IDEAS is open to everyone, and all are welcome and encouraged to engage with the material and contribute to the discussions.

### UNDERGRADUATE MENTORSHIP PROGRAM

GMaWiP also provides a mentorship program for undergraduate students. This program connects the undergraduate with a graduate student who will advise and mentor the undergraduate as they work to obtain their degree. If you are interested in this mentorship program or are interested in getting involved with GMaWiP, please fill out this contact form ([https://gmawip.physics.wisc.edu/?page\\_id=72](https://gmawip.physics.wisc.edu/?page_id=72)).

## PHYSICS LEARNING CENTER

The Physics Learning Center: Striving to help all students succeed in Physics

- Do you enjoy Physics?
- Are you patient?
- Do you like to teach?
- Would you like to help other undergraduate students?

The Physics Learning Center (PLC) has job opportunities for physics undergraduates as Peer Mentor Tutors (PMT). The PLC is looking for PMTs who have a desire to help others learn physics and have an enthusiasm for learning new ways to solve physics problems.

The PLC provides supplemental instruction and a supportive learning environment to students in large challenging introductory physics courses. They include algebra-based Physics 103-104 and calculus-based 207-208 that are requisites for many STEM majors and pre-health professional pathways. The majority of students in these classes are not physics majors.

PMTs lead a learning team twice a week helping students build a conceptual framework to solve a variety of physics problems. The PLC strives to create a supportive learning environment to help students gain skills, increase confidence, and meet potential study partners.

Peer Mentor Tutors receive extensive training in teaching Physics and in general pedagogy. Tutors meet with a PLC staff member each week to discuss strategies for teaching course content, including how to use teaching materials that stress conceptual understanding. In addition, PMTs from all courses meet as a group for a weekly teaching seminar to discuss issues such as group dynamics, techniques for actively involving students in learning, helping students to prepare for exams, raising awareness of diversity in student experiences, resources on campus, etc.

Our Peer Mentor Tutors report that they greatly enjoy working with their students. In the process, they strengthen their own foundation in Physics and presentation skills. They also tell us that teaching Physics helps to review for the Graduate Record Exam and to prepare for post-graduate teaching in middle/high school or as a University teaching assistant.

PMTs are a mix of students majoring in physics, astrophysics, secondary science education, and engineering as well as from other majors. This is a paid position taking about eight hours per week that includes learning team time, content and pedagogy meetings, reviews before exams, and time to prepare for teaching.

To find out more about the PLC Peer Mentor Tutor Program, please contact us. The PLC is located in Chamberlin 2337/2338.

### Physics Learning Center

2337/2338 Chamberlin Hall

**Contact:** Susan Nossal  
nossal@physics.wisc.edu  
608-262-9107

## RESOURCES AND SCHOLARSHIPS

The Physics Department is very happy to offer a number of awards for undergraduate and graduate students in physics each year. Many of these awards have been made possible through very generous donations by alumni and friends of the Department.

A list of all the undergraduate and graduate awards can be found on the physics website (<https://www.physics.wisc.edu/department/awards/apply/>).

## APPLICATION PROCESS

### Eligibility

- Must be enrolled as a full-time student at UW-Madison in both semesters of the Academic Year
- Must be a physics major (some awards also include astronomy majors)

Applicants will be judged by the Student Awards Committee. You may apply for a specific award below however the Committee will consider all eligible applications for relevant awards. The Committee will review your transcript.



The call for applications is often sent out near the end of fall semester with the deadline for applications often falling slightly after the beginning of spring semester. The awards decisions will be made by the Awards Committee soon thereafter. Awardees will be notified and asked to attend the Physics Awards Banquet to be held at the end of the spring semester.

## **TO APPLY**

Once the call for applications has been sent out, each applicant is to submit the following (in PDF) by the deadline via WiSH (<https://wisc.academicworks.com/>):

- Resume/CV
  - Statement of current research/teaching activity and future plans as a physics major (one page)
  - Letter of recommendation from a faculty or staff member (one page)
  - On-line application system will automatically prompt letter writer to submit letter
  - If indicated below, a statement of need (one page)
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### **For More information**

Please visit the Department of Physics Awards webpage (<https://www.physics.wisc.edu/awards/>) or contact the Department of Physics [info@physics.wisc.edu](mailto:info@physics.wisc.edu)

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