QUICK NOTES

- University of Wisconsin
  Department of Physics
  2320 Chamberlin Hall
  1150 University Avenue
  Madison, WI  53706

  Tel: 608.262.4526
  Fax: 608.262.3077
  E-mail: info@physics.wisc.edu
  Web: www.physics.wisc.edu

  Department Chair
  Professor Albrecht Karle

- Looking for a Physics group? Check out the UPS (University Physics Society) in room 2328 Chamberlin Hall, or on the web at www.ups.physics.wisc.edu

- If you can not find the information you are looking for or if you would like a printed copy of this manual please contact the department office.

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Welcome to the UW-Madison Department of Physics! We have a long history of providing our students with a great educational experience. That experience will increase your understanding of the physical universe and provide you with the foundation for your future career. Expect hard work that pays big dividends.

If you have concerns about your studies in the department, you should discuss them with the faculty member in charge of the course you are interested in, or with the teaching assistant who has responsibility for the discussion or laboratory to which you are assigned.

Apart from purely academic matters, we are interested in your personal well-being. If there is anything you think we can help with, contact the department office, or email info@physics.wisc.edu.
DIRECTORY

Department of Physics

University of Wisconsin
Department of Physics
2320 Chamberlin Hall
1150 University Avenue
Madison, WI 53706

Tel: 608.262.4526
Fax: 608.262.3077
E-mail: info@physics.wisc.edu
Web: www.physics.wisc.edu

Undergraduate Advisors

Prof. Dan McCammon
6207 Chamberlin Hall
Tel: 608.262.5916

Prof. Michael Winokur
5106 Chamberlin Hall
Tel: 608.262.5425

Prof. Cary Forest
(AMEP only)
3277 Chamberlin Hall
Tel: 608.263.0486

Staff Offices

- Austin, Ann 2320 Chamberlin 262.4826 austin@physics.wisc.edu
- Bannon, Keeley 5217 Chamberlin 263-7450 kmannon@wisc.edu
- Bradley, Dan 3116 Chamberlin 263-2446 dan@physics.wisc.edu
- Dummer, Doug 1228 Chamberlin 262.7380 ddummer@wisc.edu
- Gates Jr., Billy 3336 Chamberlin 262.2281 hjietpasii@wisc.edu
- Hietpas Ill, Giles 4288 Chamberlin 262.2281 hjietpasii@wisc.edu
- Hooper, Eric 2337 Chamberlin 890.0767 ehooper@astro.wisc.edu
- Hrenak, Christine 3290 Chamberlin 262.3595 hrenak@wisc.edu
- Huesmann, Amihan 2334 Chamberlin 890.0767 amihan@physics.wisc.edu
- Knox, Rita 2320E Chamberlin 262.0886 rknox2@physics.wisc.edu
- Kresse, Kerry 4220 Chamberlin 262.8696 kkresse@library.wisc.edu
- Lefkow, Aimee 4281 Chamberlin 262.2267 lefkow@hep.wisc.edu
- Lefkow, Renee 2320H Chamberlin 262.9678 renee@physics.wisc.edu
- Lockman, David 2309 Chamberlin 262.2548 dlockman@wisc.edu
- Matchey, Karyn 2320C Chamberlin 262.7782 kmatchey@physics.wisc.edu
- Miner, Donald 4288 Chamberlin 262.2281 donminer@physics.wisc.edu
- Narf, Steve 2237 Chamberlin 262.3898 srnarf@wisc.edu
- Nossal, Susan 2337A Chamberlin 262.9107 nossal@physics.wisc.edu
- Randall, Michael 1209 Chamberlin 262.2927 mrandall2@wisc.edu
- Reardon, Jim 2320G Chamberlin 262.0945 reardon@physics.wisc.edu
- Rylander, Russell 3290 Chamberlin 890.2003 rrylander@wisc.edu
- Schutte, Dale 3213 Chamberlin 262.4644 schutte@wisc.edu
- Schwantz, Jane 3290 Chamberlin 262.3595 schwantz@wisc.edu
- Seyes, Chad 3118 Chamberlin 262.0629 cwseys@physics.wisc.edu
- Tikalsky, Jes 3118 Chamberlin 262.0629 jtitalsky@physics.wisc.edu
- Unks, Brett 4120 Chamberlin 262.0075 unks@wisc.edu
- Watson, Larry 2337 Chamberlin 890.0767 lwatson@physics.wisc.edu

Group Offices & Facilities

- Department Office 2320 Chamberlin 262.4526
- Astro/Atomic/CM 5217 Chamberlin 263.7450
- Astronomy 5534 Sterling 262.3071
- BioPhysics 741 MVL 262.4540
- High Energy/Theory/Pheno Library 4288 Chamberlin 262.2281
- Lost & Found 2309 Chamberlin 262.2548 dlockman@wisc.edu
- Mailroom 2309 Chamberlin 262.2548 dlockman@wisc.edu
- Payroll 4220 Chamberlin 262.9500
- Plasma 3290 Chamberlin 262.3595
<table>
<thead>
<tr>
<th>Name</th>
<th>Room</th>
<th>Phone</th>
<th>Email</th>
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<tbody>
<tr>
<td>Karle, A.</td>
<td>4287</td>
<td>262.3945</td>
<td><a href="mailto:karle@icecube.wisc.edu">karle@icecube.wisc.edu</a></td>
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<td></td>
<td>2320A</td>
<td>263.3279</td>
<td></td>
</tr>
<tr>
<td>Bai, Y.</td>
<td>5211</td>
<td>265.3242</td>
<td><a href="mailto:yangbai@physics.wisc.edu">yangbai@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Balantekin, A.B.</td>
<td>5277</td>
<td>263.7931</td>
<td><a href="mailto:baha@physics.wisc.edu">baha@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Barger, V.</td>
<td>5295</td>
<td>262.8908</td>
<td><a href="mailto:barger@physics.wisc.edu">barger@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Boldyrev, S.</td>
<td>3273</td>
<td>262.2338</td>
<td><a href="mailto:boldyrev@wisc.edu">boldyrev@wisc.edu</a></td>
</tr>
<tr>
<td>Carlsmith, D.</td>
<td>4285</td>
<td>262.2485</td>
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<tr>
<td>Chung, D.</td>
<td>5207</td>
<td>265.3133</td>
<td><a href="mailto:danielchung@wisc.edu">danielchung@wisc.edu</a></td>
</tr>
<tr>
<td>Coppersmith, S.</td>
<td>5334</td>
<td>262.8358</td>
<td><a href="mailto:snc@physics.wisc.edu">snc@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Dasu, S.</td>
<td>4289</td>
<td>262.3678</td>
<td><a href="mailto:dasu@hep.wisc.edu">dasu@hep.wisc.edu</a></td>
</tr>
<tr>
<td>Egedal, Jan</td>
<td>3275</td>
<td>262-3628</td>
<td><a href="mailto:egedal@wisc.edu">egedal@wisc.edu</a></td>
</tr>
<tr>
<td>Eriksson, M.</td>
<td>5118</td>
<td>263.6289</td>
<td><a href="mailto:maeriksson@wisc.edu">maeriksson@wisc.edu</a></td>
</tr>
<tr>
<td>Everett, L.</td>
<td>5215</td>
<td>262.4699</td>
<td><a href="mailto:leverett@wisc.edu">leverett@wisc.edu</a></td>
</tr>
<tr>
<td>Forest, C.</td>
<td>3277</td>
<td>263.0486</td>
<td><a href="mailto:cbforest@wisc.edu">cbforest@wisc.edu</a></td>
</tr>
<tr>
<td>Gilbert, P.</td>
<td>5116</td>
<td>262.5829</td>
<td><a href="mailto:pupa@physics.wisc.edu">pupa@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Halzen, F.</td>
<td>5293</td>
<td>262.2667</td>
<td><a href="mailto:halzen@icecube.wisc.edu">halzen@icecube.wisc.edu</a></td>
</tr>
<tr>
<td>Hanson, K.</td>
<td>4207</td>
<td>262-3395</td>
<td><a href="mailto:kaeld@icecube.wisc.edu">kaeld@icecube.wisc.edu</a></td>
</tr>
<tr>
<td>Hashimoto, A.</td>
<td>5209</td>
<td>265.3244</td>
<td><a href="mailto:aki@physics.wisc.edu">aki@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Herndon, M.</td>
<td>4279</td>
<td>262.8509</td>
<td><a href="mailto:herndon@hep.wisc.edu">herndon@hep.wisc.edu</a></td>
</tr>
<tr>
<td>Himpson, E.</td>
<td>5108</td>
<td>263.5590</td>
<td><a href="mailto:fhimpson@wisc.edu">fhimpson@wisc.edu</a></td>
</tr>
<tr>
<td>Joynt, R.</td>
<td>5328</td>
<td>263.4169</td>
<td><a href="mailto:rjoynt@wisc.edu">rjoynt@wisc.edu</a></td>
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<tr>
<td>Lawler, J.</td>
<td>1334</td>
<td>262.2918</td>
<td><a href="mailto:jelawler@wisc.edu">jelawler@wisc.edu</a></td>
</tr>
<tr>
<td>Lin, C.</td>
<td>1318</td>
<td>262.0697</td>
<td><a href="mailto:cclin@wisc.edu">cclin@wisc.edu</a></td>
</tr>
<tr>
<td>McCammon, D.</td>
<td>6207</td>
<td>262.5916</td>
<td><a href="mailto:mccammon@physics.wisc.edu">mccammon@physics.wisc.edu</a></td>
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<tr>
<td>McDermott, R.</td>
<td>5112</td>
<td>263.4476</td>
<td><a href="mailto:rfmcdermott@wisc.edu">rfmcdermott@wisc.edu</a></td>
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<tr>
<td>Onellion, M.</td>
<td>5104</td>
<td>263.6829</td>
<td><a href="mailto:onellion@wisc.edu">onellion@wisc.edu</a></td>
</tr>
<tr>
<td>Pan, Y.</td>
<td>4283</td>
<td>262.9569</td>
<td><a href="mailto:pani@hep.wisc.edu">pani@hep.wisc.edu</a></td>
</tr>
<tr>
<td>Rzchowski, M.</td>
<td>5114</td>
<td>265.2876</td>
<td><a href="mailto:rzchowski@physics.wisc.edu">rzchowski@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Saffman, M.</td>
<td>5330</td>
<td>265.5601</td>
<td><a href="mailto:msaffman@wisc.edu">msaffman@wisc.edu</a></td>
</tr>
<tr>
<td>Sarff, J.</td>
<td>3289</td>
<td>262.7742</td>
<td><a href="mailto:jssarff@wisc.edu">jssarff@wisc.edu</a></td>
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<tr>
<td>Shiu, G.</td>
<td>5279</td>
<td>265.3285</td>
<td><a href="mailto:shiu@physics.wisc.edu">shiu@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Smith, W.</td>
<td>4275</td>
<td>262.4690</td>
<td><a href="mailto:wsmith@hep.wisc.edu">wsmith@hep.wisc.edu</a></td>
</tr>
<tr>
<td>Terry, P.</td>
<td>3283</td>
<td>263.0487</td>
<td><a href="mailto:pwterry@wisc.edu">pwterry@wisc.edu</a></td>
</tr>
<tr>
<td>Timbie, P.</td>
<td>6209</td>
<td>262.5916</td>
<td><a href="mailto:pttimbie@wisc.edu">pttimbie@wisc.edu</a></td>
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<td>Vandenbroucke, J.</td>
<td>4114</td>
<td>265.2427</td>
<td><a href="mailto:vandenbrouck@wisc.edu">vandenbrouck@wisc.edu</a></td>
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<td>Vavilov, M.</td>
<td>5318</td>
<td>262.5425</td>
<td><a href="mailto:vavilov@wisc.edu">vavilov@wisc.edu</a></td>
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<td>Walker, T.</td>
<td>5322</td>
<td>262.4093</td>
<td><a href="mailto:tgwalker@wisc.edu">tgwalker@wisc.edu</a></td>
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<td>Westerhoff, S.</td>
<td>4209</td>
<td>262.3989</td>
<td><a href="mailto:westerhoff@physics.wisc.edu">westerhoff@physics.wisc.edu</a></td>
</tr>
<tr>
<td>Winokur, M.</td>
<td>5106</td>
<td>263.7475</td>
<td><a href="mailto:mwinokur@wisc.edu">mwinokur@wisc.edu</a></td>
</tr>
<tr>
<td>Wu, S.</td>
<td>4225</td>
<td>262.5878</td>
<td><a href="mailto:Sau.lan.wu@cern.ch">Sau.lan.wu@cern.ch</a></td>
</tr>
<tr>
<td>Yavuz, D.</td>
<td>5320</td>
<td>263.9399</td>
<td><a href="mailto:yavuz@wisc.edu">yavuz@wisc.edu</a></td>
</tr>
<tr>
<td>Zweibel, E.</td>
<td>6281</td>
<td>262.7912</td>
<td><a href="mailto:zweibel@astro.wisc.edu">zweibel@astro.wisc.edu</a></td>
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</table>
### Astrophysics & Cosmology

**Experimental**
- Center for Magnetic Self Organization (CMSO): Boldyrev | Egedal | Forest | Sarff | Schnack | Terry | Zweibel
- IceCube: Halzen | Hanson | Karle | Vandenbroucke | Westerhoff

**Theoretical Cosmology**
- Chung | Shiu

### Atomic, Molecular, & Optical Physics

**Experimental**
- Atomic Collisions: Lin
- Atom Trapping: Walker
- Nonlinear Optics and Atomic Physics: Saffman
- Quantum Optics and Ultrafast Physics: Yavuz

**Theoretical**
- Atomic, Molecular, & Optical: Lin | Walker
- Neutral Atoms: Saffman

### Biophysics & Condensed Matter Physics

**Experimental**
- Biophysics: Gilbert | Coppersmith
- Magnetic Fields: McDermott | Rzchowski
- Nanostructures: Eriksson | Gilbert | Himpsel | Rzchowski
- Polymer Photophysics and Structure: Winokur
- Synchrotron Radiation: Gilbert | Himpsel | Onellion

**Theoretical**
- Complex Systems: Coppersmith
- Low-Dimensional Systems: Vavilov
- Silicon Quantum Dots: Coppersmith | Eriksson | Joyn | McDermott | Vavilov
- Strongly-Correlated Systems: Joyn

### High Energy

**Experimental**
- ATLAS at CERN: Wu
- Collider Detector Facility at FNAL: Carlsmith | Herndon
- Compact Muon Solenoid at CERN: Carlsmith | Dasu | Herndon | Smith
- LBN Project: Balantekin | Karle
- Neutrino Physics at Daya Bay: Balantekin

**Theoretical**
- Particle Theory: Bai | Balantekin | Barger | Chung | Everett
- Phenomenology: Bai | Barger | Everett | Halzen
- String Theory: Hashimoto | Shiu

### Neutrino and Astroparticle Physics

**Experimental**
- ARA Project: Halzen | Karle
- Auger Project: Westerhoff
- Daya Bay Project: Balantekin
- Deep Core Project: Halzen | Karle | Vandenbroucke | Westerhoff
- DM-Ice: Karle
- HAWC Project: Westerhoff
- IceCube: Halzen | Hanson | Karle | Vandenbroucke | Westerhoff
- MARE Project: McCammon

**Theoretical**
- Dark Energy: Chung
- Neutrino Astrophysics: Balantekin | Barger | Everett

### Nuclear

**Theoretical**
- Nuclear Theory (NucTh): Balantekin

### Plasma Physics

**Experimental**
- Center for Magnetic Self Organization (CMSO): Boldyrev | Egedal | Forest | Sarff | Schnack | Terry | Zweibel
- CMTFO: Forest | Terry
- CPTC: Forest | Schnack | Terry | Zweibel
- Madison Dynamo Experiment (MDE): Forest
- Madison Plasma Dynamo Experiment (MPDX): Forest | Zweibel
- Madison Symmetric torus (MST): Forest | Sarff
- Plasma-Couette Experiment (PCX): Boldyrev | Forest
- Rotating Wall Machine (RWM): Forest | Sarff

**Theoretical**
- MHD Turbulence: Boldyrev | Terry | Zweibel
- Plasma Astrophysics: Boldyrev | Terry | Zweibel
- RFP Theory: Boldyrev | Terry | Zweibel
- Transport in Fusion Devices: Boldyrev | Terry | Zweibel

### Quantum Computing

**Experimental**
- Quantum Computing: Coppersmith | Eriksson | McDermott | Saffman | Walker

**Theoretical**
- Quantum Computing: Coppersmith | Joyn
Roughly speaking, physics is to the inanimate world what philosophy is to the patterns of human thought. We observe, describe, categorize, synthesize, and abstract. At one time, in fact, physics was natural philosophy. But in the modern era, the two have parted company. Science moved away from the guidance of philosophers and adopted its own approach to truth, asserting that measurement is the precise form of questioning and that precise questioning is the beginning of understanding.

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.

Why choose to be a physics major.

WHY STUDY PHYSICS

1. **Intellectual Satisfaction.** First, and foremost, physics satisfies our deep desire to understand how the universe works. Physics is interesting.

2. **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.

3. **Physics Produces New Technology.** Today’s esoteric physics research will become tomorrow’s technological advances.

4. **Technical Expertise.** Physicists exploit forefront technologies in their pursuits.

5. **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.

6. **Physics is Analytical and Quantitative.** People who can reason analytically and quantitatively are essential for the success of almost any pursuit.

OPTIONS

A degree in physics helps prepare you for employment in industry, research, government, and academia. A bachelor’s degree from the undergraduate physics program will provide an overall view of both classical and modern physics along with problem-solving ability and the flexibility to continue learning. Your training 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.
A s soon as a student decides, and certainly before the end of the sophomore year, prospective physics majors should discuss their plans and curriculum with the appropriate Advisor. A list of advisors is available from the Physics Department website. Students should consult the L&S Undergraduate Catalog for the general requirements for BA and BS degrees, and those interested in high school teaching should consider the special curriculum administered jointly by the School of Education and the Department of Physics. Details of the program are described in the bulletin of the School of Education.

TO DECLARE A PHYSICS MAJOR

You must declare your major by filing out a “major declaration form,” signed by an Undergraduate Advisor with the Physics Department. You should talk with one of the undergraduate advisors as soon as you know you might have an interest in the physics major. Students can declare their physics major at any time after completing their first physics course on the Madison campus, and we encourage doing this as early as possible. You must have a 2.5 GPA in physics and math courses taken at Madison at the time you declare. In all cases, the major must be declared before the semester in which you graduate. The form can be obtained at the department office in 2320 Chamberlin Hall. Note: You should bring a copy of your current transcript when you talk with the undergraduate advisor.

Helpful Hints

- For the most up-to-date information, consult the university web site at: www.wisc.edu/pubs/ug/10lettsci/depts/physics.html
- If you can not find the information you are looking for or if you would like a printed copy of this manual please contact the department office (see below).
- Students considering a major in physics should have their e-mail address added to the undergraduate information network, please contact the department undergraduate coordinator (see below).
- Forms for declaring a physics major or to receive a Certificate in Physics are available in the department office (see below).

Engineering Students and Non L&S Majors Seeking an “Additional Major” in Physics

An undergraduate in the College of Engineering or any other college other than Letters and Science needs to complete the physics requirements listed above for the physics major, including the L&S GPA in the major requirements. None of the other requirements of the College of Letters and Science need to be satisfied. Note that engineering students as well as students majoring in any other program that is NOT in the college of Letters and Science must obtain a formal approval from their engineering (or other department) advisor and Dean before attempting to declare an additional major in Physics.

Qualifying Examination

Undergraduate Physics majors interested in pursuing graduate study in physics are encouraged to take the Qualifying Examination. See page 25 for more information.
REQUIREMENTS

The requirement is a total of 35 credits. The 35 credits must include these four groups:

1. Introductory Requirements:
   a. 247 (5 cr) and 248 (5 cr) and 249* (4 cr): the physics major track, strongly recommended for physics majors; or
   b. 207 and 208 (5 cr each), and 241 (3 cr) (or 205 (3 cr) or 235 (3 cr) or 244 (3 cr)); or
   c. 201 and 202 (5 cr each), and 205 (3 cr) or 235 (3 cr) or 241 (3 cr) or 244 (3 cr).

Two semesters of EMA (EMA 201 and EMA 202) or (EMA 201 and ME 240) may be substituted for First Semester Introductory Physics (201 or 207), and together count for 5 credits toward the physics major.

While it is strongly recommended that one of the three sequences is followed, any combination of the first, second, or third courses is permitted except that transfers into the 247/248/249 sequence are not allowed. Only one course at each level will count toward the Physics Major.

*Note: students registering for 249 are required to register concurrently for 307 lab (2 cr).

2. Core Requirement:
All physics majors must take 311 (3 cr) and 322 (3 cr).

Three semesters of Electromagnetism (ECE 220 and ECE 320 and ECE 420) may be substituted for PH 322, and together count for 3 credits. There is no physics credit for these courses if students take PH 322, nor for partial completion of the sequence.

3. Laboratory Requirement:
All physics majors must take 6 credits of intermediate and/or advanced lab. This requirement can be satisfied by any combination of 307 (2 cr), 308 (2 cr), 407 (2 or 4 cr) , 321 (2 lab cr), 623 (2 lab cr), or 625 (2 lab cr).

Note: Non-course research experience is invaluable and very strongly encouraged, but seldom offers exposure to the breadth of experimental techniques covered in PH 407. Lab course credit for such experience will be granted only in exceptional circumstances.

Non-physics lab courses may be substituted for lab course credit, if approved in advance by an advisor in the department and an instructor of PH 407 as covering substantially the same breadth and depth of experience as one of the physics lab courses. This is of particular interest to science and engineering students contemplating a second major in physics. The following engineering courses are automatically approved for lab credit as shown, but no more than six credits from this list can be counted toward the 35 of physics courses: NE 427 (2 cr); NE 428 (2 cr); ECE 305 (1 cr); and ECE 313 (1 cr).

In addition, ECE 376 can be counted for 3 credits of physics elective, including 1 credit of intermediate lab. There is no physics credit for ECE 376 if a student has taken PH 321.

4. Elective Requirement:
The remaining credits to total 35 must be from advanced level physics courses (see “Level:” designation in the course description), or PH 301. The Physics Department suggests that your program include the seminar on Physics Today (301). A strong foundation in basic physics would include wave motion/optics (325), atomic and quantum physics (448 and 449 or 531) and thermal physics (415). Those considering graduate study in physics should take 448 and 449.
Transition Note

Students who have taken PH 307, PH 308, or PH 407 prior to Spring 2011 should have the physics major declaration dated before August 1, 2011. The form can be backdated if necessary. Anyone with a declaration date July 31, 2011 or earlier will graduate under the old requirements: 32 credits of physics, including 2 credits of intermediate/advanced lab (or 3 credits if you have taken PH 249). You will receive only the old number of credits toward the major requirements for any of these courses, regardless of when they were taken if you use the old requirements.

Note: this means students graduating under the old system must register for two credits or four credits of PH 407 but only one or two old credits will count, and that PH 307 or PH 308 will count as only one credit each. PH 321, 623, and 625 will count only one lab credit each. All credits will count as taken for requirements outside the physics major.

SUGGESTED CURRICULUM

The appropriate program for a student’s goals should be established with the help of the advisor. The introductory program consists of Physics 247-248-249/307. Students are encouraged to take this sequence. Note, however, that Physics 247 is offered only in the fall semester. Alternatively, 207-208-241 or 201-202-241 (235, 205 or 244 are acceptable alternatives to 241) may be substituted. The remainder of the core program is 311 and 322 plus intermediate or advanced laboratory chosen from Physics 307, 308, 407, 321, 623, or 625, and advanced level physics elective courses (see above). It is possible to enter the core program in either semester since 201, 202, 205, 207, 208, 235, 241, 311, and 322 are given each semester.

Intermediate and Advanced Lab Courses

Students in Physics 249 must simultaneously enroll in physics 307 lab (2 cr). Students taking the alternate introductory sequences are encouraged, but not required, to take 307. Physics 307 and 308 can be taken in reverse order (308, 307) if that fits better into your schedule. Physics 407 provides a lab experience closer to that of actual research, with more student initiative and less overall structure. This option should be seriously considered by those intending to go on to graduate school in physics or who desire a broad and thorough background in laboratory work. Physics 407 can be taken for two or four credits, but consent of instructor is required to take it without first having either 307 or 308.

Physics 321 provides experience in electronics and is a useful, but not required, preparation for the other laboratory courses. 321 is a four credit course, including two credits of intermediate laboratory that can be used toward fulfilling your intermediate and advanced laboratory requirement. Physics 623 provides similar experience but at a significantly higher level. It is also a four credit course, including two credits that count toward the lab requirement. Finally, Physics 625 is an advanced, four credit course in applied optics that includes two credits of advanced laboratory work. It is an applied optics course and covers quite different material from PH 325 (which has no lab).

Mathematics

There are specific math courses listed as prerequisites for our physics courses. Depending on your interest in math (some physics majors major in math as well), the courses you select will be different. Here are some suggestions for choosing math courses. A typical math sequence is: 221, 222, 234, 319, (or 320 instead of 319/340), 321, 340, 322. Please consult with an advisor when choosing your Mathematics courses.

• Math 221/222: Standard Introductory calculus sequence. Math 221 is a prerequisite to Physics 247, 207 and 201.
• Math 234: Calculus of Several Variables, typically taken to complete the sequence Math 221/222/234. This course could be taken simultaneously with Math 319.

Graduation Requirements

The University has additional requirements on residency and minimum GPA for graduation. All students must fulfill the L&S requirement of 15 credits of upper-level work in the major taken in residence. All courses used to meet the core, laboratory, and elective requirements for the major count toward this requirement if taken in residence.
• **Math 319**: Techniques in Ordinary Differential Equations. You are strongly advised to take this or Math 320 before or with Physics 311 (Mechanics). According to the Timetable, Math 319 is a prerequisite for Math 322.

• **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 521/522 (Advanced Calculus). Many physics students find this course to be particularly useful and we strongly suggest taking it or Math 320, Math 320 Linear Mathematics. This course overlaps with Math 319 and Math 340 and can be taken as a one-semester alternative to those if you are short on time. It’s kind of a “sampler plate.” Many physics students feel strongly that taking Math 319 and 340 is well worth the time.

• **Math 321**: Applied Mathematical Analysis. Techniques for solving problems in the physical sciences, engineering, and applied mathematics, using advanced calculus and analytic function theory. Can be taken before or after Math 322. It is recommended that Math 321 be taken before taking Physics 322.

• **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.

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**Chemistry**

A college course in chemistry is advised for all physics students. Courses in physical and organic chemistry are useful for physics students. Organic chemistry is particularly valuable for those interested in biophysics or other life sciences.

**Computing**

Students are advised to learn the methods of scientific programming. The Computer Science Department offers introductory courses (such as 302).

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**Degree Audit Reporting System (DARS)**

The Degree Audit Reporting System (DARS) is part of UW-Madison’s commitment to academic advising for undergraduate students. A DARS report is particularly helpful when combined with the personal wisdom and insight of skilled advisors. DARS reports should always be reviewed with transcripts. This report becomes increasingly important as a student first decides on a particular college, then determines a particular major or combination of majors, and finally approaches graduation. DARS shows which requirements have already been completed and which remain unsatisfied. The report can offer suggestions about appropriate courses that may be taken to meet specific requirements. DARS is not intended to replace students’ contact with academic advisors. Students should print their DARS report through My-UW. DARS may be helpful in showing how completed or in-progress courses may be used in different degree programs.
# RECOMMENDED PROGRAM

## Starting Physics in the Fall semester of First Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Course No. &amp; Title</th>
<th>Cr</th>
<th>Course No. &amp; Title</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st*</td>
<td>Math 222—Calculus &amp; Analytic Geometry 5</td>
<td></td>
<td>Physics 248—A Modern Intro to Physics 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics 247*—A Modern Intro to Physics 5</td>
<td></td>
<td>Math 234—Calculus of Several Variables 3</td>
<td></td>
</tr>
<tr>
<td>2nd**</td>
<td>Physics 249—General Physics 4</td>
<td></td>
<td>Physics 311—Mechanics 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Physics 307—Intermediate Lab 2</td>
<td></td>
<td>Physics 308—Intermediate Lab 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 319—Tech in Ordinary Differential Eqns 3</td>
<td></td>
<td>Physics 301***—Physics Today 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Math 321—Applied Mathematical Analysis 3</td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>Physics 322—Electromagnetic Fields 3</td>
<td></td>
<td>Physics 325—Wave Motion and Optics 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics 321—Electric Circuits &amp; Electronics 4</td>
<td></td>
<td>Physics 407—Advanced Laboratory 2 or 4</td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td>Physics 415—Thermal Physics 3</td>
<td></td>
<td>Physics 449—Quantum Physics 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics 448—Quantum Physics 3</td>
<td></td>
<td>Electives</td>
<td></td>
</tr>
</tbody>
</table>

Accelerated program: Students entering with Math 222 credit can move Math 234, 319, 321 and Physics 311–322 sequences up by one semester, and Physics 448–449 to the third year. (Physics 407 lab can be delayed to the fourth year.)

## Starting Physics in the Second Semester of First Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Course No. &amp; Title</th>
<th>Cr</th>
<th>Course No. &amp; Title</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st*</td>
<td>Math 221—Calc. &amp; Analytic Geometry 5</td>
<td></td>
<td>Physics 207—General Physics 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 222—Calc. &amp; Analytic Geometry 5</td>
<td></td>
<td>Math 222—Calc. &amp; Analytic Geometry 5</td>
<td></td>
</tr>
<tr>
<td>2nd**</td>
<td>Physics 208—General Physics 5</td>
<td></td>
<td>Physics 241—Modern Physics 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 234—Calc of Sev'l Variable 3</td>
<td></td>
<td>Physics 301***—Physics Today 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics 321—Electric Circuits &amp; Electronics 4 (this year or next)</td>
<td></td>
<td>Math 319—Tech in Ordinary Diff'l Eqns 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 319—Tech in Ordinary Diff'l Eqns 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>or 320—Linear Mathematics 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>Physics 311—Mechanics 3</td>
<td></td>
<td>Physics 322—Electromagnetic Fields 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics 321—Electric Circuits &amp; Electrncs 4</td>
<td></td>
<td>Physics 308—Intermediate Lab, 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics 307—Intermediate Lab 1</td>
<td></td>
<td>or 407—Advanced Laboratory 1–2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electromagnetic Fields &amp; Optics 1</td>
<td></td>
<td>Math 322—Applied Mathmtcl Anlys 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(If you did not take Math 320)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td>Physics 415—Thermal Physics 3</td>
<td></td>
<td>Physics 449—Quantum Physics 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics 448—Quantum Physics 3</td>
<td></td>
<td>Electives</td>
<td></td>
</tr>
</tbody>
</table>

The underlined courses are the “Physics Core Program.” The senior year could include electives, such as 522, Advanced Classical Physics (offered Spring semester); 525, Plasma Physics; 535, Particle Physics (offered Fall semester); 623, Electronics (offered Fall semester); or 625, Applied Optics (offered Spring semester).

* Some students take Physics 115 in their first semester to see if they really want to go into physics.

** Scientific Background to Global Environmental Problems (472) can be taken as an elective at this time. Physics majors should sign up in one of the cross-listed departments. (ATM-OCN, IES).

*** Physics 301, Physics Today, is an introduction to modern fields of physics research and, with permission, can be taken more than once (though counted only once toward the 30 credits requirement in physics.) It may also be attended as a colloquium series with no registration, credit, or requirements.
INTRODUCTORY PHYSICS COURSE
SELECTION FLOW CHARTS

Choosing an Introductory Physics Course in the Fall Semester

- Are you considering a major in physics, astronomy, or AMEP?
  - Yes
    - Have you completed Math 221 or its equivalent?
      - Yes
        - This semester: enroll both in Physics 247 and in Math 222 or higher
      - No
        - Do not delay!
        - This semester: Enroll in Math 221
        - Next semester: enroll both in Physics 207 and in Math 222

- No
  - Are you considering a major in physics, astronomy, or AMEP?
    - Yes
      - Have you completed Math 221 or its equivalent?
        - Yes
          - Does your intended major require or suggest a Calculus-based physics course?
            - Yes
              - Would you prefer a calculus-based or a non-calculus-based Physics course?
                - Yes Calculus
                  - Enroll in Physics 247
                - No
                  - Non-Calculus
                    - Enroll in Physics 103
                  - Do not delay!
            - No
              - Non-Calculus
                - Enroll in Physics 103
        - No
          - This semester: Enroll in Math 221

Choosing an Introductory Physics Course in the Spring Semester

- Are you considering a major in physics, astronomy, or AMEP?
  - Yes
    - Have you completed Math 221 or its equivalent?
      - Yes
        - Does your intended major require or suggest a Calculus-based physics course?
          - Yes
            - Would you prefer a calculus-based or a non-calculus-based Physics course?
              - Yes Calculus
                - Enroll in Physics 201
              - No
                - Non-Calculus
                  - Enroll in Physics 207
          - No
            - Are you interested in an engineering major or in a major outside of engineering?
              - Yes
                - Eng L&S, Ag, etc.
              - Next Sem.
                - Enroll in Physics 207

- No
  - Are you considering a major in physics, astronomy, or AMEP?
    - Yes
      - Have you completed Math 221 or its equivalent?
        - Yes
          - This semester: Enroll in Math 221
        - No
          - Non-Calculus
            - Enroll in Physics 103
        - Do not delay!
        - Caveat: Physics 103 & 104 do not lead naturally to higher level physics courses.
        - Next semester: enroll both in Physics 247 and in Math 222

- No
  - Are you interested in an engineering major or in a major outside of engineering?
    - Yes
      - Eng L&S, Ag, etc.
    - Next Sem.
      - Enroll in Physics 201

- Next semester: enroll both in Physics 207 and in Math 222

Caveat: Physics 103 & 104 do not lead naturally to higher level physics courses.
DEGREE OPTIONS

The Department of Physics offers students several different options for majoring or minoring in physics. There are both a BA and BS degree for Physics Majors (see page 7). Students can earn a BA or BS with Honors (see page 14) or take certain physics courses for honors credit (see page 14). There is also a Certificate in Physics available (see page 13). Students can earn a BA or BS in Astronomy-Physics through the Department of Astronomy (see page 15). The AMEP program is a specialized four-year program in interdisciplinary physical sciences of applied math, engineering, and physics (see page 16). Finally the School of Education offers a physics major for secondary education (see page 18).

CERTIFICATE IN PHYSICS (CERT 783)

The department offers an undergraduate certificate in physics. An understanding of the physical universe informs many disciplines. The study of physics is essential to understanding nature and to advancing technology in the coming century. A certificate in physics increases the opportunities for students to become better informed on technological issues at the local, state, national, and international levels.

The certificate (18 credits) is designed to serve undergraduates majoring in biology, chemistry, mathematics, engineering, education and other fields who wish to extend their study of physics beyond what may be required or recommended for their major without completing the full L&S physics major requirements (35 credits including 6 intermediate/advanced lab credits).

The Certificate Requirements

To earn a certificate in physics, a student must complete at least 18 credits in physics courses at the “intermediate” level or higher. Graduate-level courses are permitted. No more than 3 credits of independent study and no special topics courses may be used to satisfy this requirement. Transfer or AP credit for 200-level introductory physics is acceptable for meeting the requirements of the certificate. EMA 201 and EMA 202 or EMA 201 and ME 240 may be substituted for PH 201 and together count for 5 credits. Otherwise, only courses within the department (or cross-listed with physics) are acceptable.

1. All undergraduates and special students are eligible (physics majors are not eligible).
2. The certificate will be awarded upon completion of requirements.
3. At least nine of the credits must be in residence.
4. Only graded courses may be used toward the certificate.
5. A minimum grade of C is required for each course used toward the certificate.
HONORS IN THE MAJOR—PHYSICS

Students wishing to earn BA or BS with Honors in Physics must speak with an undergraduate advisor in Physics. You must also complete the Honors in the Major declaration form available in the Honors Program office (Washburn Observatory). Please note that the Honors in the Major declaration form is NOT the same as the major declaration form used to declare a major in Physics. Major declaration forms can be obtained from the physics department office.

To complete the major in physics a student must complete (a) the L&S general degree requirements, and (b) present 38 credits in physics courses with a minimum GPA of 3.3. The 38 credits must include these six groups:

1. **Introductory Requirement**—same as general physics major
2. **Core Requirement**—same as general physics major
3. **Laboratory Requirement**—same as general physics major
4. **Advanced Requirement**—Students must complete 448 and 449
5. **Senior Thesis Requirement**—Students must complete PH 681 and 682 for three credits each and submit a suitable senior thesis document. Students will need to find a Physics faculty advisor and discuss a suitable project well in advance of attempting to register for PH 681.
6. **Elective Requirement**—The remaining credits to total 38 must be from advanced level physics courses (see “Level:” designation in the course description), or PH 301. The Physics Department suggests that your program include the seminar on Physics Today (301). A strong foundation in basic physics would include wave motion/optics (325), and thermal physics (415).

DISTINCTION IN THE MAJOR

The award “Distinction in the Major” will be recommended by the department to the dean for students who otherwise satisfy all requirements for honors in the major, but substitute elective physics credits for the thesis.

HONORS IN PHYSICS COURSES

Many physics courses can be taken for general honors program credit, as indicated in the timetable. You must speak with the faculty member teaching the course. You can then add honors through the on-line student center.
THE ASTRONOMY—PHYSICS MAJOR

Astronomy, the oldest of the sciences, for the last several decades has been one of the most exciting fields of modern scientific research. New discoveries concerning the solar system, stars, galaxies, and the origin of the universe continue to be made by both ground and space telescopes. To understand and pursue modern astronomy, one must have a solid background in physics and mathematics as well as in astronomy.

The astronomy-physics major, administered by the Dept. of Astronomy, provides undergraduates the opportunity to appreciate our current understanding of the astronomical universe, while developing the necessary physics and math background. Students who intend to continue astronomy in a graduate program are strongly encouraged to do a Senior Thesis (Astro 681/682 (honors) or Astro 691/692). The experiences of research and of writing a major paper develop both technical and writing skills.

Course Requirements For The Major

The major requires a minimum of 34 credits in the field of specialization, with at least 6 of these credits in astronomy and at least 28 credits in physics. Before declaring the major, students must complete Physics 247, 248, and 249 (recommended sequence), or 207, 208, and 241, or Physics 201, 202, 205. In addition, the specific course requirements for the major are (these also count toward the 15 credits of upper-level courses as required by the College of Letters and Science).

Astronomy Courses

At least two of the following (but note that 310 is a prerequisite for 330, 335, and 500):

- 310 Stellar Astrophysics, 3 cr
- 320 The Interstellar Medium, 3 cr
- 330 Galaxies and Cosmology, 3 cr
- 335 Cosmology, 3 cr
- 340 Solar System Astronomy, 3 cr
- 500 Techniques of Modern Observational Astrophysics, 3 cr

Astronomy 100 and 200 are not required for majors. Students wishing to take a survey course should take Astronomy 200.

Physics Courses

- 247-248-249 A Modern Introduction to Physics (or 201-202-205; or 207-208-241), 14 cr
- 311 Mechanics, 3 cr
- 322 Electromagnetic Fields, 3 cr
- 415 Thermal Physics, 3 cr
- 448 Atomic and Quantum Physics, 3 cr
- 449 Atomic and Quantum Physics, 3 cr
- 531 Intro to Quantum Mechanics (3) may be substituted for the 448-449 sequence.

A 300-level or higher laboratory course must be taken; Astronomy 510 or Physics 308 (Intermediate Laboratory- Electromagnetic Fields and Optics) or 321 (Electric Circuits and Electronics) are recommended to satisfy this requirement.

Helpful Hints

- For the most up-to-date information, consult the university web site at: http://www.wisc.edu/pubs/ug/10lettsci/depts/astron.html
- Department of Astronomy
  2532 Sterling Hall
  475 North Charter Street
  Madison, WI 53706
  Sharon Pittman
  Tel: 608.890.3775
  Fax: 608.263.6386
  Email: pittman@astro.wisc.edu
  Web: www.astro.wisc.edu
- Faculty Advisor
  Assistant Professor
  Snezana Stanimirovic
  Tel: 608.890.1458
  Email: stanimi@astro.wisc.edu

For the most up-to-date information, consult the university web site at: http://www.wisc.edu/pubs/ug/10lettsci/depts/astron.html
Department of Astronomy
2532 Sterling Hall
475 North Charter Street
Madison, WI 53706
Sharon Pittman
Tel: 608.890.3775
Fax: 608.263.6386
Email: pittman@astro.wisc.edu
Web: www.astro.wisc.edu
Faculty Advisor
Assistant Professor
Snezana Stanimirovic
Tel: 608.890.1458
Email: stanimi@astro.wisc.edu
APPLIED MATHEMATICS, ENGINEERING & PHYSICS

This is a four-year special program in the interdisciplinary physical sciences offering a strong theoretical foundation in related areas of engineering sciences, mathematics, and physics for professional work in the field of industrial research and technology. It also provides a foundation for graduate degree work in applied mathematics, engineering sciences, and physics. The AMEP program is an excellent choice for the student who is very interested in engineering sciences, mathematics, and physics, and who is planning a career for which knowledge of all three is important.

The program is an excellent choice for a student who is very interested in mathematics and physical science and is preparing for further study in a graduate or professional school in applied science or theoretical engineering where a substantial knowledge of engineering science, mathematics and physics is important.

Entrance Requirements

The AMEP program is difficult, demanding, and challenging. It is a program we recommend only for those students who have a strong ability and great interest in mathematics and physical science. A beginning student must have sufficient preparation from high school to begin with calculus, chemistry and physics in his freshman year.

AMEP students should be qualified to take calculus and chemistry the first semester. For admission to the junior year of the program, a student must have a grade point average of at least 2.75 in Math 221, 222, 234 or Math 275, 276, 375 and Physics 207, 208 or Physics 247, 248.

Graduation Requirements

The AMEP program has specific graduation requirements which are different from those for a typical BS or BA degree as described in the L&S-Bulletin or the Guidelines-Brochure. The degree requirements of the AMEP program are administered by the Executive Committee of the Division of Physical Sciences with the assistance of the Committee-in-Charge, AMEP GPA Requirement for Continuation in Program: Minimum 2.75 GPA required in Math 221, 222, 234 or 275, 276, 375; Physics 207, 208 or Physics 247, 248. A total of at least 125 credits is required in the College of Engineering, the College of Letters and Science, or both, with a minimum 2.0 GPA.

QUICK NOTES

- The complete Degree Requirements for the AMEP program can be found at the AMEP web site at www.math.wisc.edu/~amep/ or by contacting Prof. Cary Forest at cbforest@wisc.edu.

- For the most up-to-date information, consult the university web site at: http://www.wisc.edu/pubs/ug/10lettsci/depts/amep.html

- AMEP Program
  Department of Mathematics
  203 Van Vleck Hall
  480 Lincoln Drive
  Madison WI 53706-1388
  Tel: 608.263.2546
  Web: www.math.wisc.edu/~amep/

- **Note:** A student who wishes to change their classification to AMEP must first have permission of the AMEP coordinator. For an appointment with the AMEP coordinator, contact:

  AMEP Secretary
  Room 203 Van Vleck Hall
  Tel: 608.263.2546

- Committee-in-Charge: Professors Forest (Physics), Graham (Chemical Engineering), Milewski, Waleffe (co-coordinators, Mathematics)

- The Physics AMEP Advisor is Prof. Cary Forest.
  Tel: 263.0486
  Email: cbforest@facstaff.wisc.edu

- If you cannot find the information you are looking for or if you would like a printed copy of this manual please contact the department office.
AMEP Degree Requirements

For the most current up-to-date information, please check the website at: http://www.wisc.edu/pubs/ug/10lettsci/depts/amep.html#req

1. GPA Requirement for Continuation in Program: Minimum 2.75 GPA required in Math 221, 222, 234 or 275, 276, 375; Physics 207, 208 or Physics 247, 248.

2. A total of at least 125 credits is required in the College of Engineering, the College of Letters and Science, or both, with a minimum 2.0 GPA.

3. To be eligible to continue in the fifth semester of the AMEP program, students must file a Course Record Form in the AMEP Office.

4. Core Requirements:
   a. Complete General Education Requirements in Communication, Parts A and B.
   b. Complete at least one semester of chemistry (preferably 103 or 108).
   c. Complete Math 221, 222, 234, 321, 322. Math 275, 276, 375, 376 may be substituted for 221, 222, 234. Complete an additional 11 credits of mathematics with the approval of the mathematics advisor. Courses must be listed on the Course Record Form.
   d. Complete Physics 247, 248, 249, 311. Physics 207, 208, 241, may be substituted for 247, 248, 249. Complete an additional 12 credits of physics with the approval of the physics advisor. Courses must be listed on the Course Record Form.
   e. Complete at least 21 credits in engineering science, forming a progressive and cohesive sequence in one area of engineering. Minimum 12 credits must be at the I/A level and all courses must be listed on the Course Record Form approved by the engineering advisor.
   f. Complete 3 credits of approved laboratory experience and 3 credits of approved computational experience. These credits may also be used to partially satisfy the engineering and physics requirements.
   g. A minimum of 20 credits in L&S courses outside the Division of Physical Sciences is required. May not include courses in mathematics or computer sciences; may not include more than 10 credits in a single department. Credits earned to satisfy language requirements may be counted.
      1. Complete a minimum of 12 credits in humanities and/or social studies.
      2. Credits may include a maximum of 8 credits in biological sciences.
      3. Additional L&S credits outside physical sciences (excluding computer sciences and mathematics).
   h. Foreign Language Requirement: Complete through at least second-semester college level or the equivalent high school level in a single foreign language.
   i. Electives to bring the total credits to a minimum of 125. These may be taken in either the College of Engineering or the College of Letters and Science, or in both.
   j. Ethnic Studies Requirement. Complete at least 3 credits of ethnic studies. Select from courses with ethnic studies (e) designation.
   k. L&S Residence Requirement: Students who have completed 90 degree credits must complete the last 30 degree credits (excluding credits by exam) at UW-Madison.

A more detailed statement of the degree requirements can be obtained from the AMEP Program office.
THE PHYSICS MAJOR IN THE SCHOOL OF EDUCATION

Overview: Secondary Education (English, Mathematics, Science, Social Studies)

UW-Madison’s high school/middle school teacher preparation programs are among the most innovative in the nation. They are grounded in the latest education research. And they are continually reviewed and revised to give future teachers the experiences they will need to succeed in contemporary classrooms. Once admitted to the program, students pursue a full-time, four-semester sequence that combines education courses and school-based field experiences.

Program Admission

Limited and competitive admission to the Secondary Education programs occurs once each year in the summer. Students apply between early October and February 1, usually during their junior year. Applicants must meet minimum eligibility requirements to be considered for selection. These include 54 total earned credits by the end of the spring semester of application; a minimum number of credits in the major; a minimum 2.5 cumulative grade-point average or minimum scores on the Pre-Professional Skills Test (PPST; also called Praxis I); and completed application materials submitted by February 1. Students are admitted each summer to begin the professional sequence in the fall.

Applicants will be judged on their proficiency or potential proficiency on the criteria below.

1. Is the applicant well-qualified academically? Is this academic background consistent with the needs of the profession?
2. Is the applicant thoughtful and reflective about the meaning of teaching? Are the applicant’s motivations for entering the profession worthwhile and do they reflect a commitment to professional improvement?
3. Does the applicant show the ability and genuine commitment to work with all children, not just the privileged or highly motivated?
4. Is the applicant capable of working effectively with other professionals in the school, parents, caregivers, and members of the community outside of school?
5. Does the applicant bring unique qualities to the cohort and the profession? These may include ethnic background, being the first in the family to attend college, unusual work experiences, etc.
The Physics Department hosts a large number of colloquia and seminars each year. Check out the web for Colloquium & Seminar Notices (www.physics.wisc.edu/twap/).

Undergrads are sometimes shy about attending events they see advertised in the departmental weekly calendar, even though the subjects may sound quite interesting. Don’t be—the seminars and colloquia are open events that you’re welcome to attend. The percentage of a talk that you will likely be able to understand varies widely from one seminar to another, and from one speaker to another. If you can understand the title and it sounds interesting, then there’s a fair chance you’ll be able to keep up for a while. (Keep in mind that most people there will not generally follow the whole talk.)

The Physics Colloquium on Friday afternoon is intended to be a broad-based presentation that physicists in all subfields have a chance to enjoy. When it adheres to that ideal, it is often accessible to undergrads as well.

The Astronomy Colloquium on Tuesday afternoon is often understandable. There is also the Astronomy Journal Club, usually given by grad students in astronomy and astrophysics at noon on Thursdays—sometimes straightforward. The Astrophysics Seminar on Thursday afternoons begins with a social period, proceeds to a talk which is addressed to a group with widely varying interests, and encourages questioning the speaker to death, often running overtime in the process. It’s meant to be a place where those with astrophysical interests at all levels of experience can find a supportive interaction.

Most of the other topical seminars are usually very detailed talks for specialists in the fields, but if you watch the announcements you’ll occasionally find one in which a speaker from outside the field is giving a more general talk. These can be quite interesting. Actually, the Chaos and Complex Systems Seminar at noon on Tuesday often has interesting and understandable sounding titles. The other topical seminars are: Plasma Physics, Medical Physics, High Energy Physics, Theoretical Physics, Atomic Physics, Nuclear Physics, and Solid State Physics.
Academic Year Seminars & Colloquia

- **Seminar & Colloquium Notices**
  Check out the website for the current seminar and colloquium schedule
  www.physics.wisc.edu/twap/

- **Spring Semester**
  The Undergrad Colloquium, 1:20 PM, Tuesdays, 2223 Chamberlin Hall
  In principle this is something similar to the Intro Seminar above, but it differs in several ways. It is pitched at undergrads directly. It consists of individual faculty talking about recent developments in their fields, as well as what is happening here, or being done by them. It is not a group effort as the intro seminar is, and it is not an advertisement to attract grad students to the group. It tends to try to be more educational.

Other Physics Related Events

- **PUMP**—Fall
- **Majors Meeting with Career Advisors/Resume Builders**—Fall
- **Senior Send-off**—Spring

Special Lectures and Colloquia

- **Holiday (Spoof) Colloquium**—Friday in December
- **Physics Club Events**
  - Ice Cream—September
  - Trips and Tours
  - Pizza Meetings
  - Check with the club for the most recent info on coming events.

- **Wonders of Physics**—February
- **Physics Fair**—February
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 (2328 Chamberlin Hall) for students to read at their leisure. Every Friday afternoon, we meet with the physics colloquium speaker for half an hour, so we can learn about the process of becoming a scientist.

The club also sponsors a variety of other events. For example, in the past, we took a trip down to Fermilab and sponsored a racquetball tournament. Who knows what we’ll come up with this year? If you have any good ideas feel free to suggest something.
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 even thinking about declaring a physics major, this is the place to come for helpful advice about taking classes and getting a job in the physics department. But even if you don’t care about physics, you’re still quite welcome here. We like to meet all sorts of people. We are all truly laid back individuals and nobody should feel intimidated about approaching us.

If you join up, you can get access to the Physics Major’s Room, 2328 Chamberlin Hall, which is a great place to study or goof off any time. The club room has computers on the net, a laser printer, and wireless access for your own laptop. Joining also adds you to the club e-mail list, so you can be notified about club sponsored events.

We also sell cheap soda.

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 a several computers in the room. You can get your own key to the room and come visit at your leisure and stay as long as you like. Plus, you get the added bonus of knowing people that are in your classes (Yay! Study partners!).

Some of the Things We Do
There are organized and planned events such as:

Field trips to research facilities both inside and outside of UW... for instance, Fermilab, Argonne National Lab, the Madison Plasma Torus, and the UW Nuclear Accelerator. Trips are generally free, except for any food you choose to eat along the way.

Every day at selected times, there are tutors if you have some class related questions. UPS members are the tutors, so if you would like to get involved please e-mail the officers. You can find the current schedule for tutoring here.

And there are very random and basically non-educational things that we do from time to time to get to know each other better such as:

Ice cream socials, pizza parties, ice skating parties, movie night, card playing, pool, bowling, and just about anything else that we decide would be fun.
FOREWORD

PEER MENTORING

HELPFUL HINTS:

FOR MORE INFORMATION

Physics Learning Center
2337/2338 Chamberlin

Amihan Huesmann
huesmann@physics.wisc.edu
Tel: 890-0767

Susan Nossal
nossal@physics.wisc.edu
Tel: 262-9107

Larry Watson
lwatson@physics.wisc.edu;
Tel: 890-0767

Eric Hooper
ehooper@astro.wisc.edu
Tel: 890.0767

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) matches upper-level undergraduate students as tutor/mentors in small study groups with students studying introductory physics (algebra-based Physics 103–104 and calculus-based Physics 207–208). Physics Peer Mentor Tutors meet twice a week with the same small group of students to overview key concepts, choose and supervise practice problems, answer questions, and serve as a mentor. We strive 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, tutors 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 and in the process 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.

Most of our tutors are upper-class students majoring in physics, astrophysics, secondary science education, and engineering. We also welcome students from other fields if they have a strong physics background. Students receive either independent study credit or a stipend for participation in the Physics Peer Mentor Tutor program. To apply, please submit a resume, your transcript (unofficial copy is fine), and a short statement about why you would like to be a Physics Peer Mentor Tutor (½–1 page).
For More information

For more information go to www.physics.wisc.edu/awards

or contact the department of Physics:

E-mail: info@physics.wisc.edu
Tel: 262-4526

Undergraduate Student Awards

The Fay Ajzenberg-Selove Award is presented to undergraduate women majoring in Physics, Astronomy, or Physics/Astronomy for the purpose of encouraging women to continue their careers in science. Dr. Ajzenberg-Selove, who received her Ph.D. in Physics in 1952, is currently a Professor Emerita the University of Pennsylvania.

The Dr. Maritza Irene Stapanian Crabtree Award in Physics was established by William Crabtree to honor his wife, Dr. Maritza Crabtree, who graduated with a Physics degree in 1971. This annual award benefits undergraduate students in physics based equally on merit and need.

The Bernice Durand Undergraduate Research Scholarship was established by Vice Provost/Physics Professor Bernice Durand to promote meaningful undergraduate research opportunities and to support and encourage women and ethnic minorities as undergraduate majors in the Departments of Physics and Astronomy.

The Henry and Eleanor Firminhac Physics Undergraduate Scholarship is given to undergraduates in Physics with financial need as the primary consideration. Funding provided by Ralph Firminhac in honor of his parents.

The L. R. Ingersoll Prize is given for distinguished achievement in introductory physics. This prize is underwritten by a fund established by the family and friends of the late Professor Ingersoll, a distinguished physicist and teacher at the University who served as Department Chair for many years.

The Liebenberg Family Research Scholarship is for Physics, AMEP, or Astronomy/Physics majors. This scholarship opportunity was initiated by the Liebenberg family for the purpose of promoting undergraduate summer research opportunities.

The Albert Augustus Radtke Scholarship Award is given to outstanding junior or senior students majoring in Physics or Applied Mathematics Engineering and Physics. This award was made possible by a bequest of the late Mrs. Elizabeth S. Radtke in honor of her husband, a 1900 degree recipient from UW-Madison.
WHERE DO I START?

Application information for institutions other than UW-Madison should be requested directly from the school(s) to which you wish to apply. Many colleges and universities now have web sites available to provide you with all kinds of information, and most, if not all, allow you to apply electronically. Browse around to get your questions answered and to find a graduate school that meets your needs. You can learn about all the details, resources, and registration information for the GRE at their web site (www.gre.org). A copy of the GRE Information and Registration Bulletin can be downloaded from there as well. (Watch for advertisements of our annual practice GRE in the fall.) We generally recommend that our undergraduate majors consider attending graduate school elsewhere, but those who would like to apply should apply online at http://www.gradsch.wisc.edu/eapp/eapp.pl, and ask questions of the Physics Department Graduate Coordinator in Room 2320H Chamberlin Hall.

Renee Lefkow
Physics Graduate Coordinator

2320H Chamberlin Hall
Tel: 608.262.9678
E-mail: physgrad@physics.wisc.edu
Web: www.physics.wisc.edu

Helpful Hints

• For More Information
  Renee Lefkow
  Physics Graduate Coordinator

  2320H Chamberlin Hall
  Tel: 608.262.9678
  E-mail: physgrad@physics.wisc.edu
  Web: www.physics.wisc.edu

Qualifying Examination

Undergraduate Physics majors interested in pursuing graduate study in physics are encouraged to take the Qualifying Examination during their senior year to gauge their grasp of undergraduate physics. The exam is offered each September and February and covers basic undergraduate physics. Information on the Qualifying Examination and copies of past exams can be found at: www.physics.wisc.edu/grads/qualifiers/qualifiers.html. For questions regarding the Qualifying Examination, please contact the Physics Department Graduate Coordinator Renee Lefkow.
There are opportunities for employment of undergraduate students in the various research laboratories of the Physics Department at an hourly rate of pay. Such employment is strongly recommended to physics majors and prospective majors because it is an excellent way to participate directly in research activity and to become better acquainted with the staff of the Physics Department. The initiative in making such an arrangement is entirely with the student, who should contact directly the professor in charge of the laboratory where s/he desires to work. Your advisor or mentor can help investigate the available opportunities. Additional opportunities are sometimes available for those willing and able to volunteer.

Nearly everyone who really wants such a job actually gets one, but to find one you need a fair amount of obstinate persistence. You’re likely to hear what sounds like a no for a while. The problem is that most often jobs do not actually exist prior to a student convincing a researcher that he or she is serious and indispensable. Find someone who is working in an area you want to learn about, and then send some e-mail to make an appointment, or write letters, knock on some doors. It’s a place to start. Initiative and persistence count.

Summers are ripe with opportunity. Various labs and schools operate a variety of internship programs—Arizona, Virginia, Puerto Rico, Tennessee—where students can go and do interesting things. NSF’s REU (Research Experiences for Undergraduates) program offers many opportunities conveniently arranged on their Web site. These are really good opportunities to learn what research is like and to get a fresh perspective from beyond Madison. There are two bulletin boards where announcements of such opportunities get posted (check both, they’re sometimes different). One is outside the Physics Club room; the other is outside the department office, both on the 2nd floor of Chamberlin Hall.

The UW Honors program also has some good opportunities, with sophomore summer research support and a Hilldale program for Juniors and Seniors. Or, if you have a lab job in the department and really like it, Madison is really nice in the summer.