Omer Blaes, Professor and Freshman Advisor

New Undergraduate Physics Majors Reception

September 24, 2013
**Students graduating with a B.A. or B.S. in Physics should be able to:**

- Apply the basic laws of physics in the areas of classical mechanics, Newtonian gravitation, special relativity, electromagnetism, geometrical and physical optics, quantum mechanics, thermodynamics and statistical mechanics.
- Recognize how observation, experiment and theory work together to continue to expand the frontiers of knowledge of the physical universe.
- Apply basic mathematical tools commonly used in physics, including elementary probability theory, differential and integral calculus, vector calculus, ordinary differential equations, partial differential equations, and linear algebra.
- Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically.
- Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively.
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one’s own.
In addition, students graduating with a B.S. should be able to:

• Apply more advanced mathematical tools, including Fourier series and transforms, abstract linear algebra, and functions of a complex variable.
• Use classic experimental techniques and modern measurement technology, including analog electronics, computer data acquisition, laboratory test equipment, optics, lasers, and detectors.
• Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.
Physics Undergraduate Course Requirements – Lower Division

• Physics 20-21-22-23-34-25 (General Physics)
  OR Physics 1-2-3-4-5 (Basic Physics) with an average GPA of 2.7

• Physics 3L-4L-(5L or 25L) (Physics Laboratory/Experimental Physics)
  OR 13AH-13BH-13CH (Honors Experimental Physics)

• Chemistry 1A-1B (General Chemistry)
  OR Chemistry 2A-2B (Honors General Chemistry)

• Math 3A-3B (Calculus with Applications – if you have AP Calculus, contact the Math Department)

• Math 4A-4B (Linear Algebra, Differential Equations)

• Math 6A-6B (Vector Calculus with Applications)
Honors Labs
## Recommended Course Schedule - Freshmen

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<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Physics 20</td>
<td>Physics 21</td>
<td>Physics 22</td>
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<tr>
<td>Math 3A</td>
<td>Math 3B</td>
<td>Math 4A</td>
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<tr>
<td>Chem 1A</td>
<td>Chem 1B</td>
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Required Classes for the BS:

- Physics 101 (Complex Variables and Fourier Transforms)
- Physics 104 (Advanced Mechanics)
- Physics 110A-B (Electromagnetism)
- Physics 115A-B-C (Quantum Mechanics)
- Physics 119A (Thermal and Statistical Physics)
- Physics 127AL (Analog Electronics)
- Physics 128AL (Advanced Experimental Physics)
- One of Physics 127BL (Digital Electronics)
  - Physics 128BL (Advanced Experimental Physics)
  - Physics 134L (Observational Astrophysics)

Plus electives with some restrictions (49-54 upper division units in total)

The Physics BA requires 42 upper division units and is MUCH more flexible in terms of course choices. Be aware that a BA has more GE requirements, though.
Upper Division Physics Electives

- Physics 102 (Linear Algebra and Applications)
- Physics 103 (Intermediate Mechanics – actually a prerequisite for required 104)
- Physics 106 (Nonlinear Phenomena)
- Physics 119B (Thermal and Statistical Physics)
- Physics 120 (Physics of California: Waves, Weather, Quakes and Fires)
- Physics 121A-B (The Practice of Science)
- Physics 123A-B (Condensed Matter Physics)
- Physics 125 (Elementary Particle Physics)
- Physics 127BL (Digital Electronics)
- Physics 128BL (Advanced Experimental Physics)
- Physics 131 (Gravitation and Relativity)
- Physics 132 (Stellar Structure and Evolution)
- Physics 133 (Galaxies and Cosmology)
- Physics 134L (Observational Astrophysics)
- Physics 135 (Biophysics and Biomolecular Materials)
- Physics 141 (Optics)
- Physics 150 (Special Topics in Physics)
- Physics 142L, 143L, 144L, 145L, 198, 199 (Faculty Mentored Research)
- Physics 160K (Science for the Public)

With approval of the Chair, you can also apply 8 units of upper division courses in Chemistry, Earth Science, Biology, Engineering, Geography and Math to the Physics BS. Also, for the most ambitious of you, it is possible to take graduate classes.
# Recommended Course Schedules - Juniors

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<th>Fall</th>
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<th>Spring</th>
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<tr>
<td><strong>Standard Track</strong></td>
<td>Phys 103</td>
<td>Phys 104</td>
<td>Phys 127AL</td>
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<td>Phys 115A</td>
<td>Phys 115B</td>
<td>Phys 115C</td>
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<td>Phys 101</td>
<td>Phys 101</td>
<td>Physics Elective (optional)</td>
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<tr>
<td><strong>Advanced Track</strong></td>
<td>Phys 103</td>
<td>Phys 104</td>
<td>Phys 127AL</td>
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<tr>
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<td>Phys 115A</td>
<td>Phys 115B</td>
<td>Phys 115C</td>
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<tr>
<td></td>
<td>Physics Elective</td>
<td>Phys 101</td>
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<tr>
<td><strong>Honors Track</strong></td>
<td>Phys 103</td>
<td>Phys 104</td>
<td>Phys 127AL</td>
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<tr>
<td></td>
<td>Phys 115A</td>
<td>Phys 115B</td>
<td>Phys 115C</td>
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<tr>
<td></td>
<td>Phys 102</td>
<td>Phys 101</td>
<td>Physics Elective</td>
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<tr>
<td></td>
<td>Phys 119A</td>
<td>Phys 119B</td>
<td>Physics Elective</td>
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Junior Transfers – Take Note!!!

Please talk to Jean Dill and a faculty advisor to make sure that your previous courses transfer to UCSB with appropriate physics credit, and to make sure that you are registering for classes for which you have the appropriate background and preparation.

Some of you may want to register for classes in the Physics 20-25 series BEFORE starting upper division physics classes. We do not want to set you up for failure if you are not adequately prepared. We want you to succeed!
Registering for Classes

Most physics courses are offered only ONCE per year, though a few are offered during summer session as well. PLEASE follow the Recommended Course Schedule on the Physics Website (www.physics.ucsb.edu/education/undergrad).

Enrollments are very high. How do you get into your physics and other classes?

Every department has their own policy and procedures, so check with the departmental undergraduate advisor and website.

Some departments have waiting lists – the Physics Department does NOT use them. If a course is full, you will only be able to register for it if someone else drops.

Jean Dill, the Physics Undergraduate Advisor (dill@physics.ucsb.edu) can help you with getting into your physics (only!) lectures (only!) courses.

Our advice to you is to register for your required physics (and math and chemistry) lecture AND lab courses in the first registration pass, and then worry about getting into your General Education courses (of which you have MANY choices and opportunities).

All freshmen physics majors should be registered for Physics 20, Math 3A (at least), and Chem 1A or 2A for Fall quarter.
Where Can You Get Help?

• For general questions about other degree programs, courses, etc., make an appointment online to see a College of Letters & Science Advisor in Cheadle Hall (http://www.lsuregistration.ucsb.edu/).

• For administrative issues within physics, email or visit Jean Dill (Broida 3019C, dill@physics.ucsb.edu).

• For physics academic advice, see one of our Physics Faculty Advisors:
  Freshmen: Omer Blaes (F/W) (blaes@physics.ucsb.edu)
  Sathya Guruswamy (S) (sathya.guruswamy@ccs.ucsb.edu)
  Sophomore: Elisabeth Gwinn (F/W) (bgwinn@physics.ucsb.edu)
  Andreas Ludwig (S) (ludwig@physics.ucsb.edu)
  Junior: Ben Mazin (F) (bmazin@physics.ucsb.edu)
  Ben Monreal (W/S) (bmonreal@physics.ucsb.edu)
  Senior: Deborah Fygenson (deborah@physics.ucsb.edu)
  Transfer: David Stuart (stuart@hep.ucsb.edu)

• For help with physics,
  go see your Professors during their office hours,
  get help from graduate student teaching assistants in the Physics Study Room (PSR, M-F 9-4 PM),
  get help from our undergraduate student PSR Fellows,
  try CLAS (Campus Learning Assistant Services in the Student Resources Building)
The Physics Study Room (PSR)

Open 10 AM – 5 PM Monday-Friday
PSR Fellows

PSR Fellows are Physics undergraduate majors who have already been through the lower division Physics 20-25 series and are committed to helping new physics majors learn the material in that series.

Wednesdays 6-8 PM in the PSR
Thursdays 6-8 PM in the PSR
Sundays 6-8 PM in Broida 1640
Things that you MUST avoid

• Falling behind in your coursework – the quarter system is VERY fast! Seek out help EARLY!!!

• Cheating – you WILL get caught and you WILL be punished, possibly by being expelled from the university.

• Disrespectful behavior, hazing, or harassment. We insist that all members of our physics community treat each other with courtesy and respect.
Physics Department Policy on Hazing and Harassment

Hazing, Harassment, And What To Do About It

• **What you might think of as “joking around” can be a serious problem if it inhibits others from participation in study groups or other student activities.**

• **This includes, but is not limited to, derogatory comments about women. We know this behavior has disrupted the participation of some of our female physics students in the past and the department is very serious about curtailing this behavior.**

• **This behavior is prohibited by the UCSB Codes for Student Conduct, in which it is considered a form of hazing. It can also become a legal case of sexual harassment. Prohibitions against hazing and harassment extend beyond campus property, and beyond official UCSB functions. For example, whether coming from one student repeatedly, or from a group, demeaning female students in an off-campus informal study group is a form of hazing and subject to severe repercussions for the offenders.**
What to do? Bullying behavior of this sort can be quickly stopped when offenders are warned about the legal path they are on. An early warning to offenders is the best approach because action can be taken well before a situation would be considered sexual harassment.

- Experience has shown that targets of this behavior are not eager to report problems. If any student, male or female, is the target of or witnesses this activity, we urge you to report the issue to any of the following:
  - The professor of your class
  - Any department faculty
  - Faculty undergraduate advisor or department Chair
  - Jean Dill, administrative undergraduate advisor
  - Director of Judicial Affairs, Stephan Franklin (893-4569, Franklins@sa.ucsb.edu)
  - UCSB Office of Equal Opportunity and Sexual Harassment/Title IX Compliance (893-5410, kristen.gibson@oeosh.ucsb.edu)

*We insist that ALL of our students treat each other with respect and courtesy. And we sincerely want ALL of our students to enjoy the benefits of studying and socializing with their peers!*
Interested in finding out what DOING physics is really like? Try research!

Astrophysics
Biophysics
Condensed Matter Experiment
Condensed Matter Theory and Nonlinear Dynamics
High Energy Experiment
High Energy Theory, Gravity Theory, and Mathematical Physics
Worster Summer Research Fellowship Program
Honors Senior Thesis

If you end up achieving a Physics GPA of 3.5 or more and are doing research with a Physics faculty member, you then have the opportunity of completing an Bachelor’s Honors Thesis.

You should submit a thesis proposal to a faculty advisor 3 quarters before you expect the thesis to be submitted. In addition to writing the thesis, you will be expected to give a public seminar on your research when it is completed.

Some recent examples of Bachelor’s Honors Theses:

- Performance, Calibration and Data Analysis of a Cherenkov Radiation Based Neutron Detector
- Parameterization of a Single-Exterior Black Hole in 2+1 Dimensions
- Thermodynamic Analysis of DNA Nanotubes
- Digital Etching in Coupled L3 Photonic Crystal Cavities
- Electrostatic Force Microscopy on Organic Photovoltaics
Career Colloquia

While some of you may be interested in going on to pursue PhD research in a physics graduate program, many of you will be using your physics degrees as foundations for other careers and postgraduate professional schools.

There are MANY such career options, some of them quite surprising.

Once every quarter, the Department hosts a “Career Colloquium” by someone trained in physics who has gone on to pursue a non-academic career. Watch out for the announcements of such events!
Physics Department Undergraduate Awards

• **Arnold Nordsieck Award**: presented to an outstanding graduating senior who shows research promise.

• **Outstanding Senior Award**: for excellent academic performance and evidence of future promise in physics.

• **Research Honors** and **Academic Honors**
WOMEN IN PHYSICS

www.physics.ucsb.edu/~Women/
UCSB Society of Physics Students

Interested? Email sps@physics.ucsb.edu.