

**The Undergraduate Physics Program
at
Penn State University**



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Physics Department Sexual Harassment Policy guidelines www.phys.psu.edu/undergraduate/sexual_harassment.html	
Useful web sites for undergraduate Physics majors www.phys.psu.edu/~rick/ROBINETT/ugrad_sites.html	

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Introduction

This booklet provides information about the undergraduate physics program at Penn State University, primarily for students interested in physics as a major or a minor. It should also prove useful for faculty advisers for physics and related majors at all PSU campuses. The booklet contains suggestions for scheduling courses each semester and convenient check sheets listing required courses for the five options within the physics major. Information about opportunities for participation in research, study abroad, summer employment, the co-op program, post-baccalaureate employment, and graduate studies is also included. If you have comments or suggestions to improve this booklet, please contact the Associate Department Head and Director of Undergraduate Studies, Prof. Richard Robinett, at any of the addresses on the inside cover.

The program in physics provides technical and general education for students interested in exploring physics as well as for those planning a career in physics or related fields. Career opportunities include positions in industry, government or education at various levels. A strong background in physics is also useful for careers in engineering, science writing, law, medicine, and business. The curriculum for the first and much of the second year includes basic physics, chemistry and mathematics courses. In the junior and senior year, students majoring in physics take required physics "core" courses and select other courses depending on their choice of one of five options. In addition to the general physics option, which offers a challenging contemporary program, the department offers an acoustics option, an electronics option, and a medical physics option that have been designed for students with interests in areas of a more applied nature. The teaching option provides a strong background in physics together with education courses and leads to a certificate in secondary school teaching in the Commonwealth of Pennsylvania. Within the general physics option, students may select elective courses to fulfill requirements for double majors in, for example, physics and astronomy/astrophysics, physics and mathematics, or physics and chemistry. Students can often major in physics and select their electives to obtain a minor in an area that interests them. The program provides students with an excellent fundamental education together with ample flexibility for exploring special interests in other fields, for engaging in research, for participating in the co-op program, and for studying abroad.

Physics Advisors

Students who enter the PSU system at University Park attend a summer FTCAP (First Year Testing, Counseling, and Placement) session at which they attend College-wide meetings and visit their prospective departments to schedule their Fall semester courses. After attending such a meeting with departmental representatives, you will be sent an email to your PSU account before returning for classes in the Fall indicating the name of your Physics Faculty Advisor. Students who join the Physics program at other times (transfer students, change of majors, international students, etc.) should consult the Physics Department and request to be assigned a faculty advisor; most typically this will be the Director of Undergraduate Studies.

In either case, please schedule an appointment with your advisor at your earliest convenience. Advisers can be helpful in discussing the program, in suggesting and recommending courses, in calling to your attention university rules and requirements, and in assisting with career planning.

- *FINAL RESPONSIBILITY FOR SELECTING COURSES AND MEETING DEGREE REQUIREMENTS RESTS WITH THE STUDENT* who should become familiar with the PSU *Bulletin of Baccalaureate Degree Programs* (the so-called 'Blue Book' or Bulletin for short) and the handbook entitled *Policies and Rules for Students* both of which are available in paper form or on the web at www.psu.edu/bulletins/bluebook
- The PSU Bulletin is updated periodically on the web. Departments sometimes make changes to their course or degree requirements and students should periodically consult with their advisors or the Director of Undergraduate Studies or check their graduation degree audits to confirm their program requirements.

For your first meeting with your adviser, bring a copy of your transcript and current schedule if you are already enrolled. If you are planning your courses for the following semester, bring a tentative schedule. Keep in touch with your adviser at least once each semester, in person or via email.

New and transfer students

Incoming first year students take on-line placement tests in English, mathematics, and chemistry. The results are useful in offering guidance for course selection and will be discussed with you during your summer FTCAP (First Year Testing, Counseling, and Placement) visit to the Physics Department. Typically, first semester students interested in the Physics major enroll in MATH 140, CHEM 110 and 111, PHYS 211, and an Arts, Humanities or Social Science (AHS) elective or ENGL 15/30 for Fall. Students with no prior background in calculus may wish to postpone PHYS 211 until they have completed MATH 140. Students who are unusually well prepared and have sufficiently high scores on Advanced Placement (AP) tests may bypass one or more of the usual first year courses.

- Students should request Educational Testing Service to send AP score reports directly to the Penn State Undergraduate Admissions Office, 201 Shields Bldg., University Park, PA 16802. A complete listing of the scores necessary on various AP tests to obtain credit for a variety of PSU courses is available at www.psu.edu/admissions/steps/understanding/ap.htm

Typical course schedules (see the sample schedules in this booklet) for the first two years are similar for all physics majors regardless of the choice of option. The typical schedule for the first two semesters is sufficiently general that students who decide to transfer to other colleges at PSU (engineering, earth and mineral science, liberal arts, business, etc.) can often do so without loss of credit or time. Students thinking of transferring to physics from other programs should consult an adviser to evaluate courses already completed and to plan an appropriate schedule of classes.

Entrance to the major (ETM)

First and second year students interested in physics are usually admitted directly to the Eberly College of Science (ECoS) and assigned an adviser in physics, but are initially in a general category called SCIEN or pre-major status. To be formally admitted to the physics major, a student must

- have a cumulative grade point average of 2.00 or better for all PSU courses and

- have completed MATH 140 and 141, PHYS 211 and 212, and CHEM 110, all with a grade of C or better.

Students in their 4th semester (usually those with more than 45 credits earned) are typically sent instructions by the Eberly College of Science on how to apply for the major of their choice (using a web-based application procedure) with the Entry to Major process being finalized by the end of the second year. You may also come to the Physics Main Office in 104 Davey to obtain a change of major form. (Note that the Teaching Option has a number of additional requirements for Entry to Major.)

General Education and Diversity Requirements

The university requires all undergraduates to complete 45 credits of general education (Gen-Ed) courses as indicated in the Bulletin. To satisfy the university requirement of 18 credits in AHS (arts, humanities, and social sciences) you may select 6 credits in each category (listed as GA, GH, GS in the course catalogs) or you may instead choose a 3, 6, 9 credit distribution through a straightforward petition process. Students can use the searchable on-line 'Schedule of Courses' to find approved Gen-Ed courses. Students may also substitute 3 credits of study in a foreign/second language at the third or higher level for three credits in any of the AHS categories, provided that this would not lead to a complete elimination of any of these three areas.

- To satisfy the English 202 requirement, select ENGL 202C. Any version of the required Speech Communication course (CAS 100A, B, or C) is acceptable
- To complete the university general education requirement in the natural sciences (GN), students in the acoustics, electronics, and general options complete CHEM 110, 111, 112, and 113 for a total of 8 credits, as well as selecting one additional 3 credit general education-approved course in natural sciences (GN), not in Physics or Chemistry. (Students in the teaching and medical physics options take specified biology courses that satisfy the rest of their GN requirements.)
- Starting in Fall 2005, all students must satisfy a diversity requirement by taking **two**, three-credit courses, one labeled US (for US Cultures) **and** one labeled IL (for International cultures). A large number of General Education (GenEd) courses in the GS, GH, or GA (and even GN) categories also satisfy either the US or IL (and sometimes both) requirements.
- To satisfy the three-credit, general health and physical activity requirement (GHA), students typically take a combination of BBH (Biobehavioral Health) or KINES (Kinesiology) courses, but many possibilities exist. Most students take either two, 1.5 credit KINES courses to satisfy this requirement, or one 3.0 credit course GHA course.

First Year Seminar (FYS)

All students in the Penn State system are required to complete, during their first academic year, a First Year Seminar (FYS) course of at least one credit. Most colleges or academic programs offer a wide variety of such FYS courses and any of them can be used for this general PSU requirement. The Department of Physics offers a one-credit FYS course in Spring semesters. (In Spring 2007, for example, the course was listed under PSU 016 SCI FYS, Physics, Sec. 350.) Students who intend to major in physics are strongly encouraged to take the Physics offering if possible. The course meets once a week and is typically scheduled for late Monday afternoons in the Spring;

consult the Spring 'Schedule of Courses', or the Director of Undergraduate Studies for more detailed information. The Physics FYS

- introduces students to modern areas of physics research,
- describes research methods and tools in the physical sciences, both experimental and theoretical,
- allows students to meet PSU physics faculty and tour their laboratories, describes undergraduate research opportunities at Penn State as well as career opportunities after graduation,
- and provides information on involvement in physics outside the classroom through such programs as the Society of Physics Students (SPS), the CO-OP program, and the Research Experiences for Undergraduates (REU) program.

Foreign language

Although proficiency in a foreign language is not required of physics majors, interested students can schedule foreign languages, as electives, depending on the particular option. Students may substitute 3 credits of study in a foreign/second language at the third or higher level for three credits in any of the AHS categories, provided that this would not lead to a complete elimination of any Gen-Ed area. Students who are interested in the national honor society, Phi Beta Kappa, are reminded that that program has a foreign language requirement. Similarly, students interested in double majors should know that some of the options in the Chemistry and Mathematics majors also have a language requirement; the Astronomy/Astrophysics major, and most Engineering majors do not have a language requirement.

Choice of option within the Physics major

Five options (general physics, electronics, medical physics, acoustics, and teaching) are offered within the physics major. See the Bulletin, course checklists, and suggested schedules for further detailed information.

- Because the electronics option has more required courses than some of the other options, students should try to start this option in the third semester. However, even with a later start, the requirements for the electronics option can usually be completed in four years by careful scheduling.
- The teaching option requires a ninth semester for practice teaching in a public school as well as a number of other requirements for teaching certification; additional requirements, including community service, a diversity experience, and CPR training, are stipulated by the College of Education. **Students interested in this option should read carefully the section on the Teacher Education Programs in the Bulletin and register with the College of Education (Iris P. Flynn, 228 Chambers Bldg., 863-1495, ipf1@psu.edu) as soon as possible, typically no later than the second semester of your first year!** Students interested in this option must eventually have their application for major status approved by the College of Education.

- Students interested in graduate studies in Physics, and/or double majors and minors, often select the general physics option, because of its flexibility and larger number of free electives.
- Students interested in medical school often choose the Medical Physics option (with the life sciences emphasis). They should also consult the Pre-Med Advising Office in 213 Whitmore for useful information on applying to medical and other professional schools. Students interested in pursuing further student in Bioengineering also choose, this option, but the BIOE 'track'. Students interested in graduate programs in medical physics can often obtain the necessary preparation in the General Option, using the freedom to take 'Program List' electives.

Writing across the Curriculum

All PSU students are required to take a junior-senior level class designated as a W (writing intensive) course in their college. Physics majors are required to complete PHYS 457W (3 credits, experimental physics) with a grade of C or better. Students pursuing the double major in physics and astronomy/astrophysics may select either ASTRO 475W or PHYS 457W. Students who select ASTRO 475W need to register for only 2 credits of PHYS 457 and request that it be substituted for PHYS 457W. A similar substitution can be used for a double major with Mathematics using MATH 311W.

Suggested Course Sequences

Suggested convenient, but not mandatory, schedules for the various options are given below. Students who wish to begin advanced courses prior to the third year may schedule PHYS 419 after completing PHYS 213/214, MATH 251 and MATH 230. PHYS 237 is not a prerequisite for either PHYS 419 or 400, but it is for PHYS 410. MATH 251 and 230 should be scheduled in the second year if at all possible so that students will be well prepared for PHYS 419 and 400. It is recommended that students complete the classical Physics courses 419 and 400 before taking quantum mechanics PHYS 410. PHYS 410 is a prerequisite or co-requisite for such senior-year electives as PHYS 406, 411, and 412.

Choosing electives

Students in the Acoustics and Electronics (General and Medical Physics) Options have 6 (12) credits as electives. These courses may be taken from the long list of allowed courses in the Program List given at the end of this handbook. Avoid selecting courses which are inappropriate or not intended for science majors such as MATH courses below 140, Biological Sciences 1-4, ASTRO 1 or 10/11, etc. For students in the Acoustics, Electronics, and General Options, the 9 credit university general education requirement in natural sciences is satisfied by CHEM 110, 111, 112, and 113 plus one other 3 credit GN course, not in Physics or Chemistry.

eLion (On-line interactive student information and advising site)

At any time during their academic career at Penn State, students can access a wide variety of useful advising information (including their own transcripts, up-to-date grade information, degree audits, course schedules and space availability, projected GPAs, etc.) by logging onto Penn States eLion interactive web advising site. This on-line facility is available to all students with a valid access account at <http://elion.oas.psu.edu>

Students are strongly encouraged to make use of this system to monitor their progress. It also includes an interactive advising module which can provide useful information; please note that this is *NOT* a substitute for periodic meetings with your academic advisor, at least once a semester.

Late Course Drops and Deferred Grades

Dropping a course after the ninth day, but before the middle of the twelfth week of the semester constitutes a late drop. NO course drops are permitted during the final three weeks of the semester. Late drops are indicated on the transcript as: "WN"--withdrew no grade (no course work or tests completed); "WP"--withdrew passing; "WF"--withdrew failing. You are allowed only sixteen (16) credits of late drops throughout your entire collegiate career. Consult your adviser before dropping a course. The University also has a policy on deferred grades if, for reasons beyond a students control (typically illness, family emergencies, etc.), they cannot finish a course in a given semester. See the University calendar (www.psu.edu/registrar under Calendar) for detailed information on the late drop deadlines for any specific semester.

Petitioning the Faculty Senate

The ultimate decisions on granting exceptions to official University policies rest with the University Faculty Senate and students may petition that body for a variety of reasons, including

- retroactively adding/dropping a course or retroactive withdrawal from a previous semester
- exceeding late drop credits (>16)

To submit petitions to the Faculty Senate, follow these steps:

1. Write a letter stating the reason for the petition.
2. Ask the instructor of the course you wish to drop to write a letter of explanation.
3. Complete a Drop/Add form (available in 104 Davey Lab) and obtain your adviser's signature.
4. Go to the Office of the Registrar, pay the \$6 fee, and get a receipt.
5. Take all the paperwork to the Dean's Office, 428 Thomas Bldg.

You will be notified by mail of Senate action on your petition. Such petitions should be considered a last resort after having consulted your academic advisor and the Dean's office.

Graduation requirements

Requirements are stated in the Bulletin and include, but are not limited to the following: successful completion of all course requirements in each option; maintenance of a C-average (2.00) for all courses taken at PSU, and earning a grade of C or better in each of the following courses: MATH 140, 141, CHEM 110, PHYS 211, 212, 213, 214, 237, 400, 410, 419 and 457W.

Satisfactory/unsatisfactory grading system

The only courses which may be taken by physics majors under the SA/UN grading system are ROTC courses.

Minor in Physics

Students interested in obtaining a strong background in physics, while majoring in another field, can elect to complete a minor. The physics minor includes the introductory PHYS 211, 212, 213, 214, sequence, PHYS 237 and the three core courses PHYS 400, 410 and 419. These courses must all be passed with a grade of C or better. Come to the physics office to indicate your interest in or apply for the minor and speak with an adviser. Starting in Fall 2006, students may also use EE 330 in lieu of PHYS 400 (electricity and magnetism) for the Physics minor if they are in a major which requires them to take that course. Students who have credit for E SC 400H may petition to have it used in place of PHYS 400 for the Physics minor.

Concurrent Degrees, Multiple Majors and Minors in Other Fields of Study

It is possible to receive a single degree involving two (or more) majors. To do this, it is necessary to fulfill the requirements for each major. The idea of majoring in two areas in order to broaden one's knowledge may be an appropriate one for some students, but such a program requires ability, diligence and careful planning. Anyone interested in taking on a second major should first speak with the Director of Undergraduate Studies in each of the departments concerned. The policies related to *Completing More Than One Undergraduate Major Program (Concurrent Majors and Sequential Majors)* can be found in the Policies and Rules for Students under policy 60-00.

It is also possible to complete the requirements for a minor in other fields of study, especially for Physics students in the General Option. A minor in mathematics, for example, requires students to take one additional 4xx level course in mathematics beyond the requirements in the General Option. As an example, students who take PHYS 479 or 461 (which are cross-listed as MATH 479 and 461) as one of their 4xx level Physics electives can also count that course towards their math minor. Many other useful 4xx level MATH courses can also be used: consult your academic advisor for examples.)

Education abroad

Students interested in education abroad can obtain information from the office of International Programs (222 Boucke, 865-7681) or the ECoS COOP Office (108 Whitmore, 865-5000.) More than 45 Penn State programs are available in many countries throughout the world. Students typically remain registered at Penn State while studying abroad. Students considering studying abroad for a semester or year might not find appropriate technical courses available to them. If that is the case, they should plan carefully to schedule essential technical courses at PSU and utilize the semester abroad to complete more of the AHS (Gen-Ed) courses, and benefit fully from the cross-cultural experience.

The Cooperative Education (co-op) program

The Eberly College of Science (ECoS) offers a co-op program in which students augment their academic experience at PSU with two or more relevant paid work experiences with employers. Off-campus work experiences are arranged in consultation with the physics co-op adviser and the College of Science co-op office: participation may extend the undergraduate program beyond four years. The work experience provides students with an opportunity to apply their academic learning, to explore other areas of physics, and to experience the work-place environment. Co-op jobs often provide ideas for undergraduate research projects and for new directions in subsequent academic work as well as valuable contacts for post-baccalaureate employment. Academic credit may also be obtained for co-op work. The co-op office located in 520 Thomas Bldg and more information can be found at www.science.psu.edu/coop

The Eberly College of Science has the following policy regarding the use of co-op credits. For the first two co-op experiences students register for Science 295 and Science 395 for two credits each, while students who participate in a third co-op experience register for Science 495 (also for 2 credits) so that a maximum of six co-op credits can be used toward degree requirements.

Research participation

Undergraduates are strongly encouraged to take advantage of the outstanding research programs in the physics department. After looking at the Physics Department web site (under *Faculty*) or hearing talks from faculty during First Year Seminar, students are encouraged to make appointments with faculty members whose work interests them and discuss possible projects and the responsibilities involved. Academic credits can be earned in PHYS 296 (first and second year students) and in PHYS 496 (third and fourth year students) and used as 'Program List' electives. Three (3) credits of PHYS 496 may be used for the unspecified physics 4xx credits in the general option. Sometimes such work can lead to paid summer employment on the project and can be helpful for placement in the summer REU (Research Experiences for Undergraduates) program.

Schreyer Honors College

The Schreyer Honors College provides challenging opportunities for academically outstanding students. Students who are majoring in physics and who do excellent work in PSU physics courses in their first two years may be recommended for so-called 'junior-gate' admission to the Honors College by faculty/advisors in the Physics Department. Such students may then be admitted to the Schreyer Honors College during the summer after their sophomore year and complete their junior and senior years in the Honors Program. The program offers special opportunities for close interaction with faculty, access to special courses or sections of courses restricted to honors students, special academic and social programs through the Honors College office, the requirement of a research thesis, and the awarding of a degree of Bachelor of Science with Honors in Physics.

In order to earn honors in physics, students must:

- meet the standards of admission and retention in the honors program; and
- fulfill the requirements for a major in physics (any option) and earn an overall grade point average of 3.33 or higher in all physics, math, science and technical courses combined; and
- complete an honors thesis in physics under the supervision of a member of the physics faculty.

Try to start your research participation early in the junior year, or even before. A physics major planning to do thesis research in another department for honors in physics must first find a physics faculty member to act as co-adviser.

Students in the honors program may fulfill the required honors credits in the junior and senior years by participating in research and registering for PHYS 496H, arranging for an honors option in a physics 4xx course (PHYS 410, quantum mechanics, is a popular choice), or registering for an appropriate 5xx level Physics course. Additional information may be obtained from the director of the Schreyer Honors College (10 Schreyer Honors College Building) and from Physics Honors program advisers.

Brickwedde Prize for Undergraduate Research

The Langhorne H. Brickwedde Recognition Award for Excellence in Undergraduate Physics is open to all undergraduates. The prize includes a certificate, monetary award and engraving of the student's name on a plaque displayed near the Physics Department Office. Students need not be physics majors or in the Schreyer Honors College to be considered for this award. A student must:

- submit an independent physics research report (a copy of the signed honors thesis is appropriate) to the Physics Department on or before the last day of classes of the Spring semester; and
- ask the research adviser to send a letter of recommendation to the department office clearly indicating the student's role in the project and commenting on the insight and quality of the project. The letter is due on the last day of classes of the Spring semester.

Scholarships and the REU Program

The Department of Physics has funds to award Teas and Lane scholarships to outstanding students majoring in physics. All physics majors starting their junior or senior years are automatically considered for these awards and need not make any formal application. Awards are made only after a student has officially advanced to major status, most often covering the junior and/or senior years. The department also supports a number of students who participate in summer research, both from departmental scholarship funds and from a National Science Foundation grant for Research Experiences for Undergraduates (REU). Students interested in the PSU REU program should inquire in the department office early in the Spring Semester or consult the departmental web site for submission/deadline information.

Student Organizations

The Society of Physics Students (SPS) is open to all PSU students regardless of major. Members congregate informally in the undergraduate/graduate lounge in 219 Osmond Laboratory for studying, discussion and social interaction. Newer students can pick up useful information from more advanced students. SPS members typically hold meetings to hear talks by PSU faculty and distinguished visitors, and work on special projects. SPS also is starting to maintain a file of summer employment opportunities and sometimes arranges group visits to industrial employers or to a conference on undergraduate research. Inquire in the Physics Office for the names of current officers or visit the SPS lounge in 219 Osmond Lab and introduce yourself. Information on the Women in Science and Engineering (WISE) program can be obtained at www.equity.psu.edu/wise/index.html

Graduate studies

Physics majors interested in graduate studies can obtain information from Physics department faculty, from recent graduates, and from graduate school catalogs, most of which are now available on the web. The American Institute of Physics sponsored web site www.gradschoolshopper.com is a valuable resource for finding up-to-date information on graduate programs in both Physics and Astronomy. Many graduate schools require scores from the Graduate Record Examination (GRE) General (aptitude-verbal and mathematical) part and Subject (Physics) part. The scores are also required for application to the National Science Foundation (NSF) for fellowships for graduate studies.

- Students should determine in the junior year (typically the Spring semester) whether and when to register for the GRE. The GRE test (especially the Subject (Physics) exam) is then typically taken in the Fall of the senior year.
- Information on the GRE exam is available on the Educational Testing Service (ETS) website at www.ets.org
- Applications for admission to graduate studies in the Fall semester and for financial aid typically must be submitted in the preceding January or February. Applications for many graduate fellowship and scholarship programs have even earlier deadlines.

Recent PSU physics graduates have gone on to graduate and professional schools in such diverse areas as physics, astrophysics, engineering (electrical, mechanical, civil, nuclear, environmental), meteorology, mathematics, pharmaceutical chemistry, as well as medicine, law and theology. They have been admitted to graduate programs in Physics at such institutions as Caltech, Harvard, Cornell, MIT, Princeton, Chicago, Colorado, Stanford, Berkeley, The University of Pennsylvania, Columbia, University of Michigan, University of Virginia, University of Wisconsin-Madison, University of Illinois, University of Minnesota, Ohio State University, University of Washington, Northwestern, the Universities of California Santa Barbara and at San Diego, SUNY at Stony Brook, as well as the George Washington University Medical School, Princeton Theological Seminary, and Harvard Law School. Recent graduates have also gone to graduate study at Cambridge University (UK) and the Max Planck Institute (Germany).

Post-baccalaureate employment

In the second year, students should become acquainted with career information and are encouraged to visit the annual job fair sponsored by the Colleges of Science and Engineering to obtain information and make contacts for summer or permanent positions. At the beginning of the senior year, students should become acquainted with the facilities and services of the Career Development and Placement Office in Boucke (see inside cover for address) for career information, advising, and interviews with potential employers. Penn State hosts a Career Fair each Fall, with well over 400 companies visiting the Bryce Jordan Center and all undergraduate students in any major are invited to attend. Recent graduates have obtained jobs with firms/agencies such as Johns Hopkins Applied Research Lab, RF-Microdevices, IBM, Microsoft, 3M, Digital Semiconductor, Sprint Corporation, Bettis, Epic Systems, Applied Hydro-Acoustics Research (AHA), GlaxoSmithKline), NASA Huntsville, SAIC, R. L. Associates, NAVSEA/NAVAIR, Advanced Research Systems, Brookhaven National Laboratory, the Naval Research Laboratory, the National Security Agency (NSA), Naval Surface Warfare Center, The Applied Research Laboratory at PSU, US Patent Office, and Credit Suisse First Boston (New York City).

Weekly Physics Department Colloquia

Physics undergraduate majors and prospective majors are welcome to attend weekly Physics Department Colloquia. These are usually held on Thursday afternoons from 4:00PM - 5:00PM in 117 Osmond Lab. There is typically a social gathering beforehand, held in the second-floor Davey-Osmond overpass, with refreshments served. This is an excellent opportunity to meet faculty, postdoctoral research scholars, graduate students, and other undergraduate Physics majors.

Undergraduate Physics Major Listserve

Students interested in the Physics major or minor can ask to be added to the Physics Major listserv (ugphys-l@lists.psu.edu) and will receive email information about curricular changes, scholarships and fellowships, new courses, seminars and colloquia, career and job announcements, and other information targeted towards prospective Physics majors.

Typical Physics Course Offerings by semester

Course	Fall	Spring	Summer	Required by Major
001*	x	x	x	
211H	x			
211	x	x	x	x
212H		x		
212	x	x	x	x
213/214	x	x	x	x
237H		x		
237	x	x		x
250**	x	x	x	
251**	x	x	x	
296 (research)	x	x	x (by appt.)	
400	x	x		x
402		x		
406		x		
410	x	x		x
411	x			
412	x			
419	x	x		x
420	x	x		x
443	x (often even years)			
444		x		x
457W	x	x		x
458	x			
461		x (see below)		
479		x		
496 (research)	x	x	x (by appt.)	

Graduate level 5xx courses are open, with restrictions, to undergraduates.

* Course not intended for Physics majors (liberal arts survey course)

** Course not intended for Physics majors (algebra-based sequence for life science majors)

Note: PHYS 479 and PHYS 461 are cross-listed with MATH 479 and MATH 461 respectively.

GENERAL PHYSICS OPTION COURSE CHECKLIST

GENERAL⁺

Course	Cr	Sem	Grade	Course	Cr	Sem	Grade
ENGL 15/30	3	_____	___	Arts (GA)			
ENGL 202C	3	_____	___	_____	3	_____	___
CAS 100	3	_____	___	_____	3	_____	___
FYS ⁺⁺	1	_____	___	Humanities (GH)			
Health/Phys Act. (GHA)	3 total			_____	3	_____	___
_____		_____	___	_____	3	_____	___
_____		_____	___	Social Sciences (GS)			
_____		_____	___	_____	3	_____	___
Natural Sciences (GN)				_____	3	_____	___
CHEM 110	3	_____	___ *	Electives (See program list)			
CHEM 111	1	_____	___	_____	3	_____	___
CHEM 112	3	_____	___	_____	3	_____	___
CHEM 113	1	_____	___	_____	3	_____	___
_____	3	_____	___	_____	3	_____	___

MATH & PHYSICS

MATH 140	4	_____	___ *	PHYS 237	3	_____	___ *
MATH 141	4	_____	___ *	PHYS 400	3	_____	___ *
MATH 220	2	_____	___	PHYS 410	4	_____	___ *
MATH 230	4	_____	___	PHYS 419	3	_____	___ *
MATH 251	4	_____	___	PHYS 420	3	_____	___
MATH 405	3	_____	___	PHYS 444	2	_____	___
MATH 406	3	_____	___	PHYS 457W	3	_____	___ *
PHYS 211	4	_____	___ *	PHYS 402 or			
PHYS 212	4	_____	___ *	458	4	_____	___
PHYS 213	2	_____	___ *	PHYS 4__	3	_____	___ +++
PHYS 214	2	_____	___ *	PHYS 4__	3	_____	___

OTHER COURSES

Take one from CMPSC 101, 102, 121, 200, 201, or 202 3 _____ ___

* A grade of "C" or better is required in this course for graduation.

+ You must include 3 credits **each** of US Cultures (US) **and** International Cultures (IL) courses to meet diversity requirements, many of which are cross-listed with GA, GS, or GH courses).

++ First Year Seminar. (The Physics FYS is offered in Spring semester; see page 3.)

+++ Up to 3 credits of PHYS 496 (research) may be used here as well as **ONE** of the following courses: ASTRO 410, 440, or 485. In addition, either of PHYS 402 or 458, whichever is not already being used as a 4xx lab course requirement, may also be used here.

ELECTRONICS OPTION COURSE CHECKLIST

				GENERAL ⁺			
Course	Cr	Sem	Grade	Course	Cr	Sem	Grade
ENGL 15/30	3	_____	___	Arts (GA)			
ENGL 202C	3	_____	___	_____	3	_____	___
CAS 100	3	_____	___	_____	3	_____	___
FYS ⁺⁺	1	_____	___	Humanities (GH)			
Health/Phys Act (GHA)	3 total			_____	3	_____	___
_____	_____	_____	___	_____	3	_____	___
_____	_____	_____	___	Social Sciences (GS)			
_____	_____	_____	___	_____	3	_____	___
Natural Sciences (GN)				_____	3	_____	___
CHEM 110	3	_____	___ *	Electives (See program list)			
CHEM 111	1	_____	___	_____	3	_____	___
CHEM 112	3	_____	___	_____	3	_____	___
CHEM 113	1	_____	___				
_____	3	_____	___				

MATH & PHYSICS

MATH 140	4	_____	___ *	PHYS 213	2	_____	___ *
MATH 141	4	_____	___ *	PHYS 214	2	_____	___ *
MATH 220	2	_____	___	PHYS 237	3	_____	___ *
MATH 230	4	_____	___	PHYS 400	3	_____	___ *
MATH 251	4	_____	___	PHYS 410	4	_____	___ *
MATH 405	3	_____	___	PHYS 412	3	_____	___
MATH 406	3	_____	___	PHYS 419	3	_____	___ *
PHYS 211	4	_____	___ *	PHYS 420	3	_____	___
PHYS 212	4	_____	___ *	PHYS 444	2	_____	___
				PHYS 457W	3	_____	___ *

OTHER REQUIRED COURSES

EE 210	4	_____	___	CSE or EE (See list in Bulletin or p. 20.)			
EE 350	4	_____	___	_____	3	_____	___
EE 310	4	_____	___	CMPEN 271 [§]	3	_____	___
EE 320, 367 or 311	3	_____	___				

OTHER COURSES

Take one from CMPSC 101, 102, 121, 200, 201, or 202[^] 3 _____

* A grade of "C" or better is required in this course for graduation.

+ You must include 3 credits **each** of US Cultures (US) **and** International Cultures (IL) courses to meet diversity requirements, many of which are cross-listed with GA, GS, or GH courses.

++ First Year Seminar. (The Physics FYS is offered in Spring semester; see page 3.)

[^] For students considering EE as a major, consult an EE advisor to see which is best.

[§] Or take the four credit version with lab, temporarily labeled CSE 297A

TEACHING OPTION COURSE CHECKLIST

Students in this option must also be admitted to the College of Education and meet additional requirements.

Contact the College of Education no later than your second semester for further information.

GENERAL⁺

Course	Cr	Sem	Grade	Course	Cr	Sem	Grade
ENGL15/30	3	_____	_____	Arts (GA)			
ENGL 202C	3	_____	_____	_____	3	_____	_____
CAS 100	3	_____	_____	_____	3	_____	_____
FYS ⁺⁺		_____	_____	Humanities (GH)			
Health/Phys Act (GHA) 3 total				_____	3	_____	_____
_____		_____	_____	Lit course ^{\$}	3	_____	_____ **
_____		_____	_____				
Natural Sciences (GN)							
CHEM 110	3	_____	_____ *	Social Sciences (GS)			
CHEM 111	1	_____	_____	PSYCH 100	3	_____	_____ **
CHEM 112	3	_____	_____	HDFS 239 [#]	3	_____	_____ **
CHEM 113	1	_____	_____				
BIOL 110 ⁻⁻	4	_____	_____				
				MATH & PHYSICS			
				MATH 140	4	_____	_____ *
				MATH 141	4	_____	_____ *
				MATH 220	2	_____	_____
				MATH 230	4	_____	_____
				MATH 251	4	_____	_____
				MATH 405	3	_____	_____
				MATH 406	3	_____	_____
				PHYS 211	4	_____	_____ *
				PHYS 212	4	_____	_____ *
				OTHER REQUIRED COURSES			
CI 295	2	_____	_____ **	SCIED 411	3	_____	_____ **
CI 412W	3	_____	_____ **	SCIED 412	3	_____	_____ **
CI 495C	3	_____	_____ **	EDPSY 014	3	_____	_____ **
CI 495E	15	_____	_____ **	EDTHP 115	3	_____	_____ **
				EDTHP 4xx	3	_____	_____ **

* A grade of "C" or better is required in this course for graduation.

** A grade of "C" or better is required for certification.

+ You must include 3 credits **each** of US Cultures (US) **and** International Cultures (IL) courses to meet the general diversity requirements, many of which are cross-listed with GA, GS, or GH courses.

++ First Year Seminar. (The Phys FYS is offered in Spring semester; see page 3.)

-- BIOL 011 (3) and 012 (1) may also be used. BIOL 110 (BIOL 011/012) is offered at UP in Fall (Spring) semesters.

This requirement can also be satisfied by taking EDPSY 421 (3) or PSYCH 426 (3), but HDFS 239 counts for GS.

\$ See list of possible courses at <http://www.ed.psu.edu/edservices/certification/lit.asp>

For additional certification requirements, see http://www.ed.psu.edu/edservices/certification/ent_criteria.asp

General Physics Option Schedule (sample)

Suggested Schedule by Semester (124 credits)

<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
AHS elective 3 ↔	ENGL 15/30 3	AHS elective 3	CAS 100 3
CHEM 110 3	CHEM 112 3	Programming 3	AHS elective 3
CHEM 111 1	CHEM 113 1	MATH 251 4	MATH 220 2
MATH 140 4	MATH 141 4	PHYS 213 2	MATH 230 4
PHYS 211 4	PHYS 212 4	PHYS 214 2	PHYS 237 3
	FYS* 1	GHA elective 1.5	
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
15	16	15.5	15

<u>5th</u>	<u>6th</u>	<u>7th</u>	<u>8th</u>
AHS elective 3	PHYS 420 3	PHYS 458 4 +	Physics elec 3
GN elective 3	PHYS 410 4	or	
MATH 405 3	MATH 406 3	Physics elec 3 +	PHYS 402 4
PHYS 400 3	PHYS 444 2		
PHYS 419 3	elective 3	ENGL 202C 3	elective 3
	GHA elective 1.5	elective 3	PHYS. 457W 3
		AHS elective 3	elective 3
		Physics elec. 3	AHS elective 3
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
15	16.5	15-14	15-16

AHS = Arts (GA), Humanities (GH), or Social Science (GS) elective

S/T = Science or Technology elective.

GN = Natural Science elective.

*The Physics FYS (PSU 016 SCI FYS, Physics Sec 350) is only offered in Spring semester.

↔ means that one can freely switch the order of these two choices.

“Programming” refers to the CMPSC 101, 102, 121, 200, 201, or 202 requirement, and can be taken earlier in the curriculum if desired and subject to course availability.

Electronics Option Schedule (sample)
Suggested Schedule by Semester (132 credits)

<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
AHS elective 3 ↔	ENGL 15/30 3	CMPEN#271 3	CAS 100 3
CHEM 110 3	CHEM 112 3	Programming 3	EE 210 4
CHEM 111 1	CHEM 113 1	MATH 251 4	MATH 220 2
MATH 140 4	MATH 141 4	PHYS 213 2	MATH 230 4
PHYS 211 4	PHYS 212 4	PHYS 214 2	PHYS 237 3
	FYS* 1	AHS elective 3	
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
15	16	17	16

<u>5th</u>	<u>6th</u>	<u>7th</u>	<u>8th</u>
AHS elective 3	PHYS 410 4	PHYS 412 3	PHYS 420 3
MATH405 3	PHYS 400 3	ENGL 202C 3	Option elec ⁺ 3
PHYS 419 3	MATH406 3	AHS elective 3	AHS elective 3
EE 350 4	EE 310 4	Option elec ⁺ 3	Elective 3
GHA elective 1.5	PHYS 444 2	AHS elective 3	GN Elective 3
Elective 3		GHA elective 1.5	PHYS 457W 3
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
17.5	16	16.5	18

AHS = Arts (GA), Humanities (GH), or Social Science (GS) elective

GN = Natural Science elective

+ Select 3 credits from EE 311(3), 320(3), or 367(3)

+ Select 6 credits from CSE 312(3), 412(3), 447(3), 471(3), 477 (3), EE 412(3), 413(3), 414(3), 418(3), 419(3), 420(3), 432(3), 438(3), 453(3), 459(3), 485(3)

* The Physics FYS (PSU 016 SCI FYS, Physics Sec 350) is only offered in Spring semester.

Some CSE courses are closed to non-CSE majors. Physics majors pursuing this option are allowed to schedule these CSE courses, but may require special permission. Consult your academic advisor. Note that the CMPEN/CSE program is in the process of changing their curriculum, adding a lab to this course, so please consult your advisor.

↔ means that one can freely switch the order of these two choices.

“Programming” refers to the CMPSC 101, 102, 121, 200, 201, or 202 requirement.

Medical Physics Option Schedule (sample)

Suggested Schedule by Semester (123-125 credits)

<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
AHS elective 3 ↔	ENGL 15/30 3	AHS elective 3	AHS elective 3
CHEM 110 3	CHEM 112 3	BMB 251 3	BIOL 141 3
CHEM 111 1	CHEM 113 1	or	or
MATH 140 4	MATH141 4	BIOL 110 4	BIOL 240W 4
PHYS 211 4	PHYS 212 4	MATH 251 4	PHYS 237 3
	FYS* 1	PHYS 213 2	MATH230 4
		PHYS 214 2	CAS 100 3
		GHA elective 1.5	
15	16	15.5-16.5	16-17

<u>5th</u>	<u>6th</u>	<u>7th</u>	<u>8th</u>
BIOE elective 3	BIOE elective 3	BIOE elective 3	
or	or	or	elective 3
CHEM 210 3	CHEM 212 3	CHEM 213 2	elective 3
MATH 405 3	MATH406 3	AHS elective 3	AHS elective 3
PHYS 400 3	PHYS 419 4	PHYS 410 4	PHYS 420 3
AHS elective 3	PHYS 444 2	ENGL 202C 3	PHYS 457W 3
MATH 220 2	elective 3	elective 3	
GHA elective 1.5			
15.5	15	15-16	15

AHS = Arts (GA), Humanities (GH), or Social Science (GS) elective

* The Physics FYS (PSU 016 SCI FYS, Physics Sec 350) is only offered in Spring semester.

↔ means that one can freely switch the order of these two choices.

The BIOL 110 or BIOL 141 courses count towards the GN requirements.

Acoustics Option Schedule (sample)
Suggested Schedule by Semester (124 credits)

<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
AHS elective 3 ↔ ENGL 15/30 3	AHS elective 3	CAS 100 3	
CHEM 110 3	CHEM13 3	Programming 3	AHS elective 3
CHEM 111 1	CHEM 15 1	MATH 251 4	MATH 220 2
MATH 140 4	MATH141 4	PHYS 213 2	MATH 230 4
PHYS 211 4	PHYS 212 4	PHYS 214 2	PHYS 237 3
	FYS* 1	GHA elective 1.5	
15	16	15.5	15

<u>5th</u>	<u>6th</u>	<u>7th</u>	<u>8th</u>
AHS elective 3	PHYS 410 4	ENGL 202C 3	PHYS 402 4
MATH405 3	PHYS 420 3	elective 3	Option elec ⁺ 3
PHYS 400 3	MATH406 3	AHS elective 3	elective 3
PHYS 419 3	AERSP308 3	Option elec ⁺ 3	GN elective 3
PHYS 443 ⁺⁺ 3	PHYS 444 2	AHS elective 3	PHYS 457W 3
		GHA elective 1.5	
15	15	16.5	16

AHS = Arts (GA), Humanities (GH), or Social Science (GS) elective

GN = Natural Science elective

+ Select 9 credits from AE 458(3), ACS 402(3), AERSP 412(3), CMDIS 430(3), EE 459(3), E MCH 412(3), ME 458(3), Phys 412(3)

* The Physics FYS (PSU 016 SCI FYS, Physics Sec 350) is only offered in Spring semester.

++ Phys 443 is typically offered in Fall semesters of *even* years: it was offered in Fall 2002, 2004, and 2006.

↔ means that one can freely switch the order of these two choices.

“Programming” refers to the CMPSC 101, 102, 121, 200, 201, or 202 requirement.

Teaching Option Schedule (sample)

Suggested Schedule by Semester (136 credits)

Students in this option must also be admitted to the College of Education and meet additional requirements. **If you are interested in this option, contact the College of Education no later than your second semester for further information.** (The CI 495E course taken during the 9th semester is the student teaching experience.)

<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
PSYCH 100 [@] 3 ↔	ENGL 15/30 3	BIOL 110 ⁺ 4	EDTHP 115 3
CHEM 110 3	CHEM 112 3	MATH220 2	EDPSY 14 3
CHEM 111 1	CHEM 113 1	MATH251 4	CI 295 2
MATH 140 4	MATH141 4	PHYS 213 2	MATH 230 4
PHYS 211 4	PHYS 212 4	PHYS 214 2	PHYS 237 3
	FYS* 1	Literature [§] 3	
<hr style="width: 50px; margin-left: auto;"/>	<hr style="width: 50px; margin-left: auto;"/>	<hr style="width: 50px; margin-left: auto;"/>	<hr style="width: 50px; margin-left: auto;"/>
15	16	17	15

<u>5th</u>	<u>6th</u>	<u>7th</u>	<u>8th</u>
AH** elective 3	SCI411 3	SciEd 412 3	AH** elective 3
HDFS 239 [@] 3	MATH406 3	CI 495C 3	EDTHP 4xx 3
MATH405 3	PHYS 419 3	CI 412W 3	AH** elective 3
PHYS 400 3	PHYS 444 2	PHYS 457W 3	PHYS 410 4
CAS 100 3	GHA elective 3	ENGL 202C 3	PHYS 420 3
<hr style="width: 50px; margin-left: auto;"/>	<hr style="width: 50px; margin-left: auto;"/>	<hr style="width: 50px; margin-left: auto;"/>	<hr style="width: 50px; margin-left: auto;"/>
15	14	15	16

<u>9th</u>
CI 495E 15
<hr style="width: 50px; margin-left: auto;"/>
15

AH** = GA or GH electives, while @ labels PSYCH 100 and HDFS 239 as the required GS electives.

⁺ BIOL 011 (3) and BIOL 012 (1) may also be used. They are offered at the UP campus in Spring semesters, while BIOL 110 is only offered in the Fall.

[§] Literature requirement for certification; see <http://www.ed.psu.edu/edservices/certification/lit.asp>

* The Physics FYS (PSU 016 SCI FYS, Physics Sec 350) is only offered in Spring semester.

↔ means that one can freely switch the order of these two choices.

For certification requirements, see http://www.ed.psu.edu/edservices/certification/ent_criteria.asp

The SCI412, CI 495C, and CI 412W are taken as a 'block' and must be completed before Student Teaching (CI 495E) and can be taken in the 8th semester. Consult the College of Education.

Departmental Program Lists

Students in the General and Medical Physics (Acoustics and Electronics) options may select 12 (6) elective credits from the Departmental Program list. Students may select such supporting courses from nearly the entire range of PSU course offerings with the exception of the following courses which may **NOT** be used under 'program list electives'.

ASTRO 001-199
BI SC
BBH 001-299
CAS 004
CSD 100, 101
CHEM 001, 002, 006, 011
ENGL 004, 005
KINES 001-140
LL ED
MATH 001-200
PHYS 001, 150, 151, 250, 251

All engineering courses labeled 'Technology', including AE T, BE T, CE T, CMPET, EE T, EMET, EG T, ET, IE T, MFET, MAT T, ME T, MCH T, and SE&T courses, are **not** allowed.

Note that many courses in physics (beyond those already required in a specific option) are included in this list, as are credits for CO-OP experiences (SC 295, 395 or 495.) For the General Physics Option, a maximum of 6 of the 12 credits may be from PHYS 496 (Research), while a maximum of 9 credits may be from SC 295, 395, or 495. For all other options, a maximum of 6 credits of SC 295, 395, and 495 or PHYS 496 are allowed. A maximum of six (6) credits in ROTC courses (ARMY, AIR, NAVSC, etc.) are also allowed in the electives for the Acoustics, Electronics, Medical, and General Options.

Note also that one additional 4xx level MATH course is all that is required to obtain a Math minor in all Physics options, and it can be used as such a 'Program List' elective.

Comments on options within the Physics major

General option:

- The General option has the most required Physics courses, but also the most free electives (12 credits)
- It is generally the one used by students who are planning a concurrent major with Physics as their second major and by most students in Physics who are double-majoring with another field (except for EE).
- This option is typically the one used by students who are preparing for graduate study in Physics as it gives the most freedom to take additional Physics coursework and research credits.

Electronics option:

- This elective has fewer free electives (only 6) than the General option, and requires a larger total number of credits.
- It has the most overlap with students who are interested in pursuing a concurrent degree with EE.
- The CMPEN 271 course required for this option is controlled and students should contact their academic advisor in Physics about how best to schedule that course. The CMPEN 271 course is under revision by the CSE program, eventually requiring registration in a lab component.

Teaching option:

- This option has the largest number of credits of any of our options, due to the required coursework within the College of Education.
- Entry to major in this option requires approval by the College of Education, and many non-coursework requirements (such as PRAXIS tests, volunteer and diversity experiences) so please consult with your Physics academic advisor about making appropriate contacts with advisors in the College of Education regarding these very important additional requirements.
- Entry to major in this option requires a higher overall GPA than in any other Physics option (at least a 3.00 cumulative GPA, mandated by the Commonwealth of PA)
- Students may also be required to take SPLED 400 or demonstrate competence regarding special education issues.
- The SCIED 412, CI 495C and CI 412W courses are taken as a block in a single semester, requiring the M-F 8:00 – 1:00 time slot, and must be taken before the student teaching semester (CI 495E). Consult with the College of Education.

Medical Physics:

- This option has two tracks, one more relevant for students interested in applying for medical school, and one more useful for students interested in bioengineering.
- Students interested in pursuing graduate training in medical physics can often obtain the necessary coursework within the General Physics option by carefully choosing free electives, as well as relevant Physics coursework.

Recent (and proposed) changes for students starting in the Summer/Fall 2007

- The introductory Chemistry sequence (formerly labeled as CHEM 012, 013, 014, and 015) has been renumbered as CHEM 110, 111, 112, and 113.
- The sophomore/junior organic chemistry sequence has also been renumbered, with the following identifications: CHEM 036/038/039 CHEM 213/210/212.
- The introductory psychology course formerly known as PSY 002 is now numbered PSYCH 100; several higher level PSY courses are now numbered with the PSYCH label, but with no change in number.
- The CSE 103 course allowed for the programming requirement has been replaced by CSE 121. The Physics Department will request that this new course be allowed to fulfill the programming requirement.
- PHYS 479 (Special and General Relativity) has been approved as an official course, as of Spring 2007. It's also cross-listed with MATH 479, and hence useful in completing the requirements of a Math minor. This is a senior level elective, which has significant PHYS and MATH prerequisites.

Changes in the Physics major/minor for students starting in Summer/Fall 2006

- Phys 410 is a 'C or better' requirement for all options within the Physics major.
- The medical physics option has been streamlined to have two tracks, one focusing on preparation for medical school and/or medical physics, and one focusing on bioengineering applications. The track involving bioengineering courses still leads to a BIOE minor.
- The Teaching Option has been streamlined somewhat as well, with the removal of the SCIED 410 and STS 200 requirements.
- Students in the General Option can use **ONE** of three Astronomy and Astrophysics courses (ASTRO 410, 440, or 485) as ONE of the PHYS 4xx level electives. This is generally suggested only for students who have already taken ASTRO 291 and 292 and are considering a minor or concurrent (double) major in Astronomy/Astrophysics.
- PHYS 444 is now offered in the Spring semester, and juniors are encouraged to take it in that semester. This course provides information on "...*modern research topics and career opportunities in Physics, employment, graduate education, and tailoring the physics curriculum to meet career goals.*" Students typically only need to have taken one 4xx level PHYS course as a pre-requisite.
- EE 330 can now be used in place of PHYS 400 as the E&M requirement for the Physics minor. Students double majoring in a program which requires EE 330 can petition to have it used for PHYS 400 in the Physics major by petition. Students in Engineering Science and Mechanics can petition the use of ESC 400H for this requirement as well.