Physics Advising FAQ **The University of Texas at Austin**

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(1) Should I take the M408C/D sequence or the Math 408N/S/M sequence?

Physics is heavily based on mathematics. The Math 408N/S/M sequence was devised for majors that do not rely so much on math. If you want to be a physics major there is no real way around this: take the real math sequence and find out early if you should be a physics major. If you are hosed by M408C, it only gets harder.

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(2) Do I really need credit for a semester of calculus (M408C or M408N) to take PHY301?

Basically, yes, or at least you need to have had some solid exposure to calculus. As noted in the previous question, physics is heavily based on mathematics and this math essentially starts with calculus. While we sometimes grant an exception and allow students to take the calculus and physics classes concurrently, this is generally not ideal. The students who are successful in this combination are greatly outnumbered by those who end up dropping the physics class and having to retake it. We may say yes if you are persistent, but it is probably not a good idea.

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(3) So, if I come in and don't have the math to start in PHY301 but am interested in physics, what can I do?

Take PHY110C. This is a one semester credit hour seminar intended for new physics majors. The aim is show students some things that are going in physics today and provide some motivation for grinding through the early courses in the major sequence. That and you can work really hard in your math class.

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(4) I took PHY303K/L since I started out as an engineering major before switching to physics. Do I need to go back and take PHY301/316?

No. Any calculus based introductory sequence will satisfy the prerequisite for waves. We don't make students go back and retake courses that are similar in level and content.

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(5) What about the prerequisite of M427J for PHY315?

It is helpful to have had differential equations (M427J) before waves (PHY315), hence the prerequisite. However, you typically get enough differential equations early in the course to see you through waves. This is recognized by the waves instructors who will usually allow students to take these classes at the same time. But, this decision ultimately falls to the instructor of the waves class. So, ask them before you register. This prerequisite will be relaxed to a co-requisite in the next Undergraduate Catalog.

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(6) When should I take PHY355, Introduction to Modern Physics?

You can take 355 anytime after you complete the 301/316 sequence. In particular, you can take it at the same time as waves (although waves is the prerequisite for the junior level courses 336K, 352K and 373, so don't take modern before waves unless you need to catch up on your math).

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(7) Do I need to take Modern and Modern Lab at the same time?

No, in fact you probably don't want to. You can take Modern and leave the lab for a later semester, for example if you want to take Modern and waves at the same time. However, you don't want to leave the Modern lab too late: many faculty see Modern lab as a minimum for starting work in a research lab. And you absolutely don't want to take the lab *before* the lecture.

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(8) What about the prerequisite of PHY336K for PHY373?

This is similar to the M427J/PHY315 question: it is helpful to have had classical dynamics (PHY336K) before quantum (PHY373), hence the prerequisite. However, you typically get see what you need in 336K early enough for you to be ready for quantum. This is recognized by the quantum instructors who will usually allow students to take these classes at the same time. But, this decision ultimately falls to the instructor of the quantum class. So, ask them before you register.

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(9) What about the order of quantum II and III?

You can take quantum II and III at the same time or even out of order. There are only a few topics, angular momentum coupling, for example, that are covered in II that are used heavily in III, and these tend to be covered again in III. It is helpful to have seen them before, but not essential.

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(10) What upper division math courses are the best?

Here answers may vary. Linear algebra finds wide application in dynamics, both classical and quantum, but you can pick up quite a bit of it in your physics classes. Probability is used extensively in quantum mechanics and statistical mechanics, although again much of what you need is covered in the physics classes. Likewise the complex variables class tends to develop techniques used widely in physics, and may be a bit harder to pick up in physics classes. The partial differential equations course is also worth consideration.

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(11) What about physics electives?

Try to find time to take a couple. The list includes PHY329 Computational Physics, PHY333 Optics, PHY336L Fluid Dynamics, PHY345 Biophysics, PHY375P Plasma, PHY375R Relativity, and PHY375S Solid State. Some of these are offered every year (PHY329, PHY333, PHY345, PHY375S), some we intend to try to offer once every two years (PHY336L, PHY375R), and some, well you can hope (PHY375P).

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(12) How many upper division physics can I take in any one semester? What are the approximate levels of relative difficulty?

At some point, you will need to have semesters in which you take 2 or 3 physics classes if you want to finish in a timely manner and maybe have time for an elective or two. 4 physics classes in one semester is a seriously heavy load even for very good students. With some difference of opinion, the hardest classes in the major are PHY352K and PHY336K. Next are PHY362K and L, and PHY353L. PHY353L, the modern physics lab, makes this list because the lab reports take time. Not far behind on the next level are PHY373, PHY369, and PHY355.

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(13) What if I want to major in physics, but am pretty sure that I don't want to go to graduate school?

There are a number of very good options as a physics major. First, take a look in the Undergraduate Catalog at the physics degree options. Several of these, like radiation physics, spaces sciences and computational physics are geared towards students who would like to stop with a bachelors degree and then look for a job. Students doing the radiation physics option in particular have historically seen good prospects after they finish their degree. Another attractive option is the UTeach program. Physics is now required for all Texas high school students and there are not nearly enough teachers with appropriate training so they will be in demand for jobs all over the state. Physics majors interested in teaching are also eligible for many different large scholarships.

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(14) What looks better on an application to graduate school, more high level classes in physics, math or astronomy, or research experience?

This depends somewhat on the field you are interested in. If you are interested in experiments, research experience is a big plus. One reason is that it likely means you will have at least one strong, knowledgable letter of recommendation. That is assuming you *did* something. A second reason is that the experience means you have a clue about research in experimental physics is actually like. i.e., long, soul-sapping periods of frustration, followed, hopefully, by brief periods of joy when things actually work, then back to step one. Rinse and repeat. If you are interested in theory, there is another branch in the answer. If you are interested in calculations or modeling of physical phenomena, the answer is close to that above for experiment. You can do legitimate research as an undergrad, and this is a plus. If you interested in pure theory, it is harder to do something 'real' as an undergrad and you may be better off taking advanced physics or math courses.

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(15) How about a double major?

If you just want to beef up your resume, it is probably not worth it. You would be better off getting involved in a research project, for example. Or simply concentrating more and doing better in the core physics courses may be a better choice. If it something you are genuinely interested in that is a different matter. For example, some physics students like math. Since, the physics degree requires quite a bit of math to start with, if you interested in math it doesn't take too many more math courses to get a second degree. In this case a double major may make sense. It is likewise not too much of a stretch to do the physics-astronomy double for the same reason. Do a physics-engineering double major essentially requires an additional year just because of the sheer number of courses.

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(16) What if I want to major in physics, but want to go to graduate school in engineering? Or business? Or law? Or medicine?

A number of students each year finish a physics degree and go to graduate school in something other than physics. With a limited data set, this appears to be eminently workable and even to offer certain advantages. It is, for example, much easier to go to graduate school in engineering with a degree in physics than the reverse. Somehow it seems that a strong math background and a rigorous, rational, model-based approach to problem solving appeals to engineering departments. Who would have figured? You scored 160 on your LSAT and can do fractions? Sign here.

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(17) I am worried about the time and financial commitment of graduate school. Should I be?

Yes and no. Going to any graduate school is definitely a time commitment. The subject should be something that you are really interested in. However, graduate studies, in the sciences at least, are almost always supported by the school you attend either as a teaching assistant, a research assistant, or a combination of the two. Positions of this type typically include paid tuition. You are not likely to end up with any money in the bank when you finish grad school, but you are also unlikely to incur any additional debt (this is *not* true of law, medical or business school).

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(18) How do I go about getting started doing some research? At what point in my undergraduate career can I start?

Do a little homework to investigate what you find interesting. Attend the pizza seminars. Ask your classmates about their experiences and then go and ask some professors. Sooner rather than later. What's the worst that can happen? We say no. So what? This will be expanded in the next version of this document.

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(19) The book says I need PHY338K Electronic Techniques to take Senior Lab. Senior lab is required for most degree options, but Electronics is not. What gives?

In practice, you do not need Electronic Techniques to take Sr. Lab, and the language should really say recommended. It just takes some time to fix these things. The Sr. Lab instructors know this.

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(20) The course catalog says that students taking Senior Lab should enroll in no more than one other Tuesday-Thursday class? Is this for real?

Yes, and the Senior Lab instructors take a hard line on this issue. You need actual time in the lab to do many of the experiments and if you are dropping out to go to a class it is a major interruption. So, plan your schedule accordingly.

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(21) Can I get credit for PHY474 Advanced (or Senior) Lab by doing research in a lab at UT? By doing an REU?

Old answer: Generally, no. Senior lab is designed to provide students the opportunity to do a couple of fairly advanced experiments at a fairly sophisticated level. This opportunity will likely not ever come again. The faculty are in agreement that this should be a firm requirement. A limited number of students each year can get credit for Sr. Lab by going to Germany for a summer and working in a lab there. Professor Fink coordinates this and you should see him early in the Fall if you think you might want to do this the following summer.

Current answer: One consequence of the recent growth in the number of undergraduate physics majors has been the overloading of the capacity of our advanced lab course PHY474 (the Senior Lab). Because of the nature of the lab, an increase in the number of seats would require either a fundamental change in the format of the lab or a substantial increase in resources (space, equipment and people) devoted to the lab.

This memo outlines physics department policy on what will be accepted in order to substitute an alternative course for senior lab.

Specifically, the student must demonstrate substantial involvement in physics related work, for example by taking PHY370C, PHY670 or PHY379H, meeting three conditions:

- the work must be done under the supervision of a physics faculty member or an individual outside the physics faculty approved by the undergraduate adviser. The scope and topic of the project must be approved in advance by the undergraduate adviser;
- the work must involve the acquisition and analysis of data by the student. Note that this data would generally be from experiments but can be generated from a computer modeling project. A purely theoretical project will not be acceptable;
- the results of the work must be presented in tangible form, either a detailed written report (such as a senior thesis or a comparable report), or as a poster presented at the CNS undergraduate research forum held each spring.

Note that this process will allow for a petition to substitute an alternative course for PHY474. This will apply even if the substituted course is only 3 credit hours.

However, the writing flag requirement that is normally covered for physics students by taking PHY474 must be satisfied in some other way.

REU's (Research Experience for Undergradutes - an NSF sponsored program supported at many universities), or other research experiences (e.g., summer intern positions at a national lab) will not be accepted for a substitution for 474. You need an actual course to make the substitution.

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(22) What are the requirements for a thesis?

Basically, some type of independent study on a topic suitable for a report. These reports are typically 20-30 pages long. I have a stack of examples in my office available for inspection. There are a couple of course numbers, one of which needs to be taken in the semester that you submit the thesis. The thesis does not have to be original research (it could be a literature review, for example) although it usually is. The work is done under the supervision of a physics faculty member or someone outside the Department that is approved in advance by me. The topic is one that is mutually agreed on by you and the supervisor (and also signed off on by me, but I have never said no).

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(23) How do I claim credit for AP or other placement exams?

You may view scores and claim credit for placement exams (AP, SAT II, CLEP, UT Austin tests, etc.) online through the Center for Teaching and Learning. Click on "View Scores and Claim Credit." You will need to log in with your UT EID and password. Once logged in, you may view placement test scores that the University has on file for you and any credit you are eligible to claim. Please read all directions carefully before claiming credit as there are fees involved and your choices affect your official academic record. If you have questions, contact CTL at (512) 232-2662.

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(24) I want to take some courses at my local community college. Where can I find out if these courses transfer?

The ATE system provides UT Austin transfer credit evaluations for courses commonly transferred from Texas colleges and universities. You may review this database for information about how courses will transfer to UT.

You may request advance transfer credit evaluations for courses taken at institutions outside of Texas by completing a Pre-Evaluation Form. Please contact Admissions for more information.

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