

Physics Department FAQs for First-Years, Fall 2020

Whom can I contact if I have questions about the Physics Department and Physics courses?

Your first points of contact in the Physics Department are the Co-Directors of Undergraduate Study (DUSs). You are welcome to contact them at any time with questions.

Prof. Howard Georgi: hgeorgi@fas.harvard.edu

Office hours: <http://www.people.fas.harvard.edu/~hgeorgi>

Dr. David Morin: djmorin@fas.harvard.edu

Office hours: http://www.people.fas.harvard.edu/~djmorin/office_hours.htm

(Details for access will be periodically emailed to the SPS email list; see next item.)

How do I receive information and announcements from the Physics Department?

The Physics Dept sends all undergraduate-related announcements to the Society of Physics Students (SPS) email list. Every student interested in physics should sign up for this list.

Instructions for doing so are here: <https://lists.fas.harvard.edu/mailman/listinfo/sps-list>.

(Don't forget to reply to the confirmation email you will receive after signing up!)

How do I get involved with the Society of Physics Students (SPS)?

The SPS has many activities throughout the year, ranging from academic to social. Keep an eye on the SPS email list (previous item) for announcements. There is no need to officially join the society. Although we do have official board members, everyone else on the SPS email list is in the group by default. If you have any suggestions for new events, by all means contact the SPS board (listed on their website <http://www.hcs.harvard.edu/~physics>), and also contact Prof. Georgi and Dr. Morin.

What is the booklet, "The SPS Guide to Physics and Related Fields"?

This is a wonderfully informative booklet written by Physics undergraduates 25 years ago and updated each year by the current SPS board members. An electronic version is posted at the top of the Undergraduate page of the Physics Department's website:

<https://www.physics.harvard.edu/undergrad>. It is also posted on the SPS website. The booklet contains all sorts of useful information on courses, research, and general tips on studying physics at Harvard.

Does the Physics Department have a mentoring system?

Yes, we have a system where younger students (first-years and sophomores) are grouped with a pair of older students (one concentrator and one graduate student). The younger students are then plugged into a wealth of knowledge on how to navigate physics courses and research, and college life in general. Keep an eye on the SPS email list for announcements on this.

Are there weekly events in the Physics Department that I can participate in?

Indeed there are. Keep an eye on the SPS email list. But some of the regular events are: Physics night (doing problem sets together on Wed night), Wed-evening physics seminars, Monday colloquia, and (in non-remote times) Monday colloquia lunches.

I am deciding between Phys 15a and 16. How should I choose?

Phys 15a covers roughly the same topics as an advanced high school course (although special relativity might not be covered in high school), but with a more in-depth treatment and with much harder problems, as you will soon discover. Phys 16 covers many new and more advanced topics, and with even harder problems.

You should look through all of the material that is available on the course websites, to see which class looks more suitable for you. There is no clear-cut criterion for deciding, but a major consideration is that of time. Phys 15a will take a substantial amount of time. But Phys 16 will take more.

If you think there is a reasonable chance (say, greater than $1/(2\pi) \cong 16\%$) that you will take Phys 16, then you should start out there. In the event that you wish to switch to Phys 15a, we promise to make the transition a hassle-free one. (Homework credit will be transferred. Just be sure to do either one of the homework sets in its entirety during the week that you switch.) Furthermore, if you are someone who is thinking of taking Phys 16, then the first few Phys 15a lectures will probably be mainly review, so you have little to lose by trying out Phys 16.

In deciding between two (or more) courses with different levels of difficulty, how can I be sure that I sign up for the right one?

In most cases, you can't. The best you can do is make an educated guess by reading the available materials (course catalog, course webpages, departmental documents, Q Guide, etc.) and by talking with your various advisors and also with students who have taken the courses. Then it comes down to shopping the possibilities. Sometimes there is simply no way to determine which course is the right one for you before seeing a few lectures of each. This is all the more true because even for a given course description and syllabus, two different professors might end up teaching significantly different versions of the same course. In the event of conflicting time blocks, it's generally best to start out by attending the higher-level course (for example, Phys 16 instead of Phys 15a) and then dropping to the lower one if the

workload is too much. But beware: courses invariably start off a little slow and then pick up the pace, so don't be fooled by an initial light workload. Also, if there is a possibility that you might switch into a course after a couple weeks, keep an eye on the assignments and other requirements.

Will Phys 19 be offered this year?

No, but it is expected to be offered in Fall '21.

I want to take three STEM courses (Math, Physics, Chem, Bio, EngSci, CompSci, Astro, etc.) in my first semester. Is this advisable?

This is the million-dollar question, and the answer is It's impossible to say, because the answer is so student-specific. Most students take two STEM courses in their first semester, but a few take three. (We're not counting STEM freshman seminars here, since seminars generally involve much less work than a standard class.) The answer depends on many things - your background in the various subjects, learning style, goals, extracurriculars, and so on. You are strongly encouraged to talk with your freshman advisor and Prof. Georgi and Dr. Morin about the particulars of your schedule, and see what works best for you. But one piece of advice: In your first semester, it's best to play it safe and not get in over your head. There will be plenty of time to get creamed in future semesters if you so desire. Courses invariably end up being more difficult than anticipated, but in the (extremely unlikely) event that you are completely bored because your schedule is too easy, you can simply ace all your courses and take time to dig deeper into the topics you find most interesting.

Can I be a Physics concentrator if I take Phys Sci 12 or App Phys 50?

Yes. You can take Phys 15b after 12a or 50a, or you can take Phys 15c if you've done both 12a/b or both 50a/b. In any case, be sure to talk with Prof. Georgi or Dr. Morin as soon as possible about developing a coherent overall plan of study.

Should I be worrying about my concentration as a first-semester freshman?

No! Instead, look broadly through the course catalog. Spend time getting excited about courses that you will be able to take in future years, and think about a plan to get the prerequisites. If you do this, a concentration will likely present itself naturally. But if you do have concerns (or even if not!), by all means discuss things with Prof. Georgi and/or Dr. Morin.

How should I make use of shopping week?

Looks over all the material posted on the Canvas sites for the courses you are interested in. Make use of any office hours that are listed, to ask whatever questions you may have and to get to know the instructor(s). You can still change your mind after courses start, but you won't have

time to do much more shopping, so the goal is to get as much information as you can beforehand.

Can I switch courses during the first week of classes?

The answer is a definite yes in the Physics Department, although some other departments (and certainly with capped/lottery courses) may be more restricted. Just keep an eye on the Canvas sites of all the courses you're interested in.

What is the purpose of office hours for a course, and why is it important to attend?

There are two main purposes of office hours. First, they are an opportunity to ask all sorts of questions on the homework and about the course material in general. You certainly won't be taking full advantage of your professor and TF if you see them only during lecture and section. Most professors write their problem sets under the assumption that students will need to come and get help, so all students should make full use of office hours.

Second, attending office hours makes the class a much more fun and social experience. In addition to getting to know your professor and TF better, you will also get to know other students better. Office hours often involve students working together, occasionally getting help from the instructors. This fall semester, more than ever, it is critical that you stay engaged with other people in the class. Office hours are perfect for this.

What is the most important advice I should follow during the fall semester?

Go to office hours and have as much interaction with other people (both instructional staff and other students) as possible. The main danger to avoid (in any semester, but especially this one) is isolation. It is unfortunately easier to fall into the isolation trap in a remote-instruction setting. The good news is that on the flip side, remote instruction might actually make it easier to stay connected with people. Just click your mouse and you're there. The key is to actually take advantage of all the opportunities; remote instruction allows a wider range of possible outcomes – just make sure you end up on the positive end! One tip: set up a recurring schedule for study groups with friends, otherwise things may slide.

Do I need to get involved in research during my first year?

No. While we strongly encourage students to get involved in research, there is certainly no need to do it during your first year. The summer afterward is a great time to start. There are more than enough things to get used to during your first semester, so think very carefully before jumping into research then. If you're eager to get started right away, it may very well be the right thing for you, but be sure to talk with Prof. Georgi or Dr. Morin. After the fall semester, if you're comfortable with how that went and if you'd like to get started with (remote) research in the spring, then again, talk with Prof. Georgi or Dr. Morin.

How can I find a lab to work in?

Most students start research in the summer after their first year, so you should be thinking about this over winter break and early in the spring semester. This page contains all the ins and outs about finding a physics research position:

<https://www.physics.harvard.edu/undergrad/summer>.

For lab work specifically at Harvard, the main steps are (1) talk with Prof Georgi and/or Dr. Morin, and (2) contact professors to see if they have a research project suitable for your background. Don't worry about the fact that you won't have taken many physics courses before your first summer. Most (experimentalist) professors have projects available for all levels.

What should I do with the time that I would have spent on extracurriculars?

That's a good question, although it's rather unlikely that you'll actually have loads of free time. Students are often quite sleep deprived, so some of your "extra" hours can be used to bring your sleeping hours up to a tolerable number. And no one is ever able to spend as much time on a course as they'd like, so some of the hours can allow you to do justice to a course. In the end, you probably won't have time that you're wondering what to do with!

What are the math prerequisites for the introductory physics courses?

The corequisite for Phys 15a is Math 1b; this will work fine if you are very confident with the Math 1a material. But if you're shaky with it, then you should probably finish Math 1b before taking Phys 15a. The corequisite for Phys 16 is Math 21a. And importantly, a very high level of comfort with Math 1b material is needed for Phys 16.

What level of math is needed for Phys 15b?

The prerequisite is Math 21a. So if you take Math 1b concurrently with Phys 15a, you should delay taking Phys 15b until you have completed Math 21a. There are exceptions to this if you feel confident in your ability to read up on the Math 21a material on your own before you encounter the applications in Phys 15b. But this is risky, and you should definitely talk with Prof. Georgi or Dr. Morin if you are thinking of doing this.

Which multivariable math course will help me more in my physics courses: Math 21, or something higher?

If your goal is to obtain the math tools that will help you in physics, then Math 21 (or Applied Math 22) is probably the right course for you. However, if you are someone who likes math for math's sake, and if you are confident that you can pick up math concepts as needed, then Math 22, 23, 25, or 55 is probably the way to go. A difficult decision arises if you like math for math's sake, but you're not confident that you can pick things up as needed. At any rate, shop a couple of the courses if you're undecided, and keep the option open for switching within the first few

weeks. And be sure to discuss things with the advisors from the Math Department, who offer a large number of advising opportunities.

What is a joint concentration?

A joint concentration is basically what other schools call a double major. The rules vary from concentration to concentration. Some joints require a thesis, and some don't, so be sure to check with the specific two fields you are interested in.

Can I do a joint concentration with Physics as one of the fields?

Yes, physics allows joint concentrations with any other field. However, some fields have restrictions on joints, so be sure to check with the other department. Physics doesn't have a thesis requirement, so any thesis rules are determined by the other field.

What is a secondary field?

A secondary field is what other schools call a minor. A secondary field generally has fewer requirements than a joint concentration. However, you can double count only one course for your secondary and your concentration, whereas joints usually allow unlimited double counting.

What is the 4th-year Master's program?

This program allows you to earn both a bachelor's and a master's degree in your four years at Harvard. But note well that the requirements are substantial. You must take a total of 36 courses (28 for the bachelor's and 8 for the master's), as opposed to the standard 32. (The 8 courses for the master's can be taken at any point during your four years, so the "4th-year master's program" is a bit of a misnomer.) The requirement of 36 courses means that you will need to take five courses in four of your semesters. Additionally, most of the courses for the master's degree need to be 200-level graduate courses. So it isn't easy. The exact difficulty varies with department, but the physics master's degree is one of the tougher ones. Only two or three students do it each year.