Many people experience a whirlwind of emotions as they enter college, which we are sure is especially true this year given the extraordinary circumstances. We hope you’re excited to begin this new stage of your life, even if it is only virtually for now. However, it is perfectly natural to be a bit nervous, too, as college is a completely new experience and you may feel pressure to choose a course of study. The Undergraduate Women in Physics (UWiP) and Princeton Society of Physics Students (PSPS) have come together to demystify course selection and the physics and astrophysics majors. Drawing on the wisdom and experience of past, current, and prospective majors, we are here to help you overcome any confusion or academic uneasiness and guide you through your first years at Princeton.

After working hard in high school, it may seem like the only viable path to a challenging major such as physics or astrophysics is to take the hardest, most advanced courses as early as possible. The goal of this guide is to convince you that this is not the case. Just as there are a plethora of research fields within physics and astrophysics (atomic physics, cosmology, biophysics, nanotechnology, etc.), there are a plethora of ways to pursue the physics and astrophysics majors. While your junior and senior years give you the opportunity to explore your research interests, your first year allows you to choose your fundamental physics base. The important thing to take away is this:

It is more important to get a solid understanding of physics than to push oneself to take a course that is too advanced.

We all come from different schools, states, and countries, and therefore we approach our studies with different backgrounds and perspectives. With this in mind, it doesn’t make sense to compare yourself to your peers; rather, it is more important to ensure that you build the unique foundation that you need to be successful.

To figure out which courses you want to take, think about which subjects most interest you. If you are reading this guide, then your interests probably involve some combination of physics, astrophysics, and math, although they may also involve chemistry, biology, poetry, music, or any number of other things. When looking through courses, don’t worry about making the “right” choice. Invest some time in thinking about your courses, but remember that your first year is not going to make or break your Princeton career; there are plenty of students that begin in one field, and, after their first year, decide to move somewhere else. The liberal arts system ensures that your first two years are open to explore your academic interests, so don’t restrict yourself.

Once you have some courses in mind, look at course reviews. At the end of each term, students are asked to review the courses they took. You can find these reviews either on the Registrar’s page or through a variety of student-built course selection websites (one favorite being Princeton Courses). It is also very important to think about scheduling. The easy part of this is to ensure that none of the courses you want to take, including elective classes, overlap (a good resource for mapping out your schedule is Recall). You should also put some thought into the kind of life you want to have at Princeton. Are you an athlete? Which clubs or activities do you want to try? Do you need downtime to relax, or do you thrive off intense academic work? A course not only involves going to class, but also doing the homework and studying for exams. Keep in mind what is important to you and choose a level of academic engagement that fits how you want to structure your time.

If you are debating between two classes, remember that Princeton has a 2 week “shopping” period. This period is designed for you to sample the classes you are deciding between. With the exception of a few courses, it is much easier to switch to the “easier” course than the “harder” course. While shopping classes, pay particular attention to (for example) how accessible the professor seems to be, and how the pacing of the class feels to you; any issues that you have with these things in the first two weeks will likely persist. The most essential part of shopping, however, is to take both courses seriously while you are trying them so that you can get an accurate gauge of which is a better fit for you.

Finally, once you are in a class, take advantage of opportunities and resources. If you are struggling in a class, seek out the help that you need. Don’t automatically assume that your struggles are a weakness or sign that you are not fit for the class. Talk to your professor, your peers, your advisers, a mentor, upper-classmen, and/or your dean - take advantage of your resources to help determine if a course is the right one for you. In this guide, you can find a “Campus Resources” section at the end, which can be a starting point for what is available. Don’t be afraid to ask questions, whether it be during lecture, in precept, office hours, or at a problem session. It can often feel as though silence is a sign that everyone understands the concepts, but the reality is at least one other person probably has the same question as you. Speak up if there is something you don’t understand; it will not only benefit you, but most likely your classmates as well.

Good luck, and we look forward to meeting you!

Sincerely,
Undergraduate Women in Physics
uwip@princeton.edu

Princeton Society of Physics Students
p EPS@princeton.edu

To the GREAT Class of 2024:
WELCOME TO PRINCETON!
Welcome to the Princeton Department of Physics! We on the faculty are eager to meet you and to discuss physics together. If you are interested in majoring in physics, then there are a variety of course options for the fall semester:

- **PHY 103**: This introductory mechanics course is a great place to start if you have not previously taken a college-level physics course with calculus. In the spring term, this course may be followed by either PHY 104, or the PHY 109/110 sequence, which emphasizes physics concepts, methodologies, and problem solving techniques.

- **PHY 105**: If you have a 5 on both the Physics C Mechanics and Physics C Electricity and Magnetism exams, and have taken a calculus based, college level physics course, then PHY 105 may be the better fit for you. It presents a more advanced treatment of mechanics and includes an introduction to Lagrangians.

- **ISC 231/232**: The Integrated Science Course is a double-credit course that provides an integrated introduction to physics, chemistry, molecular biology, and computer science.

- **PHY 205**: If you have already covered the material in PHY 105, then you may request to take PHY 205, the sophomore-level mechanics course. Placement into PHY 205 is by examination only; note that you must sign up for PHY 105 in the initial course registration process.

In deciding which course is the best fit for you, keep in mind that the most important thing is to build a strong foundation in the core concepts as opposed to over-stretching towards the most advanced option. Feel free to sit in on the first week of a class, study its syllabus, flip through the required textbook in the library, and/or try your hand at the first problem set. This will give you a feel for what any given course will be like, and will help you decide if it is a good fit. And of course, never hesitate to reach out to a faculty member for advice!

**PROFESSOR WILLIAM JONES**
**PROFESSOR MARIANGELA LISANTI**
ON BEHALF OF PHYSICS UNDERGRADUATE PROGRAM COMMITTEE

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**WHAT ARE THE DIFFERENT CLASSES? WHERE DO I FIT IN?**

As you can see, there are more options for introductory physics than just one honors physics sequence, and all of these options are viable. You can be a successful astro/physicist no matter which course you take. The message we hope you take away is that there are many definitions of what it means to be a Princeton astro/physics major. It is much better to choose a class where you can stay on top of the material than one where the material is out of reach and difficult to absorb. We hope that our breakdown of course difficulty gives you a better sense of where you fit, taking into account your high school preparation.

"While I certainly could have taken PHY 105, I chose to take PHY 103 because I wanted a smoother transition to Princeton. I was pretty convinced that my high school physics courses were not as difficult as those at Princeton, so I wanted to make sure that I felt comfortable my first semester. I thought it was a great way to start my physics career at Princeton! During the first lecture, the professor told everyone "Hard work will be rewarded". I think that this statement was 100 percent true. As long as I studied rigorously for the quizzes/tests, I was confident that I would do well (and not to sound arrogant, but I did)."

— Anonymous (PHY, Class of 2022)

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Students are welcome to consult with the Astro Director of Undergraduate Studies, Professor Neta Bahcall (neta@astro.princeton.edu) if you have any questions.

**PROFESSOR NETA BAHCALL**
ASTROPHYSICS DIRECTOR OF UNDERGRADUATE STUDIES

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**ASTRO/PHYSICS**
"If you're on the fence, I encourage you to both be willing to challenge yourself and respectful of your needs as a new college student. If taking 105 is going to make your fall term a nightmare, then it's really not worth it. I know a lot of successful physics majors who took 103, and we need to debunk this myth that there is a "one track path" to becoming a physics major at Princeton. On the flip side of that, I want to remind first year students that you're capable of so much more than you think. A lot of us here suffer from impostor syndrome, and that can hold us back from pushing outside of our comfort zones. But we learn the most when we let go of that fear and embrace the challenge; so push yourself, but also be kind to yourself."

— Tori Edington (PHY, Class of 2022)

CHOOSING THE RIGHT PHYSICS COURSES

PHY 103/104 VS PHY 105/106

The quick answer is: if you didn't learn physics in high school or your physics classes weren't calculus-based, then PHY 103/104 are probably the better classes for you. If you have a very strong physics background from high school, then PHY 105/106 or ISC (or a combination of the two) might be better for you. This answer, however, is limited, as it does not reflect some of the experiences of students who have passed through these classes.

The biggest misconception students have when choosing between 103/104 and 105/106 is that "true" astro/physics majors take 105/106, and an astro/physics major is not realizable if you take 103/104. Your choice of first-year physics courses is not a reflection of your ability to do physics; rather, it is a consequence of your high school physics preparation. Just because you have a different level of preparation does not mean you can't study physics or astrophysics.

The official recommendation says that you should take PHY 105/106 if you received a 5 on both parts of the AP Physics C exam. However, you should not be discouraged to try PHY 105/106 if that doesn't apply to you. When speaking with the department and other students, keep in mind that their recommendations are exactly that — recommendations. Their statements should not be interpreted as restrictions or pressures to take these courses. There are students who have very little physics background who jump into PHY 105 and love it, and there are students who have taken AP Physics and AP Calculus classes in high school and feel much more comfortable starting in PHY 103 to cement their understanding of the material. PHY 103 is structured to introduce students to calculus-based physics, whereas PHY 105 assumes a basic level of experience with calculus-based physics.

If you are unsure which class to take, many students strike a balance by starting in PHY 105 and then switching to 103 if they feel out of their depth. The choice is very different from person to person.

Taking PHY 105 does not lock you into taking PHY 106, nor PHY 103 to PHY 104. The first semester (PHY 103/105) is mechanics, and many people have a stronger background in mechanics than electricity and magnetism. Thus, when it comes to electricity and magnetism, second semester (PHY 104/106), many students feel less prepared and decide to take PHY 104. You also have the option to take the PHY 107/110 Spring/Summer sequence to replace PHY 104 if you feel you need the extra math and physics boost to tackle E&M.

"I knew I wanted to major in physics, however I was initially hesitant to take 105 since I had taken AP Physics 1&2 rather than AP Physics C in high school. During registration, I talked with Professor Lisanti and she assured me that I would be fine in 105. I definitely feel like it was a good fit for me. I found the course to be challenging, but not unmanageable, and the pace kept me engaged and excited about physics."

— Tori Edington (PHY, Class of 2022)

"I did not have a particularly strong background in mathematics or physics. I should have probably technically have taken PHY103, but chose PHY105 out of interest. I am incredibly glad that I did — Professor Lisanti is a fantastic lecturer, and the course's emphasis is on teaching problem-solving techniques and introducing students to the more theoretical/abstract content that is typically taught at university. As such, I felt that I learned far more from taking and being challenged by PHY105 than I would have if I'd stayed within my comfort zone and taken PHY103."

— Anonymous (PHY, Class of 2023)

"PHY 103 was a good fit for me since I took AP Physics B [an algebra-based physics class equivalent to taking AP Physics 1 and 2] in high school. With my preparation, the class was somewhat easy. But I doubt I would have been prepared for PHY 105. There's plenty of time to take rigorous courses in the future, but during the first semester, it's nice to be in a manageable course."

— Bhaskar Roberts (ELE, Class of 2019)
**SKIPPING AHEAD & ALTERNATIVES**

**SKIPPING TO PHY 205 (CLASSICAL MECHANICS)**

If you have an exceptionally strong physics background and think that you are ready to jump past the general introductory sequence, you can consider going straight to sophomore-level physics courses, starting with PHY 205 (Classical Mechanics). In order to do this, you must take a placement exam. For some students this is the perfect place to start, but for others, they decide to take 105/106 even though they have a strong physics background.

"I was certain that I wanted to be a physicist and thought I was ready and willing to jump into 205. I ended up loving it — totally worth the hard first semester."

— Jonah Herzog-Arbeitman (PHY, Class of 2019)

**PHY COURSES VS. ISC 231/232**

Choosing between one of the general physics tracks or the Integrated Science track is a bit more difficult. The Integrated Science Curriculum (ISC) is geared towards students with strong STEM backgrounds who are interested in research in biology-related interdisciplinary fields (biophysics, computational biology, biochemistry, etc.). It gives students a combination of intense theoretical lectures, delving into physics and math relevant to biological systems, and unparalleled lab experiences. Keep in mind that ISC is double course, which, at the end of both semesters, gives you equivalent credit for PHY 103/104, MOL 214, COS 126, and CHM 201/202.

When trying to decide between general physics and ISC, it is useful to think about what topics you are more interested in. PHY 103/104 and 105/106 will give a deeper understanding of mechanics and electricity and magnetism, while ISC will give a broad interdisciplinary understanding of mechanics and electricity and magnetism, in addition to an introduction into quantum mechanics, statistical mechanics/fluid dynamics, and computer science. For more detailed information on the content covered in ISC, read the Integrated Science Curriculum section later on in this guide.

"I was unsure about what area of science I liked the most and I also wanted to have a good foundation on all of them to support a career as a researcher. I think [ISC] was a good fit for me because the course was challenging but also manageable given the preparation I had. The lab part of the course was also really exciting and exactly what I was looking for as an introduction to scientific writing, reasoning, and data analysis."

— Gabriel Toneatti Vercelli (PHY, Class of 2020)

"If you are unsure which course is best for you, take 105. You can always switch to 103 later. I chose 105 and stuck with it. Don't be surprised if you find it very difficult. It's a tough course but it's a very good way to gauge how physics classes are taught at Princeton, and it helps get you more comfortable with material that you may not understand right away."

— Michelle Baird (PHY, Class of 2020)

"ISC is time-consuming (no one in my year managed ISC alongside MAT 203), but for me it was totally worth it (in fact, I partly regret not staying on second semester). The labs are unlike most other first-year labs that students can get; you get a great first look at thermodynamics and statistical mechanics. I would say that the physics majors complained about there being "too much" bio (the labs felt very bio-heavy) while the MOL majors complained about there being "too much" physics (the lectures are very physics-heavy, as is the homework), and first semester didn't have too much chemistry at all, but this is an excellent course for anyone with interdisciplinary and applied interests in the natural sciences."

— Sara Anjum (PHY, Class of 2019)

"ISC is best for those interested in interdisciplinary work or undecided about major; I did not feel left behind relative to those in 105/6 when I got to sophomore year."

— Christopher Russo (PHY, Class of 2020)
YOUR CHOICE OF INTRODUCTORY MATH

Please note that this year MAT 203 will not be offered. The physics department is recommending MAT 201 as the math prerequisite. Availability of MAT 204 in Spring 2021 is also subject to change.

Choosing a math course can often be harder than choosing a physics course because there is a broader spectrum of options. Most students leaning towards physics take MAT 201 or MAT 203 (multivariable calculus) their first semester, as the material covered in these classes is the best preparation for PHY 104/106 in the spring. Students leaning towards math take MAT 215 or MAT 216 (honors analysis: the official first steps in the introductory math sequence). The overlap between the two majors in the first year is large, even though the recommended classes may be different. You can be a physics major if you take 215 or 216, and you can be a math major if you take 201 or 203. Furthermore, you can also be a physics major starting in MAT 103 or MAT 104 (Calculus I and II).

If you are unsure which class is best, spend some time looking at the syllabi for the different classes and maybe even take the calculus placement exam. By reading the syllabus for a class, you can learn which topics are covered and identify interesting or repetitive parts of the material. It is important to keep in mind that college math courses are not all the same and the depth that you covered a topic in high school (or even at a local college) may not be sufficient to skip over the class at Princeton. To better gauge this, the Math Department has provided practice problems for each of the classes. These questions can give you a sense of whether the style and difficulty of problems is right for you.

The most important thing is that you find a class that fits and that you communicate any concerns with the department in order to ease your worries and find the best path for you. 1

With all that said, the next few pages include a summary of the four main options. For more detailed info and FAQs curated by the Math Department, follow the links.

"Find a branch of math you like and take a lot of it, there will always be unexpected uses."
— Jonah Herzog-Arbeitman (PHY, Class of 2019)

"Expect the physics and math courses at Princeton to be very different than anything you took in high school. If you struggle in the first semester of Princeton math and physics don’t necessarily take it as a sign that you won’t be a good physics major. It probably just means you need to rethink how you go about doing the homework and studying for the exams."
— Hudson Loughlin (PHY, Class of 2019)

"Don’t be afraid to ask for help! The best way to make the most out of classes is working with other people and talking to professors for help."
— Sam Cohen (PHY, Class of 2021)

"Find a teacher you like. If you don’t like your teacher, move to another section. This can make all of the difference in the world."
— Madelyn Broome (AST, Class of 2019)

1 The director of undergraduate studies for physics: Prof. William Jones (wcjones@princeton.edu)

And for astrophysics: Prof. Neta Bachall (neta@astro.princeton.edu)
PROOF VS. APPLICATION

“APPLICATION-BASED” CLASSES: MAT 201/MAT 202 OR MAT 203/MAT 204

MAT 201/202 are the standard multivariable calculus (201) and linear algebra (202) courses that physics majors take. MAT 203/204 extends past the material covered in MAT 201/202, venturing into slightly more abstract territory. Whereas 201 tends to stick to calculus of 3 dimensions, 203 generalizes concepts to n-dimensions. Similarly, 202 focuses on linear algebra computations confined to matrices, while 204 extends the same principles to more abstract object types such as functions. 204 also places a stronger emphasis on how the material covered in lecture can be applied to other fields (computer science, physics, etc.).

The 203/204 sequence is generally recommended for physics majors, but 201/202 will definitely suffice, especially if you are not interested in in-depth theory. Most of the core physics classes use 201-level multivariable calculus and 202-level linear algebra (the linear algebra used in physics classes is fairly basic; matrix multiplication and eigenvalues/eigenvectors), so don’t hesitate to take 201/202 if your background and/or interests make those classes a better fit.

“Even though I took multivariable in high school, I thought I would get more out of MAT 201 than MAT 203. I’m more of an application kind of person. I don’t really like proofs and things along the lines of proofs, so I was happy enough with taking MAT 201. It was the same material as high school, but I felt like I learned more about why something was done vs just how to do something. It wasn’t the most challenging class I took, but I was very happy that I took it and got a lot out of it.”

— Anonymous (AST, Class of 2023)

“My high school [did] not offer any math courses past AP Calculus AB (MAT 103 equivalent) so I chose to take MAT 104. It was a great fit for me—I found that it challenged me enough without being overly stressful. As long as I prepared for exams/quizzes and stayed up-to-date on the homework, I was confident that I would be successful in the course.”

— Anonymous (PHY, Class of 2022)

“I started out in MAT 203 and found that it was a bit too challenging. I was initially upset with myself because I had always been in the most difficult math classes throughout high school, but in the end, I was glad that I chose MAT 201 over MAT 203. It gave me more time to focus on physics.”

— Anonymous (Class of 2023)

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— Anonymous (Class of 2023)

THE MOST IMPORTANT RESULT OF THE FIRST SEMESTER IS THAT YOU COME OUT OF IT CONFIDENT.

Nobody cares what you took, and taking a harder class does not put you ahead in a long-lasting way. But if you’re confident, you will work harder and take more risks. I felt burnt out after MAT 203 and started avoiding math. I’ve since ventured back and done well in math courses, but MAT 203 set me back. If you’re interested in MAT 203, I recommend enrolling in it (it’s really interesting), but don’t hesitate to drop.”

— Bhaskar Roberts (ECE, Class of 2019)

“PROOF-BASED” CLASSES: MAT 215/MAT 217 OR MAT 216/MAT 218

MAT 215/217 is the standard first-year curriculum for incoming math majors, providing an introduction to real analysis (MAT 215) and linear algebra (MAT 217). MAT 216/218 goes faster than 215/217 and covers more (and slightly different) ground: introduction to real analysis, linear algebra, and then a little bit of differential geometry. Neither sequence is perfectly geared towards aspiring physics majors (students in 215/217 will never learn any multivariable calculus, for example), but most students who opt for this route end up learning what they need to from their physics classes and are perfectly fine. MAT 216 assumes prior experience with proofs, whereas MAT 215 tries to ease students into this new way of approaching math — although the pace is anything but slow. It is especially worth considering one of these options if you are interested in theoretical physics. A lot of higher-level classes that are important to theory (Algebra and Differential Geometry in particular) list 215/217 or 216/218 as prerequisites.

“I wanted to do theoretical physics, so I think a rigorous proof-based math course would be useful. The difference between 215/215 is that 216 covers a broad range of topics, whereas 215 mostly only covers analysis (the baby Rudin textbook). I’ve learned some analysis in high school, so I decided 216 would be a better option for me. That being said, the course itself doesn’t require any background in proof-based math nor analysis. It is very self-contained and provides a perfect introduction to mathematics that touches a little bit of everything. I absolutely loved the material. It is definitely a good course for people who are interested in rigorous proof-based math. And if you don’t know whether you like proofs or not, shop the class and find out!”

— Anonymous (PHY, Class of 2022)

“I chose [MAT 215] because I wanted to take math beyond the standard multilinear sequence. I feel like I wasn’t very well prepared for it because I didn’t know how to write proofs and had to spend a lot of time figuring that out. But I am still glad I took it because it was necessary for the courses I took afterwards.”

— Loki Lin (PHY, Class of 2022)
A MESSAGE FROM THE HEAD PROFESSOR OF THE INTEGRATED SCIENCE CURRICULUM

Welcome to Princeton!

I wanted to let you know about an exciting educational initiative at Princeton, the Integrated Science Curriculum (ISC).

A little about the program:

• The ISC curriculum is founded on the expectation that much of the most important science of the future, though based on the classical disciplines, will lie in areas that span two or more of them. As such, we see a need to educate students with a unified view of the scientific endeavor who seek out, rather than shy away from, cross-disciplinary topics of research.

• Integrated Science is an interdisciplinary curriculum for students excited about learning science. It presents a mathematically-sophisticated, integrated view of the sciences that will allow you to tackle the problems of the future.

• Integrated science is challenging and time consuming. Ours is a double-course that will account for roughly half of your workload for the whole first year. It might just be the hardest academic experience you’ve ever had. However, if you stick with it, you will gain proficiency in introductory Chemistry, Computer Science, Molecular Biology, and Physics, allowing you to major in any science or engineering discipline.

I encourage you to learn more about the program by going to the ISC page of the Academic Expo website and http://lsi.princeton.edu/integratedscience. I have recorded a brief video introduction to the course which you can watch here: https://youtu.be/ZF63CRaEPCU

We all hope to see you on Zoom next week.

Best wishes,

JOSHUA W. SHAEVITZ
PROFESSOR OF PHYSICS AND THE LEWIS-SIGLER INSTITUTE FOR INTEGRATIVE GENOMICS
DIRECTOR, INTEGRATED SCIENCES CURRICULUM

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AN ISC GENERAL OVERVIEW

COURSE GOALS

ISC motivates students to approach science with a research mindset: problems and topics tend to be open-ended and exploratory rather than procedural, collaboration and seeking help is encouraged, and concepts are combined in creative ways. The course is not organized into biology, physics, and chemistry sections, but rather by mathematical concept. In each unit, new math concepts are introduced then put into the context of various problems in the sciences. Lectures introduce a concept and then precept will typically look at a harder application of this problem. The course begins with basic, single-order differential equations, followed by second-order differential equations and oscillators (damped and harmonic) and then statistical mechanics. The time commitment is challenging and peer collaboration is crucial; the course isn’t designed to be completed alone, and one gains a lot from collaborative discussions.

“One important thing about ISC is that it is possible to complete all of the assignments and “finish” the course without really understanding how everything works and just scraping by. If you’re already putting in the time and commitment to the course, take full advantage of all of the resources available: from the professors, textbook, and your peers. Make sure that you really understand what’s going on every week and can work through the P-Sets/additional textbook problems more or less by yourself because the level of proficiency that you will need for the midterm and final is not something you can just cram before the exam. I know you'll hear about how hard ISC is and have a ton of other time commitments once you're in the course, but if you truly want to take ISC, know what you want to get out of the course and be ready to work for it.”

— Anonymous

This overview is edited from a Principedia article authored by Milena Chakraverti-Wuerthwein (PHY, Class of 2020) and Shiye Su (PHY, Class of 2020). It covers the first semester of ISC and is based on how the course was taught during fall 2016. The curriculum changed slightly in fall 2017 to include more chemistry (removing some statistical mechanics), but the general course structure remained the same.
A CONTINUED OVERVIEW OF THE INTEGRATED SCIENCE CURRICULUM

LEARNING FROM INSTRUCTION

The first half of the semester (until fall break) follows the COS126 curriculum as well as the PHY/CHM/MOL lectures. The COS126 lectures are on Tuesdays and Thursdays. Monday, Wednesday, and Friday lectures are PHY/CHM/MOL and are taught by one professor most of the time, but sometimes other professors will come to expose you to their research or problems/topics related to what they research. Precepts are half COS and half PHY/CHM/MOL. After fall break, you will switch to entirely PHY/CHM/MOL lectures and precepts.

During the PHY/CHM/MOL lectures, it is most important to have a conceptual understanding of the larger picture rather than necessarily following all the details of the derivation. Do not get discouraged if you are lost in a derivation, just try and take a step back to see the larger concepts, because you can get the finer points from the lecture notes. Often, reading over the lecture notes will clarify or reinforce understanding significantly.

PHY/CHM/MOL precepts are unusual in that new content is introduced. Precepts take lecture concepts to a new level with more complex problems. Try to get a sense of how to approach problems and appreciate connections between the ideas presented, because, likewise, it is not necessary to follow every line. A good way to stay engaged is by asking questions. When faced with a silent room, it is easy to assume that everyone else understands and therefore feel as though your questions are somehow naive, but, in reality, your question is probably something that your peers are confused about as well. Once you shift into exclusively ISC precepts (not COS), there will be breaks halfway through precept. These breaks are a great time to talk to the preceptors one-on-one about the larger concepts or specific steps in the derivations that you didn’t understand. The preceptors also hold office hours.

The ISC labs are really fantastic, well designed and fun. In-lab, the instructors (Jenn Gadd and Quan Wang) as well as the grad student TAs are super nice and helpful if you have any questions. They are especially happy to talk to you if you are curious about how a specific task works, or why you are doing something. Take advantage of being able to talk to them about the science behind the labs, because it can be really interesting and sometimes can help with lab write-ups. Don’t underestimate the time required to write the lab report, especially the MATLAB script. It is important to be meticulous with figures and their captioning, which in terms of grading, is more important than the text.

“[ISC is] often a miserable amount of work but in higher-level classes that’ll probably be the norm so it’ll prepare you better for the grind. The labs also forced me (a noob) to quickly learn scientific writing skills and MATLAB, which I’ve found very useful post-ISC.”

— Anonymous (NEU, Class of 2020)

LEARNING FOR /FROM ASSIGNMENT & ASSESSMENTS

For the problem sets, collaboration is important. Get started early, as they are time consuming and you learn a lot more with time to think over the questions, than you do with a solution hastily explained in an hour of desperation. There are problem set sessions, which are held on Wednesday evenings with a grad student TA who is also your grader for that week. If you are uncertain about what a question is asking, by all means ask them! They are there to help you. It is helpful if you have at least looked through the problems, and possibly started them, so that you have some concrete questions to ask during the session. The TAs are also typically very open to meeting with you one-on-one and going over specific problems or questions if you are still confused on Thursday before the problem set is due on Friday.

Lab reports are typically MATLAB heavy, but don’t forget that neither MATLAB nor programming experience is a prerequisite. Many tips, techniques, and built-in functions for extremely specific objectives exist online; both the documentation and informal platforms like MATLAB Central are great. Using LaTeX is very common with lab reports, but this is not a requirement. There is no grading advantage to LaTeXing your lab reports; the content is far more important, so stick to whatever word processor you are most comfortable with. Lab office hours can be great opportunities to ask questions about lab report guidelines or data analysis, but are also a really good way to force yourself to start working on the lab report and prevent procrastination. Lab reports take a LOT of time. Do not procrastinate on them — start early.

In preparation for exams, it’s more important to have an understanding and intuition of the concepts than knowing formulae and minutiae. Do the problems in the notes, as they are time consuming and you learn a lot more standing and intuition of the concepts than knowing formulae. Do the problems in the notes, as they are time consuming and you learn a lot more standing and intuition of the concepts than knowing formulae. As there may be some explicit techniques for both problems, a problem set is held on Wednesday evenings. The TAs are also typically very open to meeting with you one-on-one and going over specific problems or questions if you are still confused on Thursday before the problem set is due on Friday.
Extra Info & Frequently Asked Questions

What Students Should Know

ISC is indeed challenging and a substantial time commitment, but don’t be put off by its reputation. If you have a true interest in biology-related interdisciplinary science and are willing to invest the effort, you can succeed in the course while maintaining balance. The class is immersive and there’s much to be gained from the social experience. Furthermore, remember that Princeton has a 2-week “shopping period.” Plenty of people start out in the class before deciding it’s just not for them and then take other classes. If you decide to shop ISC, make sure you are treating the course as if you were actually taking it. Putting in half the effort because you are unsure will only set you up to drop it later. Enjoy, because some beautiful ideas are presented.

FAQs

Q: What math background do I need for ISC?
A: Successful completion of AP BC Calculus or equivalent is highly recommended for the class. It can be helpful to take multivariable calculus (MAT 201 or 203) and linear algebra (MAT 202, 204, 217, or 218) concurrently.

Q: Do I need to take AP Bio/Chem/Physics (or equivalent) for ISC?
A: While more advanced coursework in the natural sciences (especially physics) will help, AP science courses are not necessary for success in ISC. The course does assume some basic knowledge in at least 3 areas, but not at the AP level.

Q: Will I be behind when rejoining the main physics major path?
A: Many ISC students will continue on to become astro/physics majors. Most of these students do not feel disadvantaged within the major, but the way that the two paths are structured, gives each different advantages. ISC covers a broader spectrum of topics, so you will have exposure to quantum mechanics and statistical mechanics/fluid dynamics, which the general physics track does not give you until sophomore year or later. PHY 105/106, however provides a stronger preparation for advanced mechanics/E&M classes because they have a stronger, narrower focus on those topics than ISC, in the grand scheme of things both classes prepare you to be a physics major, but in different ways (and with different strengths). You have to choose based on what you need to know to succeed in the major.

Q: I’ve taken AP Bio/Chem/Physics (or other advanced courses). Will I get anything out of ISC?
A: In most cases, high school courses are not as challenging as ISC. Many people enter having taken any combination of such classes and still exit feeling as if they were exposed to a lot of new content from a new perspective. ISC synthesizes the disparate course content in a unique way, introduces students to potentially more advanced - or at least different - biology than was covered in the high school. AP curriculum, and introduces students to thermodynamics from a statistical mechanics perspective, which is not something that is on the standard AP curriculum. The labs are also very likely, not ones a person would have done in high school (e.g. one lab involved determining Boltzmann's constant by observing and recording the motion of microscopic beads in a fluid), and they involve heavy lab report-writing as well as extensive data analysis via MATLAB.

Q: What kind of student is ISC meant for?
A: While ISC is largely geared towards students in the natural sciences, students pursue a wide variety of majors. Many become physics and computer science majors, while others use ISC to fulfill BSE requirements. Some students do end up pursuing majors in the social sciences or humanities after ISC, though this is atypical, it is not not impossible.

Q: What if I’m still not sure if I want to take ISC?
A: If you want more in-depth answers or have questions that were not answered in the FAQ, ISC alumni/alumna are more than willing to answer your questions. Feel free to contact us at uwip@princeton.edu, and we can put you in contact with an ISC alumna. This is especially true for the professors who may only teach one week of lectures and thus have a few problems specific to their field of research on the problem set for that week. The problem set graders may not be acquainted with this specific field, so it can be useful to go to that professor and ask about topics covered in lecture or about the problems in particular. Most of all, take advantage of the amazing opportunity that ISC gives you to interact with an extremely wide spectrum of brilliant researchers.

It’s also important to know how to seek out resources independently on the Internet, especially for MATLAB and LaTex tricks. If something interests you, read up on it!

External Resources

This class has an amazing support network, both due to the small class size and to the many enthusiastic alumni. It is easy to develop close relationships with instructors and upperclassmen mentors. Check out when group tutoring is scheduled (several days of the week); these are led by past students who can not only provide academic help (MATLAB/latex tricks, problem-solving approaches, etc.) but also general advice on the course and Princeton. Make friends with the tutors and TAS! Lab office hours are great for image data analysis and other problems. If you are struggling lot with lab, reach out to Jen Gold (jgold@princeton.edu). She has in the past worked one-on-one to go through lab reports (ideas, writing, figures, etc.) or to give more support and instruction with lab techniques (pipetting, plating cell cultures, using a microscope, etc.).

One thing that students in general do not take advantage of in this class is the amazing faculty. ISC is lucky to have multiple professors on staff, in addition to the 4 TAs (2 lab, 2 problem set) and 2 preceptors, every one of whom is doing interesting research. All of these people are more than willing to set up one-on-one meetings with you if you need help with material, or just want to learn about what they do. Professors are very helpful after lecture, or if you make appointments with them to talk through the material. This is especially true for the professors who may only teach one week of lectures and thus have a few problems specific to their field of research on the problem set for that week. The problem set graders may not be acquainted with this specific field, so it can be useful to go to that professor and ask about topics covered in lecture or about the problems in particular. Most of all, take advantage of the amazing opportunity that ISC gives you to interact with an extremely wide spectrum of brilliant researchers.

If you want to [take ISC and didn’t have the opportunity to take calculus or calculus-based physics], get on edX and do these Calc BC and physics C courses. Physics might be more of a hindrance than math, depending on how challenging you find it. I also want to say, the reason I’m so optimistic about ISC being possible for basically anyone is because my high school was the most underfunded place ever, and I’m self-taught in so much, and even made it and even liked it. So yes there are lots of people going in who went to fancy prep schools and have already taken college courses and whatnot, but ISC is really one of those things where determination and self-discipline and sometimes caffeine intake is slightly more important than preparation."

— Anonymous (CDS, Class of 2020)
ACADEMIC HELP
For many people the academic shock is huge and it takes a semester (or more) to adjust study habits to match the Princeton academic pace. This is very strong in STEM classes because most students have not had assignments that are as involved as Princeton problem sets. Nevertheless, there are a lot of different ways that people adjust within this environment.

PROBLEM SET SESSIONS & STUDY GROUPS
Collaboration on problem sets and assignments, when allowed, is key. Physics and math professors typically encourage students to collaborate on assignments because it builds camaraderie and enhances students’ learning. There are three main methods through which students collaborate: course-organized problem set sessions, self-organized study groups, and the McGraw Study Hall (details later).

Course-organized problem set sessions provide a time and space wherein students can drop in to collaborate on problem sets and ask questions supervised by an undergraduate or a graduate student course assistant, so they are helpful / in touch with course expectations. If your course organizes a regular problem set session, it will often be a few days before the assignment deadline, so they give a long way to helping you finish a problem set, but may not be ideal for learning entirely new concepts.

While problem set sessions are great, don’t underestimate the power of forming your own informal study group. Working with others in office hours and your group will naturally come together. A group is pretty much essential if you want to do well. That being said, interfering opinions on the helpfulness of TAs. Also, finding a Pset buddy / a course assistant, so they are helpful / in touch with course expectations. If your course organizes a regular problem set session, it will often be a few days before the assignment deadline, so they give a long way to helping you finish a problem set, but may not be ideal for learning entirely new concepts.

OFFICE HOURS
Office hours are organized by the course professor and a schedule of the hours and attending professor/preceptor are published either in the course syllabus for a given semester or announced in lecture. Typically these are informal meetings where students can turn up within the time slot with particular questions or to discuss general concepts, directly interacting with a single professor or graduate student preceptor. It’s a format that lends itself to more deeply understanding a concept or exploring tangential ideas beyond the more general bare-bones coverage provided in lecture.

"Go to office hours" is one of the most common pieces of advice students give. The utility of office hours can be highly dependent on the supervising professor or preceptor. Past students give good suggestions on which ones are lifesavers and which are "okay"; you can also try a few different ones. Office hours are also the easiest way for you and the professor to get to know each other. Not only this is a good opportunity to build connections for future recommendation letters, but getting to know your professors can expose you to completely new research areas that previously you didn’t know existed.

"I would say not to worry if you feel like you have no idea what you’re doing. You will eventually. TALK TO YOUR PROFESSORS. GO TO OFFICE HOURS. I wouldn’t have done nearly as well as I did (in PHY 105) if I didn’t get extra help at office hours." — Maëlle Baird (PHY, Class of 2020)

"PHY105 has a lot of office hours, but you should use these wisely. If you overwhelming use them and go to too many, then you run the risk of not learning the content properly. I’d advise working through the problems properly on your own and then visiting office hours briefly for advice." — Anonymous (PHY, Class of 2023)

"Office hours are extremely helpful, especially when you know which TA’s are most helpful (the only way of knowing this is to attend office hours run by different TA’s and decide for yourself — people tend to have differing opinions on the helpfulness of TA’s). Also, finding a Past buddy/ group is pretty much essential if you want to do well. That being said, don’t stress about trying to find one right away. Just try to work with others in office hours and your group will naturally come together." — Anonymous (PHY, Class of 2023)

PROBLEM SET SESSIONS & STUDY GROUPS
McGraw Center tutoring is frequently cited as a helpful resource that is free and available to anyone enrolled in the course. More than 50% of students take advantage of tutoring; it is not necessarily a sign that one is struggling. Tutoring can help reinforce and explore concepts.

Group study halls are drop in hours that create a study group environment supervised by a few tutors. This is a good space to come with specific questions, get help working through a problem, or collaborate with others on problem sets while having access to immediate feedback / aid. These are most commonly offered for introductory courses such as: MAT 103/104/201/202/203/204, PHY 103, etc. MAT 201/202 and 203/204 students will especially preach the importance of McGraw Group Study Hall for getting problem set’s done.

“The McGraw center has tutoring for MAT 203 and it saved me every week. It was the only reason I finished any of the P-Sets for that class.” — Camille Liotine (AST, Class of 2020)

Individual peer tutoring is appointment-based and allows for more focused and individualized assistance. These are particularly good for those who need more involved guidance working through problems, want to enhance their foundational knowledge of course material, identify areas of weakness, or have a broader range of concepts to discuss. Availability will be available on the McGraw Center website during each term. Tutoring is offered mainly for introductory courses, but is not limited to just the courses offered for group study halls (e.g. PHY 105 is not included in McGraw Study Hall, but students in the past have made use of 1-on-1 tutoring through the McGraw Center).

In addition to tutoring, McGraw hosts academic strategies workshops which aid students in learning and applying strategies for purposeful and efficient learning, exam preparation, planning, etc. Princeton students can also make appointments with McGraw learning strategies consultants.

For full descriptions of the McGraw Center resources, visit the website.

RESIDENTIAL COLLEGE 1-ON-1 PEER TUTORING
Peer tutors are undergraduates who have performed well in the courses they support. This is a less frequently used resource, and supply and demand varies more widely between courses. This resource is a great way to get persistent help throughout the semester through a more personal tutor/mentee relationship with one peer tutor. To request residential college tutoring, make an appointment or meet with your college dean / director studies. Depending on supply, residential college tutoring can be an alternative to office hours for help in PHY 105/106 and PHY 205/208 (as well as MAT 215/217), which do not have McGraw counterparts (unlike PHY 103/104, MAT 201/202 and 203/204).
INSTITUTIONAL SUPPORT

Freshman year can be a difficult transition period for many, and this process is complicated by Princeton's rigorous academics. The University offers many support systems to connect students who might be having similar experiences and access to professional counseling for those who want to talk through their problems.

RESIDENTIAL COLLEGES

The pastoral care from your Residential College is often the first point of support. Residential College Advisors (RCAs) are upperclassmen students who understand Princeton’s challenges as an incoming freshman, and have undergone extensive training to help you as much as they can. Likewise, Peer Academic Advisors (PAAs) are trained to answer academic-related concerns such as: degree/major requirements, academic planning, or adjusting to coursework. Peer Health Advisors (PHAs) are also open for conversation around any concerns or stresses you are experiencing and can point you to further resources if you wish, including those in CPS (see below). Of the Residential College staff, the Director of Studies and Director of Student Life deal most directly with student concerns. Feel free to check in with your Academic Advisor through the semester, who is often associated with your residential college.

WOMEN’S CENTER

Women’s Center, located on the 2nd floor of Frist Campus Center, is an inclusive space and community. It hosts interesting events throughout the year with a mission to develop leadership, promote holistic health, build community, mentor and empower, advocate for students, and educate students and staff. The Women’s Center is a great resource for women and men who want to better understand gender issues, improve equality, and develop healthy academic environments.

STUDENT GROUPS

Student organizations can provide a great community, advice, and source of information about research and opportunities. Also, these events often come with free food! There are two main student groups most directly concerned with physics/astrophysics: the Undergraduate Women in Physics (UWIP) group and the Princeton Student Physics Society (PSPS).

UWIP

The goal of Undergraduate Women in Physics (UWIP) is to offer mentorship, academic enrichment, and a welcoming community to students majoring in physics or related fields. We invite all students, regardless of gender identity/expression, race, socioeconomic background, and/or sexual orientation, to become members. As a joint collaboration between students in physics and the astrophysical sciences, we aim to provide guidance in order to aid students in their strides to achieve their academic, personal, and professional goals. To join the UWIP email list, please email uwip@princeton.edu, or fill out this form. Follow them on Facebook! @PrincetonUWIP

PSPS

The Princeton Society of Physics Students (PSPS) is the Princeton chapter of the national Society of Physics Students, a professional association designed for physics students and their advisors. Along with hosting talks by physics faculty, the PSPS aims to provide a broader perspective of physics by hosting talks from faculty members of other departments who perform applied or theoretical physics research. It also aims to aid with the academic and professional development of physics majors at Princeton by hosting professional development events by peers about summer and on-campus research opportunities, certificates that complement the physics degree well, provide peer mentoring, and more. We look forward to meeting you all and welcoming you into the PSPS and broader Princeton physics community.

LGBT CENTER

The LGBT Center supports and empowers lesbian, gay, bisexual, transgender, queer, questioning, intersex, and asexual students and employees by providing community-building education, events and initiatives. It is also located on the 2nd floor of Frist Campus Center and puts on a range of programming such as speaker events, socials, workshops, and dialogues. Check out their website for further details. The LGBT Center is a great way to build a support network or to get to know more members of the Princeton community, and while some events are only open to students in the LGBTQIA+ community, the center itself is always open to anyone who wants to come hang out or chat with the great counselors on staff.

CPS

Counseling and Psychological Services is free and available to all students. It is easy to set up an initial appointment through the web portal, phone, or visiting McCosh Health Center. Princeton’s challenging academic environment can feel isolating; CPS counselors are experienced with such problems and sometimes simply talking through such thoughts can help. CPS also offers group counseling. You do not need to have a diagnosed mental illness to take advantage of CPS counseling. Counselors are trained to handle problems ranging from the short term to the long term, and this definitely includes any issues you may be facing related to academics.

MATH GROUPS

The Math Club (listserv Null-set) and the Noetherian Ring may also be of interest to physics students. The Math Club (website, FB) is active in hosting colloquia from various Princeton professors, typically from the Mathematics but also Physics and Computer Science departments. Its course selection information events can also be relevant to physics/astrophysics majors, as are the social events. They also advertise recruiting events from software, trading, and other companies geared towards STEM majors on Handshake, a Princeton App.

The Noetherian Ring (website) is focused on women in math, particularly in creating mentor/mentee relationships. Many of its resources are helpful to all and even more so for math-leaning physics & astrophysics majors.
USEFUL LINKS

PHYSICS (PHY)
Director of Undergraduate Studies: Prof. William Jones (wjones@princeton.edu)
Undergraduate Program Administrator: Karen Kelly (kkaras@princeton.edu)
General Info about Undergraduate Program: https://phy.princeton.edu/undergraduate-program
Major Requirements: https://ua.princeton.edu/academic-units/department-physics/

ASTROPHYSICS (AST)
Director of Undergraduate Studies: Prof. Neta Bahcall (neta@astro.princeton.edu)
Academic Program Administrator: Polly Strauss (pstrauss@princeton.edu)
General Info about Undergraduate Program: https://web.astro.princeton.edu/academic/undergraduate-program
Major Requirements: https://web.astro.princeton.edu/academic/undergraduate-program/ major-requirements

MATH (MAT)
Director of Undergraduate Studies: Prof. János Kollár (kollar@math.princeton.edu)
Placement Officers: Ana Menezes (amenezes@math.princeton.edu)
Program Administrator: Michelle Matel (mmatel@princeton.edu)
General Info about Undergraduate Program: https://www.math.princeton.edu/undergraduate
Info on Introductory Math Courses:

INTEGRATED SCIENCE CURRICULUM (ISC)
Program Coordinator: Jennifer Brick (jbrick@princeton.edu)
Head Professor: Prof. Joshua Shaevitz (shaevitz@princeton.edu)
General Info about Program: https://lsi.princeton.edu/integratedscience
Official FAQ: https://lsi.princeton.edu/integratedscience/faq

STUDENT GROUPS
Undergraduate Women in Physics (UWIP): uwip@princeton.edu
Princeton Society of Physics Students (PSPS): princetonmathclub@gmail.com
Princeton Math Club: https://blog.math.princeton.edu/mathclub/
Noetherian Ring: http://web.math.princeton.edu/noetherian/index.html

TOOLS FOR COURSE SELECTION
Official Course Offerings: https://registrar.princeton.edu/course-offerings/
Princeton Courses (student-built course platform): https://www.princetoncourses.com/
Recal (student-built course schedule planner): http://recal.io/

CAMPUSS ORGANIZATIONS
Counseling and Psychological Service (CPS): https://uhs.princeton.edu/counseling-psychological-services
Women's Center: https://women.princeton.edu/
LGBT Center: http://lgbt.princeton.edu/
The McGraw Center for Teaching and Learning: https://mcgraw.princeton.edu/
ACKNOWLEDGEMENTS

This document was a collaboration between the undergraduate women in physics and the Princeton Society of Physics Students.

Special thanks to the departments of physics and astrophysics for their support of UWiP and PSPS.

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Cara Giovanetti
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Connie Miao
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Yuri Tamama
Ideas & Feedback, Geosciences 2022

Physics & Astrophysics Undergraduates
For their quotations & contributions
Due to technical difficulties, we were unable to update the 2020-2021 version of this Course Guide directly. This appendix is included to provide the most up-to-date information regarding departmental statements, student organizations, and peer feedback. For any discrepancies between what is stated in the Course Guide and this appendix, defer to the appendix; and please do not hesitate to reach out to uwip@princeton.edu or psps@princeton.edu with any further questions. We apologize for the inconvenience, and wish you all the best with the resumption of in-person classes.

**UPDATED DEPARTMENTAL STATEMENTS**

*ASTRO/PHYSICS*

The Princeton Astrophysics Department is committed to cultivating a supportive and welcoming environment for all students, regardless of identity.

*Mathematics*

Math will offer MAT 203 (Advanced Vector Calculus) and MAT 204 (Advanced Linear Algebra with Applications) this coming academic year.

Edit to page 11: A placement exam will not be offered by the department. Therefore, if you are unsure which class to take, visit the Mathematics Department website > Undergraduate > Placement. There you will find links to sample problems for each class, and contact information for the Mathematics Placement Officer and Associate Director of Undergraduate Study, who can provide further guidance.

-uwip & psps
The student organization formerly known as Undergraduate Women* in Physics (UWiP) is undergoing structural changes this academic year with the goal of embracing an intersectional approach to activism that better serves all underrepresented minorities within the physics community. Rather than focusing solely on gender minorities, the organization moving forward will work to provide resources, community, and advocacy for all oppressed identities in physics and related fields. We would love as much student feedback as possible in navigating these changes, so please join the discussion by signing up for our listserv to receive more information on how to get involved!

-TORI EDINGTON ’22
UWIP CO-PRESIDENT
-CLAIRE LESSLER ’22
UWIP CO-PRESIDENT

A STATEMENT FROM
UNDERGRADUATE WOMEN* IN PHYSICS

Helpful resources: “Meeting other people in the class through McGraw group tutoring, also individual tutoring that forced me to study and prep ahead of time!”
Anonymous ’23, Astrophysics

“If you think you are likely to be a physics/astro major, the most prudent strategy is probably to start in PHY105 in the first week and potentially move into PHY103 as you see fit. ISC is great and provides a lot of interdisciplinary fun, but it’s ultimately not going to provide you with as strong of a foundation in physics as the more conventional introductory physics classes. (The brutal amount of workload is also quite something for first-years.)”
Allan Shen ’24, Physics

“If you’re interested in majoring in physics but haven’t taken AP Physics C or had a good high school physics course, you will do fine in PHY 103, and you’ll be able to catch up to the rest of your cohort when you take PHY 205 in sophomore fall. That said, PHY 103 was one of the worse physics courses I’ve taken at Princeton, and I’ve heard slightly better feedback about PHY 105. My advice is to take a leap of faith and try out 105; it’s harder, but hopefully you’ll reap better academic & intellectual rewards.”
Claire Lessler ’22, Physics

“I found my study group to be the most accessible resource for working on regularly scheduled assignments (problem sets, labs) and office hours for making sure I have concepts down before exams.”
Maya Chande ’24, Math
“Try to think of yourself first and your preparation for the course you want to take. If you do not feel 100% comfortable and ready for a more advanced course like PHY 105, then there is no reason to feel bad about taking PHY 103. Be honest with yourself and take the course that is more suitable for YOU. In the end, you will not be missing out on much. You will end up with a more solid foundation suited to what you were ready for, and the advantage you get from taking a higher-level course does not last for too long, anyway. You will benefit more from taking the course you need to take. Study groups were definitely very helpful, as well as office hours, if you go to one where the instructor’s teaching style suits you. I got involved with UWiP (Undergraduate Women in Physics), which is where I met the amazing women that saved my life in this course. Office hours are also quite informative and engaging, so I would suggest you go even if you do not have a particular question in mind. Just hearing what others have to say is very helpful.”

Aseel Bukhari ‘24, Physics

“You should consider what you want to do in your future coursework before selecting your intro physics course. If you want to be a physics major, the rest of the classes in the major definitely assume that you’ve taken 105/106. I knew I wanted to do biophysics so ISC was a great fit - it also set me up really well to take quantum and 301. But, it made it harder to take classes such as 304 in the future.”

Eli Costa ‘22, Physics

“If you’re confused/unsure, don’t be afraid to reach out to the relevant faculty in the department and ask about courses.”

Anonymous ‘24, Astrophysics

PHY 103

* If you take PHY103, the best tip I can give you is to learn some basic MATLAB immediately. If you don’t know what MATLAB is, it’s a programming language used in PHY103/104 labs to make graphs and calculations… To learn MATLAB, MathWorks (the parent company of MATLAB) has a number of self-paced courses that you can complete. MATLAB Onramp is the most elementary class and will give you the basics, and that should be roughly sufficient for PHY103 purposes.”

-Allan Shen ‘24, Physics

“This was the recommended placement for me based on my high school experience (I took AP Physics 1 and 2). I think it was a good fit for me because it covered concepts I was already familiar with but more in depth as well as with more mathematical basis”

Anonymous ‘24, Undecided

“I chose to take PHY 103 based solely on the input of my academic advisor, who told me that given my weak high school background in physics, 103 would be the right choice. I was interested in majoring in either physics or chemistry, so I planned on taking a mechanics class during my first semester. I think PHY 103 was a good fit, but I don’t think it was a particularly good class; the lectures relied heavily on powerpoint/slides as opposed to writing on a chalkboard (this turned out to be a big negative for me), and the homeworks and quizzes were tedious, relying more on rote application of formulas than actual physical understanding. If I could re-do my freshman year, I would take 105 instead”

Claire Lessler ‘22, Physics

“I had never taken a calculus-based physics course before, so I decided to go with PHY 103. I think it was the right choice because the content was already very encompassing, and the course itself was challenging enough to keep me engaged all semester. It totally changed the way I thought about physics problems and how I approached them.”

Aseel Bukhari ’24, Physics
STUDENT STATEMENTS (3/6)

PHY 105

“PHY 105 is/was the generic recommendation for people with the AP Physics C credit. Problem sessions and office hours were the most helpful. This might change year-to-year but for 105 I think the quality of instruction is consistently high at problem sessions/office hours. Unless you have elite preparation (and often even if you do), physics classes as a freshman are hard. It’s ok.”

Anonymous ‘22, Physics

“I was told to take [PHY 105] in the class fair; I had initially wanted to be ambitious and take PHY205, but I was talked out of it. I had both AP physics C’s, and a math-heavy background, and with that I felt I had all the preparation necessary. In fact, some of the material was redundant from this background, but there was so much more depth and new stuff that I did not really mind the redundancies… Physics 105 is a very challenging class even though it will review much of what you’ve probably seen before; that being said, it is very possible to succeed and get a good grade.”

Anonymous ‘23, Math

“I initially unsure of the magnitude of my interest in physics, I figured it would be best to take a class that was more challenging than what I had been exposed to in AP Physics courses but not so challenging that the course would take too much time away from the subject areas I was more sure of my interest in (potentially the case if I had taken PHY 205). The focus on developing approaches to challenging problems was helpful in gaining a more robust understanding of material that I was already familiar with from previous coursework, which was a comfortable yet enriching place to begin my physics coursework at Princeton.”

Maya Chande ‘24, Math

PHY 205

“If you are keen on experiments, don’t jump 105; by taking 205 sequence literally there are very few physics classes with experiments.”

Anonymous ‘23, Physics

“In high school, I took a classical mechanics course at my local university that was a mix of PHY 105 and PHY 205 in terms of coverage/difficulty, so I definitely felt prepared for the material in PHY 205. Also, I was willing (and had the time) to put in the hours into the psets, which tend to be long (compared to other Princeton psets).”

Anonymous ‘24, Astrophysics

“I wanted to have a solid foundation of Lagrangian Mechanics and Hamilton Formalism. In that respect, this class was a good fit for me. However, I wish we had covered the canonical formalism chapter of Landau more in-depth. Nevertheless, the course has a good structure and I think Prof. Giombi did a good job despite the unusual semester conditions. I would definitely recommend checking Prof. Giombi’s office hours. He doesn’t hesitate to delve deep into the question that is asked. Other than that, pset groups help a lot as well. I had a background in physics and problem solving that I acquired through my physics olympiad ventures in high school. So taking phy205 in the first semester was a smooth process for me. However, I believe anyone with an intermediate experience of Newtonian Mechanics, linear algebra and calculus can take the class without a problem.”

Emre Parmaksiz ‘24, Math

“In high school, I took a classical mechanics course at my local university that was a mix of PHY 105 and PHY 205 in terms of coverage/difficulty, so I definitely felt prepared for the material in PHY 205. Also, I was willing (and had the time) to put in the hours into the psets, which tend to be long (compared to other Princeton psets).”

Anonymous ‘24, Astrophysics
STUDENT STATEMENTS (4/6)

ISC

“I chose ISC because I wanted maximum flexibility when it came to choosing a major. I knew I wanted to major in a science, but was undecided between physics, chemistry, biology, and computer science. I also wanted to focus on interdisciplinary science, which ISC is great for but regular physics classes are not. It was a great fit for me - I got to learn about the intersection of physics and biology while forging close relationships with professors who worked in the areas I was interested in, and who I still work with today. I also got exposed to molecular biology labs, which are critical for biophysics but very different than labs you find in other intro physics classes. ISC is very time consuming and you really get to know everyone else in the class very well while working on problem sets and lab reports. There is tutoring every day of the week in Icahn, and weekly problem sessions with TAs that really help with understanding concepts and getting work done.”

Eli Costa ’22, Physics

MAT 104

“Because I was interested in physics and chemistry, I knew I had to take more math courses in college—and anyway, I had really enjoyed my high school math courses and wanted to continue. I had only taken AP Calculus AB in high school (BC wasn’t offered), so I started out in MAT 104, or Calculus 2. I think 104 was a great fit for me; if I had skipped straight to 201, I would have missed out on some key mathematical concepts, like Taylor series and basic approaches to ordinary differential equations, which turned out to be vital to my physics degree.”

Claire Lessler ’22, Physics

“Don’t retake any courses that you took in high school (i.e., don’t take MAT 103 if you’ve already taken AP Calculus AB). Take the next course available that you haven’t yet taken, and don’t feel pressured to skip ahead. The material taught in the introductory math courses is foundational to many analytical/mathematically oriented majors, and you don’t want to build on a flimsy foundation. Finally, try not to be intimidated by some of the harsh reviews for intro math classes. There are positive reviews, too: for me, MAT 104 was one of the best courses I’ve taken at Princeton, and it helped convince me to become a physics major.”

Claire Lessler ’22, Physics

“Any math course you take will be hard. It’s totally normal to retake a math (ex. you took Calc BC in high school, but you take MAT104 at Princeton). You’ll have a much more intense and thorough foundation in any math class you take here.

Anonymous ’24, Undecided

APPENDIX
“Instructor office hours were amazing. I didn’t go as often at the beginning but once I realized that they literally go through any question you ask them and tell you how to do it or at least give you good suggestions and point you in the right direction I went every time and asked them all my questions. We also had a zoom meeting most weeks where we checked answers with each other which was very helpful. People also asked and answered questions in the groupme groupchat which was really helpful as well.”

Anonymous ’24, Computer Science BSE

“I went to a high school that did not offer any calculus courses at all, so I was forced to teach myself Calc 1 so that I would at least have the preparation for Calc 2 by my first semester. Having a solid foundation in math is extremely important, so I decided not to rush things and take MAT 104. I think I made the right move because I ended up using a lot of that content later on. I was able to catch up with my classmates easily as well, since I took a summer course in the material that I needed. I also took MAT 215 the following semester, and I was completely prepared for it, so I definitely do not regret it.”

Aseel Bukhari ’24, Physics

MAT 201

“I took MAT201 because I had already taken AP Calc BC, and MAT203 wasn't offered during my first semester. That said, I did take a "203-style" section of this course, and really enjoyed it! It definitely included some more challenging material than a normal 201 section. Some of this extra material was really interesting, but I did find that some of it went completely over my head. If you did well in calculus and are looking for a bit more challenge, but know you don't want to be a math major, I would recommend MAT203 (even though I didn't technically take it).”

Anonymous ’24, Physics

MAT 215

“Problem session was the most helpful: the TAs for MAT 215 are undergrads who took it and there is a strong legacy of students which are very helpful to the next generation of MAT 215 students.”

Anonymous ’22, Physics

MAT 201

“I took MAT201 because I had already taken AP Calc BC, and MAT203 wasn't offered during my first semester. That said, I did take a "203-style" section of this course, and really enjoyed it! It definitely included some more challenging material than a normal 201 section. Some of this extra material was really interesting, but I did find that some of it went completely over my head. If you did well in calculus and are looking for a bit more challenge, but know you don't want to be a math major, I would recommend MAT203 (even though I didn't technically take it).”

Anonymous ’24, Physics

MAT 215

“Problem session was the most helpful: the TAs for MAT 215 are undergrads who took it and there is a strong legacy of students which are very helpful to the next generation of MAT 215 students.”

Anonymous ’22, Physics

MAT 216

“I had previously taken college-level proof-based math classes, which was definitely a necessary prerequisite, but also happened to be sufficient — I felt completely prepared for the class. I found some of the material redundant, but nonetheless difficult — it's always nice to review tough material in greater depth… Office hours were essential — the problem sets are difficult but not at all impossible, yet oftentimes the concepts can be tough to grasp, so having the professor review them is quite useful.”

Anonymous ’23, Math

“If they are still using Gunning's book, there is so much inside that no teacher should be able to cover everything; so reading the textbook is necessary.”

Anonymous ’23, Physics

“Because I had some background in proof-based math, I was interested in taking MAT 203, but it wasn't offered in the Fall 2020 semester. However, I still thought the material in MAT 201 was interesting and challenging. I ended up taking MAT 204 in the spring and really enjoyed it, so I think MAT 203 would've been a better fit for me.”

Anonymous ’24, Astrophysics

APPENDIX
“Nearly the entire cohort had a prior rigorous math background that they acquired either through math olympiads or just by keen interest. So most of the people were familiar with the topics we covered. If you take this class and mat218, it will be definitely rewarding for you. But definitely talk to Prof. McConnel before taking the class to see if you can manage it through. If not, this heavenly paradise of 216 can turn into a hellish spiral.”

Emre Parmaksiz ’24, Math

“Math was my primary interest going into freshman year, and it continues to be so, largely due to this course. While I was likely less experienced in proof-based math than most of my peers, I felt it was certainly manageable given a genuine interest and motivation to engage with the content deeply. I felt that the work I put into the course rewarded me with a heightened curiosity for pure math, a healthy level of confidence with proof-writing, and a strong foundation to approach a variety of higher level math classes in the future.”

Maya Chande ’24, Math