Orientation Information for Physics and Astronomy Majors

For general information and help selecting your fall schedule, contact:

Joe Weingartner (call me Joe)
jweinga1@gmu.edu
(After you've enrolled at GMU, please only email me from your GMU email account. University policy prohibits professors from responding to student email from other accounts.)
http://physics.gmu.edu/~joe/
Schedule an appointment through Patriot Connect: https://plan.connect.gmu.edu/home/students/

Degree Requirements

If you are majoring in physics, you have the option of doing a concentration in one of the following: astrophysics, computational physics, or applied & engineering physics. Or you can do no concentration. Regardless of your choice, the courses are identical in the first semester, so freshmen don't have to decide yet. The astronomy major does not have concentrations.

Degree requirements are divided into two groups: major and Mason core courses. The major requirements are detailed here:

https://catalog.gmu.edu/colleges-schools/science/physics-astronomy/physics-bs/#requirementstext

https://catalog.gmu.edu/colleges-schools/science/physics-astronomy/astronomy-bs/#requirementstext

The Mason core consists of multiple different categories. For each category, you select 3 credits (usually one course) from a list of approved courses. Your major requirements satisfy 5 of the Mason core categories: quantitative reasoning, information technology & computing, natural science, writing intensive, and Mason apex. So, you can ignore those categories. That leaves the following 8 categories that you need to consider apart from your major courses: written communication (lower-level), oral communication, arts, global contexts, global history, literature, social & behavioral sciences, written communication (upper-level). The lists of courses that satisfy each Mason core category are here:

https://catalog.gmu.edu/mason-core/

Note: If you are an Honors College student, your Mason core requirements are reduced, partially replaced with Honors College requirement. Your Honors College advisor will help you navigate these requirements.

In addition to satisfying the course requirements for your major and the Mason core, you also need to earn at least 120 total credits and 45 upper-level credits (course number 300 or higher) to graduate. Since the total number of credits you will need to satisfy your major and Mason core requirements is less than 120, you can choose to add another program to your degree (a second major or a minor) or take general elective courses, which could be on any topic that interests you. General elective courses could be additional courses related to your major, if you like. I teach the following courses that you could take as general electives and would be thrilled to have you in class (let me know if you're interested and have questions!):
RENE 131: Introduction to Renewable Energy (3 credits)
PHYS 122: Inside Relativity (1 credit)

PHYS 123: Inside the Quantum World (1 credit)

The list of available minors is here: https://catalog.gmu.edu/programs/#filter=.filter_29

If you'd like to do a minor that complements your major, I can give you suggestions, based on your post-graduation goals. Or you can do a minor in a completely unrelated area that interests you.

Steps for Course Selection

1. Determine what courses you already have credit for, if any. If you have already sent the records of these courses to GMU (AP credits, credits from other colleges/universities, etc.), then you can check your Degree Audit or unofficial transcript in Patriot Web to see if they are on your record. Log into Patriot Web, using your GMU login and password (same as for your GMU email), here:

https://patriotweb.gmu.edu/

Instructions for how to access and understand your Degree Audit and unofficial transcript here:

https://registrar.gmu.edu/degreeaudit/for-students/

https://registrar.gmu.edu/topics/unofficial-transcript/

There's a time delay from when the admissions office receives credits until they are reported to the registrar's office and applied to your record, so don't panic if you recently sent course records but don't see them on your Degree Audit yet. For information on how to inquire about missing transfer credits, or to request that credits transfer in as a different course than GMU determined, see https://www.gmu.edu/transfer/credits

If you have not yet sent course records to GMU, or if you have but they aren't on your record, there are a couple online resources where you can check what GMU courses you'll get credit for.

To see what course credit you'll receive at GMU from your AP, IB, CLEP, etc. exam scores: https://www.gmu.edu/freshman/requirements/exam-credit

If you've taken courses at other colleges (including dual enrollment), this page will tell you what course credit you'll receive here when you transfer the courses in:

https://transfermatrix.admissions.gmu.edu/

Not all courses at other schools are on this list, so let me know if you've taken a course that does not appear here. If you've taken courses within the Virginia Community College system, click here for faster results:

https://transfermatrix.admissions.gmu.edu/?state=VA&school=USVCCS&course=View%20All#transfer_credit_search_form

2. Download the degree requirement checklist for your major.

Astronomy: http://physics.gmu.edu/~joe/DS_ASTRO_BS_25-26.pdf

Physics (no concentration): http://physics.gmu.edu/~joe/DS_PHYS_BS_25-26.pdf
Physics (applied/engineering): http://physics.gmu.edu/~joe/DS_PHYS_BS_APPL_25-26.pdf
Physics (astrophysics): http://physics.gmu.edu/~joe/DS_PHYS_BS_ASTRO_25-26.pdf
Physics (computational): http://physics.gmu.edu/~joe/DS_PHYS_BS_COMP_25-26.pdf

If you already have credits for any of the requirements (step 1 above), check them off now! You can check if a course satisfies a Mason core category by searching for it in the GMU catalog:

https://catalog.gmu.edu/

Click on "Course" and enter the course prefix and number (for example, MATH 113) in the search bar. The resulting catalog entry will provide basic info about the course, including which (if any) Mason core categories it satisfies.

3. Download the sample schedule which best fits your circumstances (major, freshman/transfer) from the options here: http://physics.gmu.edu/~joe/Sample-schedules.html
These are just samples. They don't account for every possibility, so your schedule could be different. But they are usually a helpful guide.

4. Select your math course(s), unless you've already completed all the required math courses.
For both physics and astronomy majors, Calc I is a prerequisite (usually abbreviated "prereq," a course which you must take prior to the course for which it's a prereq) for nearly all of the other major courses. So, figure out your math course first.

If you've already earned credit for Calc I or beyond (for example, with a sufficient grade on an AP exam or from a transfer course), then you can register for the next course in the sequence (MATH 113 Calc I, MATH 114 Calc II, MATH 213 Calc III, MATH 214 Differential Equations and/or MATH 203 Linear Algebra). If you've earned math credit but it hasn't appeared on your Degree Audit/transcript yet, then you can request a prereq override from the math department so that you can register for the next course in the sequence. Online request form here:
https://science.gmu.edu/academics/departments-units/mathematical-sciences/majors-and-minors/course-override-request

If you've already earned credit for a calc course but don't feel that you learned it solidly, then you should take it again here.

If you don't yet know if you have earned math credit (for example, you haven't received your AP score yet), assume that you did not earn the credit and register accordingly. You can change your registration later if your AP score comes in high enough.

Note: There is a 2-semester sequence, MATH 123 and 124, which is equivalent to MATH 113 (Calc I). If you have credit for MATH 123 (for example, from an AP exam score of 3), then you can register for MATH 124.

If you have not already earned credit for MATH 113 (Calc I) or 123 (Calc I part 1) or beyond, then you should either take precalc (MATH 105) or Calc I (MATH 113) or Calc I part 1 (MATH 123). In this case, you'll need to take the math placement test in order to register. Info on the math placement test is here:
https://science.gmu.edu/academics/departments-units/mathematical-sciences/mathematical-sciences-

testing-center

Alternatively, there is a self-paced online algebra tutorial course, MATH 008, that you can take without taking the math placement test. Once you complete MATH 008, then you can register for MATH 105. Info on MATH 008 here:
https://science.gmu.edu/academics/departments-units/mathematical-sciences/math-tutoring/math-tutorials-schedule-and

Note: When you register for MATH 113, 114, 213, or 214, you will need to register for both a lecture section and an associated recitation section. (The recitation meets once a week, usually with a smaller group of students than in the lecture section, for more one-on-one interaction with the instructor and classmates.) For example, in fall 2026, if you register for lecture section 001 of MATH 113, then you will also need to register for recitation section 311 or 312. You can't register for lecture section 001 and any of the other recitation sections besides 311 or 312, because those other recitation sections are associated with different lecture sections, not section 001. For example, recitation section 306 is associated with lecture section 003.

5. Select physics and/or astronomy courses, if applicable. The first course in the required physics sequence, for both physics and astronomy majors, is PHYS 160 or 170 (lecture) and 161 (lab). Note that the lecture and lab are separate courses and you will need to register for both. If necessary, you can take the lab course in a later semester than the lecture course, but it is preferable to take them in the same semester. As with the calc courses (see item 4 above), most (but not all) sections of PHYS 160 have an associated recitation section. If the lecture section you select has an associated recitation section, then you must register for both the lecture section and one of the recitation sections that is associated with that lecture section.

Since Calc II (MATH 114) is a coreq for PHYS 160, you can only take PHYS 160/161 in the fall if you also take MATH 114 or beyond. (If course *A* is a coreq for course *B*, then you can only take *B* if you've already taken *A* or are taking *A* at the same time as *B*. Confusing, the GMU catalog indicates coreqs as prereqs, but with an asterisk stating "may be taken concurrently.") Understandably, physics and astronomy majors often want to take some sort of physics in their first semester, so we offer PHYS 122 and 123. These are both 1-credit, half-semester courses (122 the first half and 123 the second half) that cover relativity and quantum physics at a non-mathematical level. They are not required for the major, but they do count as general electives. So, depending on the math course you take in the fall, the most probable physics course(s) you should take would be:

MATH 105 or 113:	PHYS 122 and/or 123 or no physics
MATH 114:	PHYS 160 and 161
MATH 213:	PHYS 251 and 260 and 261

Transfer students might take multiple higher-level physics and/or astronomy courses in the first semester, depending on which specific courses are being transferred in. You can use your requirement checklist and sample schedule (items 2 and 3 above) as a guide. You can see which physics and astronomy courses are offered each semester here:

http://physics.gmu.edu/~joe/course-schedule.pdf

Note that the intro-level astronomy courses for astronomy and physics majors, ASTR 124 and 210, are only offered in spring semesters.

6. With your math and physics selections complete, it's time to round out your schedule with Mason core courses and/or courses to satisfy a minor or second major (if you'd like to do one of these) and/or general electives. You'll probably want to aim for 14 or 15 credits total in your first semester. You need to take at least 12 credits to have full-time student status. For freshmen, I usually recommend taking ENGH 101 as one of your Mason core courses during your first semester (unless you already have credit for it), but you can take it in a later semester if you prefer. In general, use your degree requirement checklist and sample schedule as a guide.

7. Once you've selected the courses you'd like to take in the fall, you can use Patriot Web (link in item 1 above) to schedule them. The first item in this list of Patriot Web tutorials will guide you through the course registration process:

https://registrar.gmu.edu/students/patriot-web-tutorials/

The scheduling tool will search for sections of the courses that do not conflict with each other and offer you various possibilities, showing you what your full course schedule will look like each day of the week. It might not be possible to construct a schedule containing all of the courses you want. One or more might not be offered this semester, or might be full. Or, there might be a time conflict between two or more of the courses. In the case of conflicts, always prioritize math and physics. If you can't get all of the courses you wanted, search for suitable alternative courses.

Additional Information

1. My website: http://physics.gmu.edu/~joe/ has numerous links to help you with all aspects of your student experience, including the above links related to course selection and registration. Please check it out! Scroll down until you reach the section "GMU Links."

2. Meet and collaborate with other physics and astronomy majors in the student lounge (Planetary Hall room 220A), located across from the department office (Planetary Hall room 203). Ask at the desk in the department office for the code to the student lounge.

3. Participate in events at the GMU Observatory:
https://science.gmu.edu/academics/departments-units/physics-and-astronomy-department/observatory

4. Join one or more of the department's student groups:

(a) The Physics and Astronomy Society
(b) Spectrum (https://gmuspectrum.squarespace.com/ , spectrum.mason@gmail.com)
(c) The Friends of the Observatory ("FOTO")

You can join these also find other student groups through Mason 360:
https://mason360.gmu.edu/home_login

5. Join Spectrum's peer mentoring program: https://gmuspectrum.squarespace.com/mentorship

6. Take advantage of free tutoring in physics and math. For physics tutoring, see info outside the department office (Planetary Hall room 203) or here:
https://science.gmu.edu/academics/departments-units/physics-and-astronomy-department/tutoring

For the Math Tutoring Center:
https://science.gmu.edu/academics/departments-units/mathematical-sciences/math-tutoring/tutoring-center-hours-and

7. If you're taking PHYS 160 (University Physics I), you can find helpful resources here:
http://physics.gmu.edu/~joe/PHYS160/PHYS160.html
(username = elephant, password = dandelion)
This includes tutorials that guide you step-by-step through problem solving, numerous practice problems and solutions, and videos of solutions.

8. Practice math! Math is the biggest stumbling block for most students in intro physics. Regardless of your math background, I recommend that you work through some of the problems in this online precalc book: https://sites.math.washington.edu/~m120/TheBook/TB2010-11.pdf
This book covers basic math in a way that's especially useful for physics and astronomy. If the problems are too hard, try reading the chapter and/or working earlier problems, or let me know. I particularly recommend the following problems: 1.10, 12, 13; 2.3, 5, 6, 7; 3.2a, 3.4, 3.5, 3.6, 3.8; 4.9, 11, 14, 15, 16a; 5.10c; 6.5; 7.7, 10; 8.3; 9.5, 6, 8a; 10.5; 11.4; 12.1, 2, 3, 5, 8(b, c, d), 10; 15.8, 9 (bottom picture only); 17.3, 4a, 10; 18.6b, c; 19.1(a, b), 4a, 5; 20.5.
I also recommend that you work through the math resources ("Math Background" and "Math Practice") in the PHYS 160 link in item 7 above.

9. Don't be afraid to ask for help, and don't wait to ask!

Here's a response I gave in an interview with a student. I'm somewhat embarrassed to include it, since I was not well spoken, but I really want to get this point across, so here it is.

What kind of advice would you give to physics students to help them feel like they belong in physics?

I think there are a lot of reasons why a student might feel they don't belong, but I can tell you the one that I've encountered the most from my interactions with students, and that is that they're just struggling in their coursework, and they come to me and they say… "I don't know if I can do this. … I just don't know if I have what it takes to succeed in this curriculum in this major." And so … my advice is, basically, you need to not be afraid to ask for help. What often happens is they come to me, maybe in the middle of the semester, and say, "I've been lost from day one." I'm like, "Why didn't you come on day one and ask?" And a lot of the times, the response is, "Well, I felt like I didn't even know what my problems were. I didn't even know how to formulate a request for help, and so I didn't feel comfortable doing it." And I said, "Look, you've got trained educators. You have your course instructor, your teaching assistant, your learning assistant, free tutors on campus, your academic advisors. We know, even though you don't know how to formulate what your problems are, we know how to spot it. We know how to formulate it. We know how to help you with that." And so, yeah, basically to try and get that word out to students before it gets to that point, because a lot of the times it's too late, at least for that course, by the time they seek help, their grades are just too far down, you know, in the sewer, to ever come back up and pass the course.

10. It's never too early to start thinking about potential careers. See the following for info on physics and astronomy careers:
https://jobs.physicstoday.org/careers/
https://aas.org/careers/career-resources