Proposal to modify the Astrophysics Minor

Our current Astrophysics Minor typically enrolls a few students each year, mainly drawing from students in engineering majors. More students express interest in the minor, but do not pursue it because it is hard to fit all the required courses into their schedule and requires advanced planning. We propose to modify the requirements for the existing Astrophysics Minor program to make it more flexible for students, while still guaranteeing a solid foundation in astrophysics.

The existing curriculum for the minor requires 15-17 credit hours as follows:

Required courses:

Phys 223 or Phys 224—General Physics III	Fall, Spring	(3-4 credits)
Phys 360—Introduction to Astrophysics	Spring	(3 credits)

Pick three courses (9-10 credits) from the following:

Phys 361—Observational Astrophysics	every other Fall	(4 credits)
Phys 403—Relativity	3 semester rotation	(3 credits)
Phys 460—Stellar Astrophysics	3 semester rotation	(3 credits)
Phys 461—Extragalactic Astrophysics	3 semester rotation	(3 credits)

This sequence requires 15-17 credit hours depending on selection and is currently difficult to complete due to the infrequent offering of the upper-level astrophysics courses. To fit all this in, students generally need to begin the requirements within 5 semesters of graduation. Phys 403 is also not a very practical course for the minor—it is a difficult course that requires Math 251 and Phys 308 as prerequisites, which are not otherwise required for the minor.

We propose that the new requirements be:

Required courses:

Phys 223 or 224—General Physics III	Fall, Spring*	(3-4 credits)
Phys 360—Introduction to Astrophysics	Spring	(3 credits)

Pick 6-10 credits from the following:

Phys 361—Observational Astrophysics	3 semester rotation	(4 credits)
Phys 460—Stellar Astrophysics	3 semester rotation	(3 credits)
Phys 461—Extragalactic Astrophysics	3 semester rotation	(3 credits)

Pick 0-3 credits from the following:

Any 300+ level Phys course

*Note that Phys 223/224 may in the future be offered as a Fall only class, and the prereq for Phys 221 removed.

For a minimum of 15 total credit hours.

With this structure, students would learn a basic curriculum in modern physics (Phys 223 or 224), basic astrophysics (Phys 360), and take at least two of the other upper-level astrophysics courses (Phys 361/460/461). Students could then either take another astrophysics course (Phys 361/460/461) or any other 300+ level physics course of their choosing. This allows them to customize the experience to what works best with their schedule, interests, and academic backgrounds. With these adjustments, students can complete the minor without issue if they begin 3 semesters before their graduation date.

Some classes that would work well for most minor students without requiring any additional prerequisites include:

Phys 304 *(*3 credits)	Thermodynamics & Statistical Physics	Spring
Prereqs: Phys 223 or 224		
Phys 427 *(*3 credits)	Advanced Laboratory	Fall
Prereqs: Phys 223 or 224		
Phys 300 (4 credits)	Instrumentation laboratory	Fall
Prereqs: Phys 221		
Phys 485 (1 credit)*	Colloquium	Spring, Fall
Prereqs: Phys 223 or 224		
*Students may take Phys 485 more than once to meet the credit hour requirement		
Phys 404 (3 credits)	Subatomic Physics	?
Prereqs: Phys 223 or 224		
Phys 491 (1-3 credits)	Undergraduate research	Spring, Fall
Prereqs: None		

Students who have taken Math 252 would also meet the prerequisites for:

Phys 308 (3 credits)	Classical Mechanics	Fall
	Prereqs: Math 252 and (Phys 223 or Phys 224)	
Phys 405 (3 credits)	Fundamentals of Quantum Theory I	Fall
	Prereqs: Math 252 and (Phys 223 or Phys 224)	
Phys 413 (3 credits)	Electromagnetism I	Fall
	Prereqs: Math 252 and (Phys 223 or Phys 224)	

Example course selection:

Example 1: Phys 223 (4 credits), Phys 360 (3 credits), Phys 361 (4 credits), Phys 460 (3 credits), Phys 491 (1 credit) for a total of 15 credit hours

Example 2: Phys 224 (3 credits), Phys 360 (3 credits), Phys 460 (3 credits), Phys 461 (3 credits), Phys 304 (3 credits) for a total of 15 credit hours

Example 3: Phys 224 (3 credits), Phys 360 (3 credits), Phys 361 (4 credits), Phys 461 (3 credits), 2 semesters of Phys 485 (1 credit per semester) for a total of 15 credit hours

Prerequisite Changes
To further streamline the process and include only the most relevant courses, we recommend eliminating (Chem 122/123 or Chem 124) from the perquisite requirements for Phys 360 and 361. This change will allow more students (e.g. Computer Science students, who do not require Chem 124 for their major) to complete the minor without the barrier of taking additional prerequisites.

Other Catalog updates
Phys 361 needs to be updated from being offered every other fall to being offered on a 3 semester rotation. It will be taught in the same semester as Phys 403. This will ensure Goni and Emily will be able to cover all the astro classes offered in a semester, and ensure the minor can be completed in 3 semesters. It will also create more flexibility in scheduling for our major students, which will help with the degree complexity score.

Proposal received 7 yes votes, 0 no votes, in undergrad curriculum committee (Carlo, Emily, Yurii, Pavel, Jeff W, Goni, Bhoopesh)