**Ph.D. Astronomy**

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| Program | Ph.D. in Astronomy |
| Department(s) | Physics and Astronomy |
| College | Sciences |

**1. Student Learning Outcomes for the program.** List the Student Learning Outcomes for the program. *Number for later reference.*

1. understand astrophysics at the graduate level
2. understand EITHER classical mechanics OR quantum theory OR electromagnetic theory at the graduate level
3. understand mathematical physics at the graduate level
4. understand observational astronomy techniques
5. understand astrophysics of gaseous nebulae and active galactic nuclei, and high energy astrophysics
6. understand cosmology at the graduate level
7. understand stellar atmospheres and the interstellar medium
8. perform a graduate research project at the doctoral level
9. communicate scientific research to a scientific audience
10. possess strong background of knowledge and expertise in physics and astronomy

**2. Curriculum Alignment of Student Learning Outcomes.** Where is the information covered in the courses required in the program? At what developmental stage is it covered (Beginning, Middle, or End)?

| Courses in program (required & electives) | Student Learning Outcomes for the Program: 1 (use #s from 1st page) | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| AST 713-714 | M | | | | | | | | | |
| PHYS 702 or PHYS 721 or PHYS 711 | | M | | | | | | | | |
| PHYS 700 | | | M | | | | | | | |
| AST 710 | | | | M | | | | | | |
| AST 721,725 | | | | | M | | | | | |
| AST 727 | | | | | | M | | | | |
| AST 731,747 | | | | | | | M | | | |
| PHYS 796 | | | | | | | | | E | |
| PHYS 799 | | | | | | | | E | E | |
| | | | | | | | | | | |

**B = Beginning, M = Middle, E = End**

B = outcome introduced in beginning of development, such as in introductory course

M = outcome covered in middle stages of development

E = outcome fully developed at the end of career, such as in a capstone course