

Topics at the Frontier of astrophysics

AST 353: unique course id – 46595

Professor Pawan Kumar

T-Th 9:30 A.M. – 11:00 A.M.

Online

- **INSTRUCTOR:** Pawan Kumar – Professor of astrophysics, specializing in exploding stars
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 - **TA:** Boyuan Liu - graduate student in astronomy, specializing in cosmology
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 - **Graders:** Rylie Phillips (undergrad student majoring in physics/astronomy)
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Books (none of these are required)

1. Astrophysics in a Nutshell, Dan Maoz (suggested)
2. Cosmology: The science of the universe, Edward Harrison (suggested)
3. An Introduction to Modern Cosmology, Andrew Liddle (suggested)

Course Description

The goal is to learn about some of the frontier topics in astrophysics. The list of topics we plan to explore together are –

- Cosmology: the big bang origin of the universe, expansion and the future of the universe, dark matter and dark energy, the theory of cosmic inflation and what happened before the big bang, formation of stars and galaxies etc. [12 lectures]
- Einstein's theory of gravity or general relativity, black holes and gravitational waves [8 lectures]
- Powerful explosions and transients: gamma-ray bursts (the death and explosions of massive stars), stars falling into black holes (TDE) and the last signals we have detected from these catastrophic events, fast radio bursts from exotic objects [5 lectures]
- Exoplanets: finding planets outside the solar system, their properties and the search for life around other stars [2 lectures]

Grading

There will be no exam in this course. The grade will be based on homeworks (20%), pop quizzes and class participation (20%), and three term papers (60%).

Each term paper should explore a current topic in astrophysics in depth. The length of the term paper is expected to be between 5 and 10 typed pages, single spacing.

Plus/minus grading will be used for the final grade: 59.0 – 63.6 D-, 63.7 – 66.6 D, 66.7 – 69.6 D+, 69.7 – 72.6 C-, 72.7 – 76.6 C, 76.7 – 79.6 C+, 79.7 – 82.6 B-, 82.7 – 85.6 B, 85.7 – 88.6 B+, 88.7 – 92.0 A-, >92.0 A; **this is only an approximate guideline – the final grade will be determined by a curve and the numerical grade corresponding to a particular letter grade might be ± 7 given above.**