

Physics 129 — Nuclear and Particle Astrophysics

Winter 2014 - TuTh 2:00-3:45 - ISB 231

Instructor: Joel R. Primack, Physics

Office hours: Wednesdays 2-3:30 or by appointment

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The standard model of particle physics, general relativistic cosmology, the early universe and Big Bang nucleosynthesis, dark matter and structure formation, formation of heavy elements in stars and supernovae, neutrino oscillations, high energy astrophysics: cosmic rays and gamma ray astronomy. *Note:* This course is an upper division astrophysics course, and thus can be one of the three such courses that UCSC Astrophysics majors must take.

T e n t a t i v e syllabus:

week topics

- 1 Standard Model of particle physics
- 2 Special and general relativity in the universe
- 3 Conservation rules and symmetries
- 4 The early universe and Big Bang nucleosynthesis
- 5 Dark matter and structure formation
- 6 Nuclear astrophysics, formation of elements in stars and supernovae
- 7 Neutrinos: production, detection, mass, oscillations
- 8 Nature and sources of high energy particles in the universe
- 9 Gamma ray astronomy
- 10 Future prospects and summary

Textbook: *Particle Astrophysics*, 2nd Edition, by D. H. Perkins (Oxford University Press, 2009) [ordered at Bay Tree Bookstore, available cheaper from Amazon, online at the UCSC Science Library]. I have put a number of relevant books on reserve at the Science Library.

There will be additional material presented in lectures and posted online, at <http://physics.ucsc.edu/~joel/Phys129/>

There will be regular problem sets, a midterm, and a final exam. Students will be expected to be familiar with special relativity and quantum mechanics. Physics 101A or 102 is a prerequisite, and Physics 101B or more advanced courses will be helpful.