Astrophysics and Cosmology (77501)
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Part I: Cosmology

- Introduction: Olbers paradox; Hubble expansion; homogeneity and isotropy; big-bang versus steady state; cosmic microwave background.
- A homogeneous universe: Robertson-Walker metric; redshift; horizon.
- Global dynamics: Newtonian cosmology; Friedmann equations; solutions with and without a cosmological constant; age of the universe.
- Classical cosmology: geometry of the universe
- Observational cosmology: measuring the expansion rate, the density and age of the universe; measuring cosmic acceleration by supernovae.
- Hot big bang model: The Cosmic Microwave Background: plasma era; recombination; decoupling; the last-scattering surface; Big-Bang Nucleosynthesis; thermal history.
- Structure formation: initial conditions; gravitational instability; spherical collapse; hierarchical clustering; cosmological simulations; Galaxy formation: dissipative collapse; cooling; feedback.

Part II: Stellar systems and galaxies

- Galaxies: introduction, galaxy types, stellar populations
- Galaxies: structure, dark matter

Part III: Stars

- Stars: Introduction and general considerations
- The physics of stellar structure: equations and physical processes
- The structure of main sequence stars and pre-main-sequence evolution
- Post main sequence evolution and supernovae
- Final stages of stellar evolution: white dwarfs, neutron stars and black holes