Astrophysics (Dr. Nir Shaviv)

- Measuring stellar properties: Distances, luminosity, mass, flux, magnitude, color, spectral type, color magnitude diagram, H-R diagram.
- Properties of the Sun: Observations, structure, activity, magnetic fields, variability.
- Basic Behavior of Stars: Kelvin-Helmholtz time scale, Burning Time scale, Virial Theorem and usage, hydrostatic equilibrium, sources of pressure in stars (thermal, degenerate, radiation).
- Polytropes, and usages: Sun, White Dwarfs.
- Basic radiative transfer and convection. Equations of stellar structure.
- Homologous stars.
- Thermonuclear Reactions in Stars (Gamow peak, PP and CNO processes, late stages of burning)
- Key points in Stellar Evolution (formation, evolution, late stages, death, compact objects).
- On double stars. (observation, evolution)

Cosmology (Prof. Yehuda Hoffman)

- Introduction: Olbers paradox; Hubble expansion; homogeneity and isotropy; big-bang versus steady state; cosmic microwave background.
- A homogeneous universe: Robertson-Walker metric (open, at, closed); redshift; hori- zon.
- Global dynamics: Newtonian cosmology; Friedmann equations (from General Relativity); 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 (Ia).
- Hot big bang model: The Cosmic Microwave Background: plasma era; recombination; decoupling; the last-scattering surface; Big-Bang Nucleosynthesis; thermal history.
- Dark Matter: the matter density via velocities (rotation in galactic halos, virial equilibrium in clusters, cosmic ows); gravitational lensing; baryonic dark matter; hot and cold dark matter.
- Structure formation: initial conditions; gravitational instability; spherical collapse; hierarchical clustering; cosmological simulations.
- Galaxy formation: dissipative collapse; cooling; feedback.
- Anisotropies in the Cosmic Microwave Background Radiation: observations; cosmological parameters.
- The standard model of cosmology: inflation