

1. Subject Code: EP-316
2. Contact Hours :
3. Examination Duration (Hrs.) :

Course Title: **Cosmology and Astrophysics**

L : 3 T : 1 P : 0

Theory : 3 Practical : 0

S. No.	Contents	Contact Hours
1.	Our place in the Universe: A tour of the Universe, its scale and contents (e.g. planets, stars, galaxies and the interstellar medium). Observational astronomy: the electromagnetic spectrum; geometrical optics (ray diagrams, focal length, magnification etc); diffraction (resolving power, Airy disc, diffraction limit etc); telescopes (reflecting, refracting, multi-wavelength).	12
2.	Properties of stars: brightnesses (luminosities, fluxes and magnitudes); colours (blackbody radiation, the Planck, Stefan-Boltzmann and Wien laws, effective temperature, interstellar reddening); spectral types; spectral lines (Bohr model, Lyman & Balmer series etc, Doppler effect); Hertzsprung-Russell diagram; the main sequence (stellar masses, binary systems, Kepler's laws, mass-luminosity relations); distances to stars (parallax, standard candles, P-L relationships, m-s fitting etc); positions of stars (celestial sphere, coordinate systems, proper motions, sidereal and universal time).	12
3.	The life and death of stars: energy source (nuclear fusion, p-p chain, triple-alpha, CNO cycle, lifetime of the Sun); solar neutrinos; basic stellar structure (hydrostatic equilibrium, equation of state); evolution beyond the main sequence; formation of the heavy elements; supernovae; stellar remnants (white dwarfs, neutron stars, black holes, degeneracy pressure, Schwarzschild radius, escape velocities). Planets & life in the Universe: formation of the stars and protoplanetary discs (molecular clouds, Jeans mass); contents of the solar system; planetary and cometary orbits; equilibrium temperatures; extrasolar planets (Doppler wobble, transits, microlensing; prospects); search for life elsewhere; SETI. Galaxies: Constituents of galaxies; stellar populations; the interstellar medium; HII regions; 21cm line; spirals and ellipticals; galactic dynamics; galaxy rotation curves and dark matter; active galaxies and quasars.	10
4.	Cosmology: Galaxies and the expanding Universe; Hubble's Law; the age of the Universe; the Big Bang; cosmic microwave background (blackbody radiation); big bang nucleosynthesis (cosmic abundances, binding energies, matter & radiation); introductory cosmology (the cosmological principle, homogeneity and isotropy, Olber's paradox); cosmological models (critical density, geometry of space, the fate of the Universe); dark energy and the accelerating Universe.	8
	Total	42

4. Relative Weight : CWS : 25 PRS : 0 MTE : 25 ETE : 50 PRE : 0

5. Credits :

4

6. Semester :

EVEN

7. Subject Area :

DEC-4

8. Pre-requisite :

Nil

9. Objective :

Acquire in depth understanding of Astronomy and

cosmology

10. Details of Course:

11. Suggested Books

S. No	Name of Books, Authors	Year of publication/reprint
1	Zelik & Gregory, <i>Introductory Astronomy & Astrophysics</i> , (Saunders College Publishing)	4th ed