

PHYS01GE1B: SPACE, TIME AND THE UNIVERSE

(Interdisciplinary)

Credits: 6 (Theory-05, Tutorials-01)

Theory Credit: 5

Contact Hours per Week: 5

Historical and cultural perspective of our view of the Universe [15]: Traditional astronomy in ancient culture, Greek Astronomy, Astronomy in literature, music and arts, the Copernican revolution and its impact, Science Fiction and its impact

Our changing concept of Space and Time [25]: Macroscopic concept of space and time: Newton and Galileo, Concept of inertia, Newtons laws of motions and their scientific and philosophical implications, Newtons law of gravitation, Concept of unification of physical laws, Kepler's laws and planetary motions, Galilean invariance, Arrow of time and the concept of entropy, Maxwell's electromagnetism and the concept of special relativity, postulates of special relativity, length contraction and time dialation, changing concept of space and time, Inertial and gravitational mass, equivalence principle, general theory of relativity, gravitational timedialation, Microscopic concept of space and time: Failure of classical physics, Wave particle duality, uncertainty principle, road to quantum mechanics, Copenhagen interpretation, Einstein-Bohr debate, Quantum Reality, zero point energy relativity and quantum mechanics, concepts of fields, vacuum energy, fundamental interactions, unification and the standard model, Higgs Boson and the fundamental notion of mass, Quantum Mechanics and General Relativity

Modern view of the Universe [15]: Physical basis of Einstein's field equations, cosmological principle, geometry of the universe, scale factor, redshift, expansion of the universe, idea of cosmological constant, Hubble's law, Big Bang theory, Cosmic microwave background, content of the Universe, Dark Matter and Dark energy,

Observational Status and modern day Astrophysics [20]: Astronomical observations, multiwavelength astronomy: optical, radio, X-ray, Gamma Ray Telescopes and their design, Stellar evolution and stellar spectra, end stages of stellar evaluation: white dwarves, neutron stars, Pulsars and their importance in astronomy concept of astrophysical black holes, solar system and extra-solar system of planets, galaxies and active galaxies, distance scales in astronomy, gravitational waves and a new window of astronomy