COURSE DETAIL

PRINCIPLES OF ASTRONOMY AND ASTROPHYSICS
Country Italy
Host Institution University of Bologna
Program(s) University of Bologna
UCEAP Course Level Upper Division
UCEAP Subject Area(s) Physics
UCEAP Course Number 105
UCEAP Course Suffix
UCEAP Official Title PRINCIPLES OF ASTRONOMY AND ASTROPHYSICS
UCEAP Transcript Title PRINCIPLS ASTRONOMY
UCEAP Quarter Units 6.00
UCEAP Semester Units 4.00

Course Description

The course provides fundamental and exhaustive knowledge regarding the main aspects of astronomy and astrophysics, including up-to-date topics (e.g. extrasolar planets and astrobiology, black holes, dark matter, dark energy). The course focuses on the following main topics: from positional astronomy to the solar system, stars, galaxies, and cosmology. Topics covered include: basic spherical astronomy (solid angle, great circle, spherical triangles, shape and size of the Earth, Eratosthenes experiment), terrestrial coordinates (latitude, longitude), celestial coordinates, Doppler effect, perturbation of coordinates (precessions, nutation, parallax, proper motion, aberration), the motion of planets (including historical background), the Kepler laws, the Earth (properties, seasons, tides), the Moon (properties, motion), solar and lunar eclipses, the Solar system (planets), and notions on extrasolar planets, the electromagnetic spectrum, astronomical observations (terrestrial atmosphere, astronomical sites, seeing, adaptive optics), telescopes (reflection and refraction optics, submm-mm, radio, space telescopes, HST, Herschel, Planck, X-ray telescopes), astronomical data (images, spectra), radiation from astrophysical objects (luminosity, spectra, flux, 1/r^2 law), apparent magnitudes and Pogson law, color indices, extinction and atmospheric extinction, absolute magnitudes, black-body radiation, Planck, and Wien laws, relation between black-body and color indices, Stefan-Boltzmann law, atoms and radiation (electronic transitions, hydrogen atom, types of spectra, emission and absorption lines, continuum spectra, emission nebulae, 21 cm transition, basic thermodynamics), the classification of stars and relation with black-body, types of stellar spectra and absorption lines, luminosity classes, Hertzsprung-Russell diagram, binary stars (visual, photometric, spectroscopic, astrometric), mass of visual binary stars, the luminosity-mass relation, the four equations of stellar structure, energy transfer mechanisms, energy production in stars and timescales, thermonuclear reactions, proton-proton chain, CNO cycle, triple-alpha reaction, stellar evolution (HR diagram, time on main sequence, mass and internal structure), open and globular clusters, age estimate with HR diagrams evolution of low-mass stars, evolution of high-mass stars (Novae, Supernovae, Pulsars, Black Holes), interstellar medium (gas phases, composition, types of nebulae, H II regions,

molecules, dust, star formation, chemical enrichment), our galaxy (properties, structure, components, observations across the electromagnetic spectrum, stellar populations, spiral structure, star formation, differential rotation, bulge, rotation curve, dark matter, central black hole, the local Group), galaxies (Hubble classes, colors, spectra, Schechter function, luminosity functions, spirals, ellipticals, starbursts, merging, large scale structure, groups, clusters, galaxy formation), supermassive black holes and active galaxies, basic cosmology (Hubble law, age of the Universe, Big Bang, cosmic microwave background, large scale structure, density parameter, dark matter, dark energy, possible destiny of the Universe). Required reading: FUNDAMENTAL ASTRONOMY by H. Karttunen, P. Kröger, H. Oja, M. Poutanen.

Language(s) of Instruction
Italian

Host Institution Course Number
66702

Host Institution Course Title
PRINCIPLES OF ASTRONOMY AND ASTROPHYSICS

Host Institution Campus
SCIENZE

Host Institution Faculty

Host Institution Degree

Host Institution Department
Matematica

Print