B.K. Birla College Kalyan

Department of Physics

**Certificate Course in Astronomy (2 Credits)**

Introduction to astronomy

* What is astronomy, scope of astronomy, world of amateur and professional astronomers, frontiers

Powers of 10 and structure of Universe

* Presentation based on Phillip Morris book

Indian and Western Astronomers

* Contribution of Aryabhat, Bhaskara I & II, Varahmihir, Lalla,…, Ganesh Daivajnya, Saha, Chandrasekar
* Contribution of Eratosthenes, Copernicus, Tycho Brahe, Kepler, Galileo, Newton, Herschel, Hubble,..

Solar System

* Empirical laws, composition of planets, asteroids, comets, formation of solar system

Evolution of stars

* Birth of stars, HR diagram, spectral classes, fusion reactions, mass-life span relation, red giants, white dwarf, supernovae, neutron stars, pulsars, black holes

Constellations and Calendar Systems

* Time scale, sidereal and tropical year, lunar month, lunar year – solar year difference, intercalary months, shifting of seasons due to equinox, Indian National Calendar

Optics and observatories

* Basics of telescopes, different observatories in the world and their specialities

Astronomy through the History

* Development of astronomical concepts through the history of mankind and simultaneous development of Human thought

Universe through Hubble’s eye

* Appreciating and understanding the universe through HST pictures

Space Probes

* Various space probes to Moon, Mars, Sun, Inner and Outer planets

Intelligent life in outer world

* What is life, requirements of life, why earth could harbor life and sustain it so long?, what is intelligent life, Drake equation

Evolution of Universe

* Various models of cosmology (hot and cold big bang, big bounce, steady state, quasi steady state model, multiverse)

References:-

1. "Astronomy: A Beginner's Guide" by Fred Hoyle, Penguin Books, 1966
2. "The Universe in a Nutshell" by Stephen Hawking, Bantam Books, 1988
3. "Cosmos" by Carl Sagan, Random House, 1980
4. "Powers of Ten" by E.O. Wilson, W.W. Norton & Company, 1990
5. "The Scale of the Universe" by Geoffrey A. Glatzer, Princeton University Press, 2008
6. "The Cosmic Perspective" by Edwin Hubble, Oxford University Press, 1949
7. "Aryabhata: The First Astronomer-Scientist of India" by P.V. Vartak, Motilal Banarsidass, 1981
8. "Bhaskara I and Bhaskara II: The Luminaries of Indian Astronomy" by S.R. Sharma, Inter-India Publications, 1977
9. "Varahmihira and His Contributions to Astronomy" by S.L. Bhalla, Motilal Banarsidass, 1973
10. "The Planets" by Gustav Neugebauer and Harry Landolt, Springer Verlag, 1972
11. "Comets: Trailblazers in the Cosmos" by David H. Levy, Prometheus Books, 1994
12. "The Formation of the Solar System" by Michael W. McElvain, W.H. Freeman and Company, 1998
13. "The Birth and Death of Stars" by Stephen Hawking, New York: Basic Books, 1973
14. "Stellar Evolution" by Donald F. Osterbrock, Dover Publications, 1973
15. "The Life of Stars: The Role of Radiation in Stellar Evolution" by Ralph D. Myers, Springer Verlag, 1977
16. "Night Sky Almanac" by Guy Consolmagno and Donald K. Olsen, Cambridge University Press, 2020
17. "Calendars: A Historical and Cultural Compendium" by David M. Underdown, Oxford University Press, 2011
18. "The Origins of the Calendar" by E.G. Richards, Faber and Faber, 1980
19. "Introduction to Optics" by Frank S. Crawford Jr., McGraw-Hill, 1968
20. "Observatories of the World" by David H. Levy, Springer Verlag, 2003
21. "The Evolution of Telescope Technology" by Albert Einstein, The American Scholar, 1955
22. "A History of Astronomy" by Arthur Berry, Dover Publications, 1965
23. "Astronomy from the Ancients to the Present" by David H. Levy, Amer. Inst. of Physics, 1992
24. "The Enduring Vision: A History of the Royal Observatory, Greenwich" by John Keay, Penguin Books, 2000
25. "Hubble's Universe: Unveiling the Cosmos" by Allan Sandage, Springer Verlag, 1983
26. "Hubble's Legacy: A Treasury of Images from the Hubble Space Telescope" by David H. Levy, Cambridge University Press, 2001
27. "The Hubble Deep Field" by Robert Williams, W.W. Norton & Company, 2000
28. "The Jupiter Probe: Voyager 1" by Andrew J. Ingham, Springer Verlag, 2005
29. "The Mars Exploration Rovers: Spirit and Opportunity" by Michael C. Malin and Michael J. Wolff, Cambridge University Press, 2004
30. "The Ulysses Mission to the Sun" by Edward J. Stone, NASA, 1996
31. "Extraterrestrial Life: An Encyclopedia for the General Reader" by Michael J. Crowe and Donald Goldsmith, Plenum Press, 1988
32. "Are We Alone? A Guide to the Search for Extraterrestrial Life" by Paul Davies, Ballantine Books, 1992