A Short Course on Theoretical Positional Astronomy
December 20 – December 29, 2025 I I T KANPUR

The course objective: This course is designed for introducing beginners to the fundamental theoretical aspects of 'Positional Astronomy'. It is expected that after going through this series of sessions the students will be familiar with the basic theory behind positional astronomy – the most fundamental of all branches of observational astronomy. The theoretical aspects will be demonstrated through planetarium software.
Course organization: This short course will consist of seven sessions of 1 to 1 1⁄2 hr duration. Since the course is of basic nature most of the discussions will be with pen and board. Use of slides will be minimum.

Lecture Dates (7 lectures in all) December - 20, 22,23, 24, 26, 27, 29

Lecture Time: 11:00 am - 12:30 pm

Venue: SPASE Seminar Room, Building ESB 2, Room no. 715 (6th Floor)

Lecture contents (Tentative): The following topics will be covered in 7 lectures.

Topic 1: What is positional astronomy; Importance and application of positional astronomy; Our universe, Milky-Way galaxy; Our solar system. Proper motion of stars.

Topic 2: The sun-earth system; The sun's motion as seen from the earth; Ecliptic plane, the cardinal days and seasons; The celestial sphere and the critical lines, poles, equator, ecliptic and equinoctial points.
Topic 3: The sun – earth – moon system; Moon's motion and its phases, conjunction and opposition; Moon's orbit and the ascending and descending nodes; Eclipses and eclipse season.

Topic 4: Introduction to spherical trigonometry; Great circles and geodesic lines; Spherical triangles – conventions and characteristics; Derivation of the basic equations – the cosine laws and the sine law.

Topic 5: Spherical trigonometry and applications (contd); Terrestrial coordinate system and determination of shortest paths on the earth; Other applications of spherical trigonometry.

Topic 6: Celestial coordinate systems – equatorial, ecliptic and horizontal; Their importance and application; Celestial coordinates – Right Ascension, declination, longitude, latitude, azimuth and altitude; Conventions and definitions.
Topic 7: Transformation of celestial coordinates; Rising and setting points of stars and the sun; Transits.

Topic 8: The horizontal system 'Hour angle'; Time elements ; Daylight duration; Local Sideral Time (LST) and Local Mean Time (LMT); Greenwich times – sideral and solar; Conversion rules; Application to navigation.

Topic 9: Lunar months – sideral and synodic; Civil day and sideral day; Sideral year and tropical year; precession of the equinox and its effects.

Topic 10: Archaeoastronomy and its application in deriving chronology; Concluding remarks.
Note: Beside the lectures there will be adequate problem solving sessions and planetarium demonstration

Bio-Data of the Speaker

Prof. Amitabha Ghosh, PhD,DSc(hc), FIE,FNAE,FNA,FASc,FNASc
born in 1941, is the former Professor and Head of Mechanical Engineering, IIT Kanpur and former Director, IIT Kharagpur. He was also the Chairman of CSIR-Central Mechanical Engineering Research Institute, Durgapur from 2001 to 2013 and Chairman BoG of National Institute of Technical Teachers' Training and Research, Bhopal from 2009 to 2014. He also chaired a number of national level Committees like FIST of the Department of Science and Technology, Government of India and the Engineering Science Committee of the Council of Scientific and Industrial Research. He was also the Indian Coordinator of the Indo-Japan Science Collaboration Programme run by the DST and JSPS from 1998 to 2007 and the Indo-US Joint Centre for Research Excellence in Manufacturing from 2006 to 2013. Prof. Ghosh has written thirteen books and the text books by him are widely followed in India and abroad. Currently he is an Emeritus Scientist of the Indian National Science Academy, New Delhi. Prof. Ghosh is Fellow of all the four science and engineering academies of India.

For more details visit https://en.wikipedia.org/wiki/Amitabha_Ghosh_(academic,_born_1941)