

Indian Institute of Technology, Kanpur
Proposal for a New Course

1. Course No: SPA 6XXM *SPA 613M*
2. Course Title: Introduction to Celestial Observational Techniques
3. Lectures per week: 3 (L), Tutorial: 0 (T), Laboratory: 0 (P), Additional hours: (0-2): 0 (A), Module Credits (3*L+2*T+P+A): 5,
Duration of Course: Half Semester (Odd Sem First Half)
4. Proposing Department: Space Planetary & Astronomical Sciences & Engineering (SPASE)
5. Proposing Instructor: Prashant Pathak, Amitesh Omar, Avinash Deshpande

6. Course Description

(A) Objectives: The course will introduce basic concepts of Positional astronomy, observational techniques, signal properties with a few examples of observations of celestial sources.

(B) Contents (preferably in the form of 5 to 10 broad titles):

1. **Positional astronomy:** Night sky, celestial sphere, ancient astronomy, motion of planets, moon and comets, constellation and nakshtras, sidereal time, calendars, precession, proper motion and parallax, eclipses and transits, Astrometry, distance ladder, application of Stellarium software (7 lectures)
2. **Measurements:** Observations, brightness, intensity, flux, luminosity, magnitude scale, Photometry, spectroscopy (Doppler shift, spectral resolution, FWHM, convolution), filters, Atmospheric transmission windows on Earth, atmospheric seeing and extinction, effect of ionosphere (6 lectures)
3. **Signal properties:** - Signal & noise, wave and shot noise, sampling, VCZ theorem, coherence, Hanbury brown - Twiss effect, bunching of photons (4 lectures)
4. **Celestial objects (observational):** Multi-wavelength observations of - solar system objects, exo-planets, stars (color-magnitude, HR diagram), Galaxies, large-scale structures. (4 lectures)

(C) Pre-requisites: None

(D) Short summary for including in the Courses of Study Booklet: This course includes Positional astronomy, introduction to night sky, motions of celestial objects, measurement techniques, signal properties of celestial sources and their observations.

7. Recommended Books:

- Astrophysical Techniques: C. R. Kitchin
- To Measure the Sky: An Introduction to Observational Astronomy: Frederick R. Chromey

8. Any other remarks:

Dated: Proposer:

Dated: DUGC/DPGC Convener:

The course is approved/not approved

Chairman, SUGC/SPGC

Dated:

Abhej
5/11/24