

## **Paper-15A**

### **Observational and Computational Astrophysics Lab**

#### **Group A: Observational Astronomy**

Introduction to Optical Telescopes, Stellar Photometry and Spectroscopy:  
CCD based photometers and detectors.

List of Experiments (tentative):

1. To estimate the temperatures of an artificial star by photometry.
2. To study the solar limb-darkening effect.
3. To study the effective temperature of stars by B-V photometry.
4. To determine the solar constant using the principle of calorimetry.
5. To study the Fraunhofer absorption lines from the solar photosphere.
6. Analysing SN1a data to determine the deceleration parameter and the Hubble parameter of the universe.
7. Determination of the height of lunar mountains.
8. Night observations using a 14 inch telescope at Fr. Eugene Lafont Observatory (stellar photometry and stellar spectrometry)
9. Radio Data Analysis (tentative)
  - Hands on experience: Visit to facilities in and around Kolkata and outside Kolkata (subject to availability of accommodation).

Reference Books:

1. Astronomy: A physical perspective by M. L. Kutner (CUP, 2003)
2. Astronomical Techniques by Kitchin

## **Group B: Computational Astrophysics:**

Planetary Dynamics, Chaos, Spherical Accretion Models, Stellar Structure and Stellar Atmosphere (radiative transfer), Cosmological distances, Age of the Universe.

### Reference Books:

1. Numerical Methods in Astrophysics: An Introduction (Series in Astronomy and Astrophysics Book 12) by Peter Bodenheimer, Gregory P. Laughlin, Michal Rozyczka, Tomasz Plewa, Harold. W Yorke, Harold W. Yorke
2. Computational Physics by Nicholas Giordano and Hisao Nakamishi (Prentice Hall)
3. An Introduction to Modern Astrophysics by B. W. Carrol and D. A. Ostlie (Pearson, 2006)