AS102: Optical Astronomy: *piercing into the cosmos by light*(20 lectures in 30 hrs)
(A certificate course for high school, UG, PG and PG+ students)
Instructors: *S.K. Chakrabarti, A. Raj,D. Bisht, S. Biswas, K. Bilwal, M. Bisht*
Mode of Instruction*: English*

Syllabus

Orientation**(1 lecture)**
Instructor: D. Bisht
Basic introduction to stars and star formation, properties of stars (distance, brightness, size, mass, temperature, luminosity, etc.).

Inside a star**(3 lectures)**
Instructor: A. Raj
The basic equation of stellar structure, hydrostatic equilibrium, and the virial theorem, radiative and convective energy transport inside stars, nuclear energy production. Equation of state, opacity.

Observational astronomy*(2* **lectures)**
Instructors: D. Bisht
Observational tools for multi-wavelength astronomy - optical telescopes (refracting and reflecting telescopes), radio telescopes, astronomical instruments and detectors, Introduction to Astronomical Data Analysis

Stellar systems**(2 lectures)**
Instructor: A. Raj
Measurement of stellar parameters: distance parallax, Cepheid variables, nova and supernovae, redshift.

Classification and spectra of stars**(5 lectures)**
Instructors: D. Bisht, S. Biswas
Stellar spectra, spectral lines, the Hertzsprung-Russell diagram, Life cycle of a star, luminosity and radius, binary system and mass determination, scaling relation on the main sequence, spectral and luminosity classification of stars, types, and formation of spectra, astronomical spectra, and chemical composition.

Star cluster **(2 lectures)**
Instructor: D. Bisht
Star clusters, Photometric and Spectroscopic analysis of clusters, variable stars, and different types of variability.

Compact objects and their observations **(3 lectures)**
Instructors: P. Nandi, S.K. Chakrabarti
End stages of stars white dwarfs (electron-degeneracy pressure, mass-radius relation), neutron stars (mass limit of neutron stars, neutron stars observable as pulsars), and supernovae, black holes as the endpoint of stellar evolution.

Sitapur Observatory trip**(1 night, 2 lectures)**
Instructors: Ashish Raj, Devendra Bisht, Kuldeep Belwal, Mohit Bisht, Shraddha Biswas
Discussion on observables in the night sky, software guided observation using optical telescopes; Hands-on exercises using real CCD data, CCD Imaging and Data Reduction with IRAF/PyRAF, CCD Photometry Techniques, Observations at other wavelengths (infrared, UV, X-ray and gamma-ray astronomy), all-sky surveys.