

## **Courses Offered in 2024-2025**

### **AS100: Gateway to the Universe (8 lectures in 12 hrs.+ 1 interactive session)**

*(A Certificate Course: Open to all space and astronomy enthusiasts of any educational background)*

**Instructors:** S.K. Chakrabarti, S. Palit, T. Basak, D. Bisht, P. Nandi, S. Saha, S. Biswas

**Mode of Instruction:** Bengali & English in alternate batches (every 4 weeks)

### **Syllabus**

#### ***Current picture of the Universe (1 Lecture)***

**Instructor:** Sandip K. Chakrabarti

The observable universe, age, size and content – galaxies, clusters and groups, intergalactic space – stars, planets and other objects – forces governing the universe – gravity, and space time – Universe mass distribution - dark matter, dark energy and accelerated expansion.

#### ***Exploration of the Universe (1 Lecture)***

**Instructor:** Sourav Palit

Balloon borne astronomy- Brief history of rockets to satellites – Scope of Rocket Science and Balloon Science -- Sputnik – human in space - moon landing – space shuttle program – satellite program and exploration -- planetary missions – missions to asteroid – missions to outer solar system and interstellar space – Voyager's long journey

#### ***The Stars (2 Lectures)***

**Instructors:** Devendra Bisht (English) / Tamal Basak (Bengali)

Stars and their structure and layers – energy source of a star - the sun as a star – stellar (solar) activity, flares, Coronal Mass ejections – Nova - stellar cycle, birth, evolution - main sequence stars & white dwarfs – death of a star – supernova.

#### ***The Solar system (1 Lecture)***

**Instructor:** Sovan Saha

Origin- age of solar system - solar system's layout and characteristics – planetesimals – terrestrial and Jovian planets – laws of planetary motion, overview only – planetary satellites – planetary rings- asteroid belts – comets - Oort cloud.

#### ***The Milky way galaxy (1 Lectures)***

**Instructor:** Prantik Nandi

Milky way galaxy, structure and mass – shape of galaxies – rotation of galaxy – population-I and II stars - nucleus of a galaxy - quasars and supermassive black holes – merger of galaxies - group and cluster of galaxies.

#### ***Compact objects: Black holes and neutron stars (1 Lecture)***

**Instructor:** Prantik Nandi

Black holes, event horizon and singularity - accretion and growth of black holes - types of black holes - planetary nebulae - white dwarfs - neutron stars and pulsars - origin of cosmic rays - gamma-ray burst - cosmic recycling.

#### ***Detection of Exoplanets and search of life beyond solar system (1 Lecture)***

**Instructor:** Shraddha Biswas (Bengali)

Different observational techniques for detecting exoplanets – exoplanet finding missions - exoplanet statistics – exoplanet host stars – life in exoplanets?

#### ***Sitapur Observatory trip (1 night)***

**Instructors:** Devendra Bisht, Ashish Raj, Kuldeep Belwal, Mohit Bisht, Shraddha Biswas

Discussion on the observables in the night sky, software guided observation using optical telescopes.