

Indian Institute of Technology, Kanpur

Proposal for a New Course

1. Course No: SPAxxx
2. Course Title: Study of compact objects using real space data (Astrosat)
3. Lectures per week: 01 (L), Tutorial: 0 (T), Laboratory: 1 (P),
Additional hours: (0-2): 0 (A)
Credits ($1*L+0*T+3P+0*A$): 05 Duration of Course: Full Semester
4. Proposing Department: SPASE
5. Proposing Instructor: J. S. Yadav
6. Course Description

(A) Objectives:

Compact binraies (blackhole and neutron star X-ray binaries) use most efficient energy producing mechanism namely accretion. It produces very high temperature in the inner accreton disk and emits in X-ray. LAXPC instrument onboard Astrosat provides X-ray data best suted to study accretion flow in X-ray binaries. Student will use data of LAXPC instrument. It will introduce the basic principles and techniques like; good or bad data and data selection, data analysis, instrument background, generating light curves, Power Density Spectrum (PDS), Energy spectrum. Using this data, Students will drive basic physical properites of the black hole and Neutron star X-ray bianries like temperature, inner disk radii, source energy spectrum state: soft or hard, spectrum timing properites, thermonuclear burst, Neutron star spin frequency , flux variation and others.

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

S. No	Broad Title	Topics	No. of Lectures	No. Of Practical lab classes
1.	Data Acquisition	Data download, Data type; good or bad selection, factors that affect data quality and the data levels	1	2
2.	Data analysis	Selecting the data, understanding of space instrment used, satelltie orbit details, instrument background, generating lightcurves, data intervals and over all data quality	3	3
3.	The physical properties of the source using actual space instrument data	Soft energy spectrum of a black hole binary source, Hard energy spectrum of a black hole binary source, Soft energy spectrum of a neutron star binary. Testing various spectral models. Theromonuclear bursts, Neutron star spin frequency, amount of matter between observer and the galactic or extragalactic sources and absorption column density. Timing spectrum (PDS), fitting timing spectra, and low and Khz Quaisi-periodic oscillations (QPOs).	9	8
Total Lecturs & Practical/lab Classes			13	13

Pre-requisites: This course is an advance course for Ph. D and M Tech students. Students should have working knowledge of Linux operating system as all lab classes will be conducted in Linux environment. Students should have basic understanding of radiaion detectors and its background.

[7.] Recommended Books:

1. Radiation detection and measurement, Gless F. Knoll
2. High Energy Astrophysics, M. S. Longair, Volume 1 and 2
3. Astrosat LAXPC science instrument manual(ISRO site)

Dated: 18:10:2024

Proposer: J S Yadav

Dated: \ \ \ \ \ \ \ \ \ \ \

DUGC/DPGC Convener:

The course is approved/not approved

Chairman, SUGC/SPGC

Dated: