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भारतीय प्रौद्योगिकी संस्थान कानपुर
INDIAN INSTITUTE OF TECHNOLOGY KANPUR

P.O.: IIT Kanpur, 208 016, Uttar Pradesh, India

ACADEMIC SECTION : UNDERGRADUATE OFFICE

Prof. Sagar Chakraborty
Chairperson, SUGC

No. A(U)/New _Course/2025/UG/7974
October 9, 2025

OFFICE MEMORANDUM

The SUGC, in its meeting 2024-25/10th, approved the proposal of the Space Planetary Astronomical Sciences and Engineering (SPASE) department to offer a new course as detailed below:

Sl. No.	Course No.	Curse Credits	Course Title	Course Type
1.	SPA403M	3-0-0-0 [5]	Observing the Milky Way (galaxy)- Our home in the cosmos	MODULAR

The copy of the course proposals is enclosed for reference.

Sagar Chakraborty

Copy to:

1. Dean, Academic Affairs
2. Associate Dean, Academic Affairs
3. All SUGC members
4. Heads of All Departments
5. OARS Section

Indian Institute of Technology, Kanpur
Proposal for a New Course

1. Course No: SPA4**

2. Course Title: Observing the Milky Way (galaxy) - Our home in the cosmos

3. Lectures per week: 3 (L), Tutorial: 0 (T), Laboratory: 0 (P), Additional hours: (0-2): 0 (A), Credits (3*L+2*T+P+A)/2 = 5, Duration of Course: Half Semester - Modular

4. Proposing Department: Space Planetary & Astronomical Sciences & Engineering (SPASE)

5. Proposing Instructor: Amitesh Omar (aomar@iitk.ac.in)

6. Course Description

   (A) Objectives: The Milky Way galaxy is our home in the cosmos and its observations are fascinating for both amateurs and professional astronomers. This modular course covers a comprehensive observational perspective of the Milky Way. The course introduces Milky Way's composition, physical properties, size and location in the cosmos, its formation & evolution. The course aims to teach how each constituent is scientifically studied by astronomers and how are these studies important for astrophysicists.

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

   1. **Introduction**
      The Milky Way and its location in the cosmos; morphology dimensions, spiral structure, view from Earth. [2 Lectures]
   2. **Cosmic Signals**
      Multi-wavelength emission (high-energy to radio bands), line emissions (HI 21 cm-line, Balmer lines, MASERs, molecular lines etc.) [3 Lectures]
   3. **Dense Matter**
      Stellar and Compact objects, Observations and astrophysical importance of studying variable stars, active stars, open clusters, globular clusters, Novae and supernovae, black holes, Pulsars [5 Lectures]

4. **Diffuse Matter**
   Gas dust, Densities Temperatures, Molecular clouds, Star-forming regions, Observations and Astrophysical importance of studying dust and gases [4 Lectures]
5. **Mass & Energy Density**: Stellar motions and gas dynamics, estimation of dust, gas, stellar mass and dark matter, Cosmic rays, magnetic field, total energy. [5 Lectures]
6. **Formation & evolution**
   Present understanding of its formation and evolution, Age, Tidal interactions with nearby galaxies (LMC, SMC, Andromeda). [2 Lectures]

(C) Pre-requisites: None

(D) Short summary for including in the Courses of Study Booklet: This modular course covers a comprehensive observational perspective of the Milky Way galaxy. Topics covered are morphology, spiral structure, cosmic signals, dense matter, star clusters, black hole, pulsars, diffuse matter, gas, dust, cosmic rays, magnetic field, dark matter, formation, evolution, and interaction with nearby galaxies.

7. Recommended Books:
   - The Physical Universe: An Introduction to Astronomy - Frank Shu
   - Galactic Astronomy - J. Binney and M. Merrifield
   - The Cosmic Perspective - Bennet, Donahue, Schneider, Voit.
   - Introduction to galaxy formation & evolution - Andrea Cimatti, F Fraternali & C Nipoti
8. Any other remarks:

Dated: Proposer: AOMAR

Dated: 30-09-2025 DUGC/DPGC Convener:

The course is approved/not approved

Chairman, SUGC/SPGC

Dated: