# Indian Institute of Technology, Kanpur

## Proposal for a New Course for Undergraduate studies

1. Course No:

2. Course Title: Space Economics, Law, Policy, and Benefits

3. Per Week Lectures: 3(L), Tutorial: 0 (T), Laboratory: 0 (P), Additional Hours[0-2]:0 (A), Credits (3*L+2*T+P+A): 5, Duration of Course: 6 weeks

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

   Other Departments/IDPs which may be interested in the proposed course:

   Other faculty members interested in teaching the proposed course:

5. Proposing Instructor(s): Abhay Gupta, Pankaj Jain/Soumyabrata Chakrabarty

6. Course Description:

   A. Objectives:

   By the end of this course, students will:

   - Understand the fundamentals of the global and Indian space economy, emerging markets, and commercialization models.
   - Analyze the legal and regulatory frameworks that govern space activities—both internationally and nationally.
   - Explore space policy as a strategic and developmental tool—national security, scientific research, disaster management, and digital infrastructure.
   - Evaluate socio-economic and environmental benefits of space programs, especially in emerging economies like India.
   - Apply interdisciplinary thinking to emerging space challenges such as space traffic management, debris mitigation, PPPs in satellite constellations, and lunar economy.

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

| S No. | Module | Topics | No of Lectures |
|---|---|---|---|
| 1 | Foundations of Space Economy | Evolution of the global space economy; commercial vs. public space programs; new space race; Indian space ecosystem; case studies from SpaceX, ISRO, Pixxel, Skyroot, Piersight and other Indian startup companies. | 2 |

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| 2 | Space Policy and Strategic Goals | Role of space in national security, climate resilience, digital infrastructure; Indian space reforms; global power competition in LEO, lunar, and deep space | 2 |
| 3 | International and Indian Space Law | UN Treaties (Outer Space Treaty, Moon Agreement), ITU regulations, liability, sovereignty; Indian Space Policy 2023, IN-SPACe mandate, licensing and compliance | 2 |
| 4 | Private Sector and PPP Models | Satellite services, launch and propulsion markets, downstream applications (EO, GNSS, telecom); PPP models; public procurement and anchor tenancy | 2 |
| 5 | Socio-Economic and Developmental Benefits | Disaster monitoring, precision agriculture, urban planning, communication access, digital inclusion; impact evaluation frameworks and public value of space | 3 |
| 6 | Space-enabled Communication and Services Regulation | Telecommunications Law and Regulation - Licensing Frameworks for services and infrastructure. Policy on Remote Sensing and deep-Space Communication. International trade in satellite communication services and global mobile personal communication services. Legal framework for GNSS services, International institutional context for GNSS operations | 3 |
| 7 | New Frontiers: Debris, SSA, and Sustainability | Space traffic management, orbital debris, active debris removal (ADR), space weather, SDGs and long-term sustainability of space | 2 |
| 8 | Financing and Economics of Missions | Cost-benefit of flagship missions (Chandrayaan, Starlink); ROI of EO data and constellations; insurance, risk-sharing, revenue models (e.g. subscription vs. data licensing) | 3 |
| 9 | Futures Thinking and Policy Design | Moon and Mars economy, asteroid mining, in-space manufacturing, ethical dilemmas; foresight exercises; scenario planning for India's 2040 space future | 3 |

C. Pre-requisites: Not Applicable.

D. Short summary for including in the Courses of Study Booklet:

**"Space Economics, Law, Policy, and Benefits"** is a multidisciplinary elective that introduces students to the evolving space economy and the associated legal, policy, and socio-economic frameworks. It covers strategic objectives of space programs, regulatory mechanisms, private sector participation, and public good applications like agriculture, climate resilience, and communication. Case studies from India and the world help students build critical insights into how space can be a driver of development, security, and innovation.

7. Recommended books:

Textbooks:

- "Space Economics: From Earth to the Stars" – Joel Greenberg & Henry Hertzfeld
- "Introduction to Space Law" – Tanja Masson-Zwaan and Mahulena Hofmann

- “Space Law: A Treatise” – Francis Lyall and Paul Larsen

Supplementary / Reference Material:

- ISRO, IN-SPACe and NSIL policy documents (Indian Space Policy 2023, IN-SPACe Technical Centre resources, Earth Observation Consultation Paper 2023)EO-Aug01-93Glimpses-Indian-Space-I…IN-SPACe-Technical-Cent…
- OECD Reports on the Space Economy

- World Economic Forum reports on Space for Sustainability and Satellite Services
- NASA Economic Impact Reports
- Academic papers on SSA, ADR, and debris mitigation

8. Any other remarks:

   As part of the course assessment, students will complete a short essay or project that applies the concepts learned to real-world space scenarios. Options include:

   - Writing a policy brief or analytical essay on a topical issue (e.g., regulating private spaceports, India's lunar ambitions, space traffic management frameworks).
   - Preparing a business case or commercialization model for a space technology or service (e.g., EO-based crop insurance, satellite IoT platform, debris removal startup).
   - Mapping the socio-economic impact of a space mission using data from sources like ISRO, NASA, or UN SDG indicators.
   - Designing a foresight scenario for India’s space economy in 2040.

   Students may work individually or in teams, and are encouraged to draw from engineering, policy, economic, or entrepreneurial perspectives depending on their academic background.

Dated:05-08-2025. Proposer: Abhay Gupta

Dated:_____ DUGC/DPGC Convener:_____

The course is approved / not approved

Chairman, SUGC/SPGC

Dated:_____