

Indian Institute of Technology, Kanpur Proposal for a New Course (Modular)

1. Course No: SPA6** (Modular)
2. Course Title: Space Instrumentation Laboratory - I
3. Lectures per week: 0 (L), Tutorial: 0 (T), Laboratory: 9 (P), Additional hours: (0-2): 0 (A), Credits ($3*L+2*T+P+A$): 5, Duration of Course: Half Semester (Modular)
4. Proposing Department: Space Planetary & Astronomical Sciences & Engineering (SPASE)
5. Proposing Instructors: Amitesh Omar, Prashant Pathak, Deepak Dhingra, J. S. Yadav, Avinash Deshpande
6. Others interested in teaching this course: Rohit Sharma

6. Course Description

(A) Objectives: The course aims to provide hands-on experience on instrumentation techniques related to astronomy, planetary and space sciences and engineering.

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

Students will be required to complete at least 2 experiments from each stream as described here -

1- **Detector characterization** in X-ray/UV/optical/nearIR; experiments related to working of CCD, CMOS, PMT, X-ray detectors etc.

2. **Observing fundamental principles** - Coherence, Van-Cittert-Zernike theorem, Hanbury Brown intensity interferometer; Double slit experiment, Heisenberg uncertainty; Michelson/Fabry-Perot interferometer; Faraday effect; Young's modulus for different materials.

3. **Spectroscopy and polarimetry techniques** - Characterization of filters, polarizing elements and dispersing elements; Brewster angle, wave-plates- Spectrometer and polarimetry; spectral reflectance from surfaces, rocks and minerals in different illumination conditions; Spectra of various gases and flames - emission/absorption experiment; fibre optics; optical telescopes.

4. **Radio detection techniques** - Amplifiers, mixers, filters, noise detection, phasing, antennas, RFI mitigation, impedance matching, transmission lines.

(C) Pre-requisites:

(D) Short summary for including in the Courses of Study Booklet: Experiments modules will consist of experiments related to electromagnetic wave detection and analyses in X-ray/UV/optical/IR/radio bands, observing fundamental principals (interference, diffraction, coherence etc.), setting up spectroscopy and polarimetry experiments and carrying out related measurements applicable in field of astronomy, planetary and geological sciences.

7. Recommended Books:

Necessary reading material and instruction documents will be provided in the lab.

8. Any other remarks:

Dated: Proposer: (Amitesh Omar)

Dated: DUGC/DPGC Convener:

The course is approved/not approved

Chairman, DUGC/DPGC

Dated: