

Indian Institute of Technology Kanpur

Course Proposal Indian Technical and Economic Cooperation Programme

Title of the Course/Workshop: **Spacecraft Dynamics and Control**

Item	Details
<i>Title of the Course</i>	Spacecraft Dynamics and Control
<i>Course Coordinators</i>	Dipak Kumar Giri (Correspondence: dkgiri@iitk.ac.in)
<i>Duration</i>	Two Weeks
<i>Eligibility Criteria (basic expected background)</i>	Basic Science / Engineering Background
<i>Target group</i>	Teachers of Engineering, Researchscholars, Business analysts from corporate sector
<i>Tentative dates for the proposed event</i>	23rd March 2026 - 4th April 2026
<i>No. of days of training</i>	14 Days = 60 hrs (approximate)
<i>Objectives</i>	The module provides the theory and practical application of spacecraft dynamics and control. After successful completion of this module, attendees will be able to: - - Basics on Orbital Mechanics- Two body and Three-Body problem - Explain the basic terms and concepts related to spacecraft attitude control, - Analyze the kinematics of attitude control and develop the kinematics model for a spacecraft, - Analyze the dynamics of a rigid body and develop the dynamics model for a spacecraft, - Explain and interpret the basic terms and concepts of classical control theory, - Analyze the properties of linear systems, - design controllers for linear systems, Use standard software for the analysis of controlled systems and the design of controllers, - Explain and interpret the basics and methods related to state space control, - Derive the requirements for an attitude control subsystem from the mission objectives, - Model and demonstrate different spacecraft sensors and actuators, - develop kinematics and dynamic models for a real system in three-axis, - Design and demonstrate single-axis attitude control maneuvers on a real system using the methods of classical control theory.

<i>Tentative list of topics to be covered</i>	1. Basic on Orbital Mechanics and Control 2. Attitude control system concept and types 3. Various types of spacecraft attitude parameterization - Rigid body dynamics and attitude kinematics 4. Attitude estimation algorithm 5. Brief to Mission Design Analysis 6. Properties and stability of linear systems 7. Laplace transformation 8. Classical control theory (Root locus, PID-controller) - State space representation 9. Basics and methods of state control (Pole Placement, Linear Quadratic Regulator, Observer)
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