



SATELLITE ATTITUDE DYNAMICS AND CONTROL

PROF. MANORANJAN SINHA

Department of Aerospace Engineering
IIT Kharagpur

TYPE OF COURSE : Rerun | Elective | UG/PG

COURSE DURATION : 12 Weeks (24 Jan' 22 - 15 Apr' 22)

EXAM DATE : 23 Apr 2022

PRE-REQUISITES : Linear Control Systems/ Basic Mechanics

INTENDED AUDIENCE : Aerospace, Mechanical, Electrical

INDUSTRIES APPLICABLE TO : ISRO/DRDO

COURSE OUTLINE :

This course first introduces the rotational kinematics which is essential for implementing the satellite attitude control. This is followed by comprehensive introduction to the subject matters of satellite/rigid body rotational dynamics. Finally, the attitude control of satellites using reaction wheels, control moment gyros, magnetic/Lorentz force actuators, and thrusters are introduced.

ABOUT INSTRUCTOR :

Currently, I am a professor in the Department of Aerospace Engineering IIT Kharagpur, and pursuing research on satellite dynamics and control, aircraft dynamics and control. I contributed to the aerospace discipline by solving some more than six decades old problems related to the magnetically actuated satellite control. Moreover, I established the field of satellite attitude control using Lorentz force through my comprehensive work on its dynamics and control. I also contributed to the advanced medium combat aircraft development by the Aeronautical Development Agency.

COURSE PLAN :

Week 1: Attitude Kinematics

Week 2: Attitude Kinematics

Week 3: Attitude Dynamics

Week 4: Attitude Dynamics

Week 5: Stability of Torque Free Rotation

Week 6: Gravity Gradient Modeling and Stabilization

Week 7: Spin Stabilized Satellite

Week 8: Satellite Attitude Control using Reaction wheels and Control Moment Gyros

Week 9: Satellite Attitude Control using Reaction wheels and Control Moment Gyros

Week 10: Attitude Stabilization using Magnetic Torquer and Lorentz Force

Week 11: Attitude Control using Thrusters

Week 12: Attitude Control using Solar Sails