SPACE FLIGHT MECHANICS

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TYPE OF COURSE : New | Elective | UG/PG
COURSE DURATION : 12 weeks (20 Jul' 20 - 9 Oct' 20)
EXAM DATE : 17 Oct 2020

PRE-REQUISITES : Calculus of Multi-variables, Physics, Applied Mechanics

INTENDED AUDIENCE : Aerospace, Mechanical, Physics, Mathematics

INDUSTRIES APPLICABLE TO : ISRO, DRDO, BOEING, and various private industries working on satellite

COURSE OUTLINE :

This course is designed to introduce orbital mechanics of satellite. The course will begin with central force motion and then proceed to the two- body and three-body dynamics under mutual gravitation acceleration. It will also introduce the concept of Lagrange Points and their stability. Moreover, the concept of general orbit perturbation will also be discussed. Earth as a non-spherical body and its effect on gravity will be elaborated. Preliminary orbit determination of the satellite will be discussed. Finally, orbit transfer will be elaborated.

ABOUT INSTRUCTOR :

Currently, Prof. Manoranjan Sinha is a professor in the Department of Aerospace Engineering, IIT Kharagpur and involved in research on satellite and aircraft dynamics and control and solved some intricate problem. IHe had worked on orbital mechanics and orbit determination of satellite extensively and taught the course space flight mechanics at IIT Kharagpur for more than 15 years.

COURSE PLAN :

Week 1**:** Conic Section & Central Force motion

Week 2**:** Two Body problem (equation of relative motion, integrals of the two body problem)

Week 3**:** The Classical Orbital Elements (determination from burnout data and inverse problem of orbit determination)

Week 4**:** Kepler's Equation and Kepler's Problem (orbit propagation)

Week 5**:** Three Body/Restricted Three Body Problem (equation of motion)

Week 6**:** Restricted Three Body Problem (Lagrange points and their stability)

Week 7**:** General Perturbation Theory (variation of parameters)

Week 8**:** General Perturbation Theory (variation of parameters)

Week 9**:** Preliminary Orbit Determination (reference frames and methods of orbit determination)

Week 10**:** Orbit Transfer (Hohmann and bielliptic)

Week 11**:** Orbit Transfer (patched conic section method, interplanetary transfer, flyby)

Week 12**:** Non-Coplanar Orbit Transfer (Interception and Rendezvous)