Course Type	Course Code	Name of Course	L	T	P	Credit
DE	**NMCD534**	Orbital and Space Flight Mechanics	3	0	0	3

Prerequisite

- Linear Algebra, Calculus, Ordinary Differential Equations and Numerical Methods

Course Objectives

- To develop an understanding of orbit determination, conceptual designs of space trajectories, trajectory transfer, maneuvers and control.

Learning Outcomes

Upon successful completion of this course, students will:

1. Have a basics knowledge of Orbital Mechanics
2. Have a basic concepts of trajectories design and transfer

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	Dynamics of Point Masses, Central Force Motion, Gravitational Central Force, the Two-Body Problem, Classical Orbital Elements, Orbit classification, Kepler's Problem,Three-Body Problem,Restricted Three-Body Problem	7	To understand fundamentals of Central Force Motion
2	Equilibrium Points, Gibbs' method of orbit determination from three position vectors, Lambert's problem, Sidereal time, Topocentric coordinate system, Gauss's method of preliminary orbit determination	7	To understand the classification equilibrium points and orbit determination methods
3	General Perturbation Theory, Transformation from Celestial to Earth Fixed Reference Frame, Propulsion Systems, Stability Analysis	7	To understand the General Perturbation Theory and stability analysis
4	Orbital transfer and maneuvers: Impulsive maneuvers, Hohmann transfer, Bi-elliptic Hohmann transfer, Phasing maneuvers, Non-Hohmann transfers with a common apse line, Apse line rotation, Chase maneuvers, Plane change maneuvers.	7	To learn the basics Orbit transfer and maneuvers
5	Interplanetary trajectories: Interplanetary Hohmann transfers, Rendezvous opportunities, Sphere of influence, Method of patched conics, Planetary departure, Sensitivity analysis, Planetary rendezvous, Planetary flyby, Planetary ephemeris, Non-Hohmann interplanetary trajectories.	7	To learn Interplanetary trajectories design, transfer and maneuvers
6	GMAT software for space mission design and navigation: Installation and configuration, GMAT overview, Two parallel interface, Resources and commands, Fields and parameters, Dynamics and environment modelling, optimization and targets, plotting and visualization of orbit, examples of transfers and maneuvers using GMAT.	7	To learn GMAT for trajectories design

Total	**42**	

Text Book:

1. Howard Curtis, Orbital Mechanics for Engineering Students, Elsevier 2013

Reference Books:

1. Roy, A.E., Orbital Motion, Institute of Physics Publishing 1998
2. O., Gill, E. Satellite Orbits by Montenbruck, Springer, New York, 2001