Space Flight Mechanics - Web course

COURSE OUTLINE

The space flight mechanics is the first course in graduate and undergraduate courses.

The advanced course on space flight mechanics gets specialized in the sub s treams of space flight mechanics.

The proposed course even though is introductory but effort will be made to expose to the complicacies of the sub streams in space flight mechanics.

So that student get exposure to the various aspects of the subject and can appreciate the complicacies involved which will further imbue curiosity to understand this subject and explore.

Even though the main thrust will be on the space flight mechanics but the subject will be enriched with the introduction to rockets which will make the subject matter.

Complete in the sense that from the starting phase of launching of a satellite to its orbit maintenance and determination will be covered to give the students a complete glimpse of the subject matter without which it will remain a theoretical exercise which many text books available in this area can provide.

A number of problems will be solved to enhance the understanding of the subject matter and besides, many unsolved problems will be provided with answers to further test the student's learning.

Contents:

Introduction to Space Flight Mechanics, Central Force Motion, Coordinate System, Orbit Parameterization and Determination, Orbit Transfer, Satellite Attitude Dynamics & Control, Rocket Performance.

COURSE DETAIL

S.No	Topics	No.of Hours
1	**Introduction to Space Flight Mechanics**.	1
2	**Particle Dynamics**.	2
3	**Conic Section**.	1
4	**Central Force Motion**.	
	A. *Two Body Problem Equation of Relative Motion*.	1
	Integrals of the Two Body Problem.	1
	Kepler's Equation.	1
	Kepler's Problem.	1

NP-TEL

NPTEL

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Aerospace Engineering

Pre-requisites:

1. Mechanics.

Coordinators:

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	Orbital Elements and Coordinate Systems and orbit Determination.	4
	B. *Restricted Three Body Problem Equation of Motion.*	1
	Inertial, Relative, and Barycentric Formulas.	1
	Ten known Integrals.	1
	General Three Body problem.	3
5	**Orbit Transfer**	
	A. *Coplanar Transfer .*	
	Hohmann and Bielliptic transfer.	3
	Orbital Change due to Impulsive Thrust.	2
	B. *Noncoplanar Transfer*.	2
	C. *Interception and Rendezvous*.	3
	D. *Continuous Thrust Transfer*.	2
6	**Attitude Dynamics**	
	A. *Rigid Body Dynamics*.	2
	B. *Attitude Control .*	2
	C. *Gravity Gradient Satellite .*	1
	D. *Dual Spin Satellite*.	1
7	**Rocket Performance**	4
	Total	40

References:

1. Vallado, David A., Fundamentals of Astrodynamics and Applications, Kluwer Academic Publishers, London.
2. Roy, Archie E., The Foundation of Astrodynamics, The Macmillan Company, Collier Macmillan Limited, London.
3. Battin, Richard H., An Introduction to The Mathematics and Methods of Astrodynamics.
4. Kaplan, Marshall H., Modern Spacecraft Dynamics and Control, John Wiely & Sons, New York.
5. Wiesel, William E., Spaceflight Dynamics, Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Thomson, William T., Introduction to Space Dynamics, Dover Publication, Inc. New York.
7. Sidi, Marcel J., Spacecraft Dynamics and Control, Cambridge University Press, U.K.