Course Title	Course Code	Credit Hours
Astrodynamics	AE-474	3-0

Textbooks:

- Roger R. Bate, Donald D. Mueller, Jerry E. White, and William W. Saylor, “Fundamentals of Astrodynamics”, Dover Publications
- Howard D. Curtis, “Orbital Mechanics for Engineering Students”, Elsevier Science

Reference Books/Materials:

- G. Swinerd, “How Spacecraft Fly: Spaceflight Without Formulae”, Springer New York
- M. J .L. Turner, “Rocket and Spacecraft Propulsion”, Springer Berlin Heidelberg

Course Objectives:

This course, designed for Aerospace and Avionics students, covers Astrodynamics in two parts. The first part addresses vector mechanics, the two-body problem, and orbital parameters, while the second part focuses on spacecraft maneuvers, including in-plane and out-of-plane adjustments, with an emphasis on ΔV sustainability and propulsion design for orbit changes.

Course Outline:

- Introduction to Astrodynamics
- The n-body and 2-body Problems
- Trajectories, Constants of Motion Trajectory Equation
- Types of Orbits: Elliptic, Circular, Parabolic, Hyperbolic
- Classical Orbital Elements, Determining Orbital Elements
- Orbital Mechanics
- Position and Velocity as Functions of Time, Time of Flight
- Prediction Problem
- Basic Orbital Maneuvers
- In-plane Maneuvers, Simple In plane Orbit Changes Hohmann Transfer, Bielliptic Transfer

- Basic Orbital Maneuvers, Plane Change Maneuvers, Simple Plane Change, Combined Plane Change
- In Space Propulsion Chemical Propulsion Electrical Propulsion, Advanced Propulsion Technologies
- Propulsion for Space Maneuvers, Burn Time Calculation, Propellant Mass Calculation
- Software Based Orbital Maneuvers Application