DEPARTMENT OF MATHEMATICS,

UNIVERSITY OF KARACHI,

Course Outline

MATH 686: Astronomy II

Course contents:

Section A: Projectile dynamics, orbital and escape velocities, geostationary and polar satellites, satellite-launch vehicle (SLV), satellite and SLV orbits; down-range and cross-range error for short-range projectiles; mathematics of inertial-navigation and telemetry systems

Section B: Review of lagrangian and Hamiltonian dynamics; two-body problem in plane-polar- and elliptic-astrodynamical-coördinate meshes (first one done in detail, second one only introduced)

Section C: Hohmann-transfer orbit; introduction of control laws (cross-product, extended-cross-product, normal-component-cross-pro-duct, dot-product, normal-component-dot-product and ellipse-orientation steering)

Section D: Introduction of guidance schemes (delta, Lambert and inverse-Lambert, Q, inverse-Q and multi-stage-Q)

Section E: Three-body problem and stability of satellites.

Books Recommended:

1. Baker, R. H., Astronomy, Van Nostrand, Amsterdam, 1998.
2. Battin, R. H., An Introduction to the Mathematics and the Methods of Astrodynamics, AIAA Education Series, New York, 1987 and 1999.
3. Deusch, R., Orbital Dynamics of Space Vehicles, Prentice Hall, Englewood Cliffs, New Jersey, USA, 1963.
4. Smart, W. M., Textbook on Spherical Astronomy, Cambridge Univ. Press, Cambridge, UK, 1962.
5. Swihart, T. L., Astrophysics and Stellar Astronomy, John Wiley, New York, 2001.