

Proposal for a new course

Course title: **Spacecraft dynamics**

Course no.: SPA 637

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Department: Space, Planetary & Astronomical Sciences and Engineering (SPASE)

Credits: 9 (3-0-0-0)

Pre-requisite: Basic course in mechanics and adequate exposure to calculus.

Course description and contents:

This course discusses the orbital motion, trajectory analysis and maneuvers of a spacecraft. The lecture distribution is given below in terms of 41 lectures of 50 minutes each.

1. The Two-Body Problem, Orbital Elements and Orbit Determination – 4 lectures
2. Orbit Maneuvers, Plane Change and Transfer between Orbits – 5 lectures
3. Interplanetary Trajectory Analysis and Gravity Assist – 8 lectures
4. Orbit Perturbations: Lagrange and Gauss Perturbation Equations and Applications – 9 lectures
5. The Three-Body Problem, Lagrangian Points, Lyapunov and Halo Orbits – 8 lectures
6. Spacecraft Relative Motion, Rendezvous and Formation Flying – 7 lectures

Textbooks:

1. Curtis, H. D. 2019 *Orbital Mechanics for Engineering Students*, 4th ed. Elsevier (Butterworth – Heinemann).
2. Kaplan M. H. 2000. *Modern Spacecraft Dynamics & Control*, Dover.
3. Prussing, J. E., and Conway, B. A. 2012 *Orbital Mechanics*, 2nd ed. Oxford University Press.
4. Schaub, H., and Junkins, J. L. *Analytical Mechanics of Space Systems*, 4th ed. AIAA.
5. Roy, A. E. 2005. *Orbital Motion*, 4th ed. CRC Press.

References:

1. Chobotov, V. A. *Orbital Mechanics*, 3rd ed. AIAA.
2. Gurzadyan, G. A. 1996. *Space Dynamics*. London: Taylor & Francis.
3. Vallado, D. A. 2019. *Fundamentals of Astrodynamics and Applications*, 4th ed. Space Technology Library.

Signature of the Proposer

This course is APPROVED/NOT APPROVED Convener, DPGC

This course is APPROVED/NOT APPROVED Chairman, SPGC