Proposal for a new course

Course title: **Spacecraft dynamics**
Course no.: SPA XYZ
Proposer: Ishan Sharma, Arun Misra (Visiting faculty)
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, attitudinal dynamics and stability of a spacecraft. The lecture distribution is given below in terms of 50 minute lectures.

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

Textbooks and references:

1. Battin, R. H. 1999. *An Introduction to the Mathematics and Methods of Astrodynamics*, Revised ed. AIAA.
2. Chobotov, V. A. *Orbital Mechanics*, 3^{rd} ed. AIAA.
3. Curtis, H. D. 2019 *Orbital Mechanics for Engineering Students*, 4^{th} ed. Elsevier (Butterworth – Heinemann).
4. Gurzadyan, G. A. 1996. *Space Dynamics*. London: Taylor & Francis.
5. Prussing, J. E., and Conway, B. A. 2012 *Orbital Mechanics*, 2^{nd} ed. Oxford University Press.
6. Schaub, H., and Junkins, J. L. *Analytical Mechanics of Space Systems*, 4^{th} ed. AIAA.
7. Roy, A. E. 2005. *Orbital Motion*, 4^{th} ed. CRC Press.
8. Vallado, D. A. 2019. *Fundamentals of Astrodynamics and Applications*, 4^{th} ed. Space Technology Library.
9. Wie, B. 2015. *Space Vehicle Guidance, Control and Astrodynamics*, 3^{rd} ed. AIAA.

Signature of the Proposer

This course is APPROVED/NOT APPROVED Convener, DPGC
This course is APPROVED/NOT APPROVED Chairman, SPGC