First Course Handout

AE-641A (Space Dynamics-I)

Title: Space Dynamics-I

Instructor: A. Tewari

Allotted Venue: L-19

Allotted Timings: Tue, Wed 12:00 – 13:15

Course Objectives: To introduce space dynamics in a rigourous, yet easy to comprehend manner.

Prerequisites: Knowledge of third-year UG level mathematics and basic mechanics.

Course Contents:
- Introduction to space dynamics.
- Gravity and n-body problem.
- Two-body orbits and orbital maneuvers.
- Relative orbital motion.
- Impulsive orbital rendezvous.
- Orbital perturbations.
- Spacecraft attitude dynamics.
- Attitude stabilization and maneuvers.

Online Instruction:
- The course will be conducted in the **online mode**.
- There will be **two** recorded video lectures per week uploaded to "hello.iitk" platform, with alerts sent via e-mail. The lectures will normally be available every **Tuesday** and **Friday**, unless informed otherwise. (The first lecture will be uploaded on Friday, January 6).
- Any doubts and questions regarding the lecture material should be addressed to the instructor (**ashtew@iitk.ac.in**) via e-mail from your **registered** e-mail account (*@iitk.ac.in).
- **Home-work exercises** will be contained at the end of every lecture, and must be attempted before the next lecture.

Evaluation Policy:
- The course will follow a **continuous evaluation** policy through **bi-weekly quizzes**.
- Instructions for taking the quizzes will be e-mailed well in advance.
- There will be **no** mid-semester and end-semester exams.
- Bi-weekly Quizzes   :   5 x 1.25 hr = 6.25 hrs (100%)

References:
- Tewari, A., *Foundations of Space Dynamics,* Wiley, Hoboken, N.J., 2020.
- Tewari, A., *Atmospheric and Space Flight Dynamics*, Birkhäuser, Boston, 2006 (Chaps. 1-4, 5.1-5.7, 6.1-6.4, 13.1-13.7).
- Bate, R.R., Mueller, D.D., and White, J.E., *Fundamentals of Astrodynamics*, Dover, New York, 1971.
- Battin, R.H., *Mathematics and Methods of Astrodynamics*, AIAA Education Series, Washington, D.C., 1999.
- R.M.L., Baker, and Makemson, M.W., *An Introduction to Astrodynamics*, Academic Press, New York, 1967.
- Prussing, J.E., and Conway, B.A., *Orbital Mechanics*, Oxford University Press, Oxford, 1993.
- Curtis, H.D., *Orbital Mechanics for Engineering Students*, Butterworth-Heinemann, London, 2013.