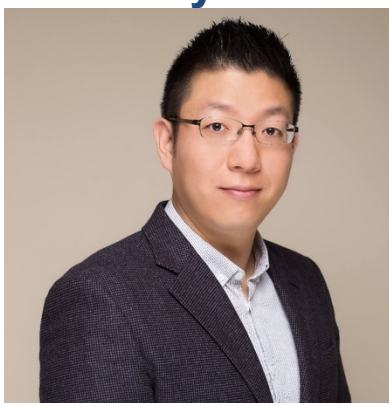
Department of Astronautical Engineering

Special Seminar: "Planetary Orbits and Gravity Fields"



Ryan Park, Ph.D.
University of Southern California
NASA Jet Propulsion Laboratory

Abstract:

The orbit and gravity of planetary bodies play a crucial role in both spacecraft operation and planetary science. Precise knowledge of the orbital paths of celestial objects is essential for accurate guidance and targeting of spacecraft at millions of miles away from Earth. It also enables predicting the orbital evolution of our solar system as well as assessing the potential Earth impact of hazardous near-Earth objects for planetary defense. Understanding the gravity field of planetary objects allows for precision spacecraft navigation and provides insights into the planetary interior structure and geophysical processes.

The orbit and gravity field are typically computed through an orbit determination process, which involves various topics in engineering and science, such as orbital mechanics, estimation, relativity, signal processing, and others. Various observables, including radiometric ranging, Doppler, Very Long Baseline Interferometry, astrometry, and onboard optical imagery, are used to compute the orbit and gravity field. The data acquisition process and analysis methods for predicting the trajectories of celestial objects will be discussed. In addition, how the recovered gravity field data can be used to probe the interior structure of planetary bodies will be discussed, providing an understanding of the geophysical processes at work.

In summary, this presentation will provide a comprehensive overview of the complex process of orbit determination, emphasizing the fundamental role of orbit and gravity in spacecraft operation and planetary science.

Bio:

Dr. Ryan Park is a Principal Engineer, Senior Research Scientist, and supervisor of the Solar System Dynamics group at the NASA Jet Propulsion Laboratory. His group is responsible for predicting the orbits of all natural planetary bodies, including planets, planetary moons, asteroids, and comets. Dr. Park also serves as the Associate Directorate Scientist of JPL's Interplanetary Network Directorate, responsible for overseeing research activities involving NASA's Deep Space Network. He has contributed to numerous space missions and studies, including the GRAIL, Dawn, Juno, Psyche, Europa Clipper, and Hera missions. Dr. Park is an Adjunct Professor at USC, a Fellow of the American Astronautical Society, and an Associate Fellow of AIAA.

Thursday, May 1, 2025; 1:30 – 2:30 P.M. - RTH 526
Refreshments will be served before the seminar