



MECHANICAL ENGINEERING

SEMINAR

Flower Constellations: solutions looking for applications!

Daniele Mortari
Professor of Aerospace Engineering
Texas A&M University

In 2014 the Flower Constellations theory celebrates his ten-year birthday. Ten years were needed to fully understand the implications of the theory. Today, this new satellite constellations design tool is ready for applications. Using minimal parameterization (Hermite normal form) Flower Constellations include all spatial and temporal symmetric solutions, introduce a new class of space objects characterized by *shape preserving configurations*, allow designers to use any inclination when selecting elliptical orbits under J_2 perturbation and (using the necklace theory) allow designers to increase the space of potential solutions by keeping small the number of satellites while preserving the symmetries.

The evolution of the mathematical theory is presented, showing some potential configurations to improve existing applications as well as some configurations in search of new applications! Radio occultation and interferometric (amplitude correlation imaging) mission examples will be shown. Also, a new class of orbits, called *J_2 propelled orbits*, where the Earth oblateness perturbation is used (rather than fuel) to cover spatial volumes around the Earth, will be presented to design space missions (single satellite or constellations) to measure or monitor physical quantities.



Daniele Mortari is professor of Aerospace Engineering at Texas A&M University, working on the field of spacecraft dynamics and control. He has taught at the School of Aerospace Engineering of Rome's University, and at Electronic Engineering of Perugia's University. He received his dottore degree in Nuclear Engineering from University of Rome "La Sapienza", in 1981. He has published more than 250 papers, and has been widely recognized for his work, including receiving best paper Award from AAS/AIAA, two NASA's Group Achievement Awards, the 2003 Spacecraft Technology Center Award, and the 2007 IEEE Judith A. Resnik Award. He is AAS Fellow, AIAA Associate Fellow, IEEE Senior Member, former IEEE Distinguish Speaker, and Honorary Member of IEEE-AESS Space System Technical Panel.

Friday, September 26th, 2014
11:00 am Seminar in 233 Mudd
Lunch served at 12:00pm
in MECE Lobby