SSM
Scuola Superiore Meridionale

Course title:

Introduction to Aerospace

Duration [number of hours]**: 24 hours**

PhD Program [MERC/MPS/SPACE]**: SPACE**

Name and Contact details of unit organizer(s):

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Course Description [max 150 words]**:**

This course will introduce the dynamics and control of space vehicles. It will cover orbital mechanics and attitude mechanics, combining them to represent a real-world scenario for a spacecraft mission. Keplerian orbits, orbital perturbations, orbital maneuvers, and spacecraft rendezvous will be analyzed. Attitude representations, rigid body dynamics, and synthetic and natural control and disturbance torques will be introduced. The students will apply the theory implementing Matlab and Simulink functions whose goal is to simulate orbital flight. At the end of the course the students will be able to understand the space environment and how aerospace engineers navigate it and make choices on subsystems when designing their missions. The course is open to all engineering, physics, mathematics, and science students who have a background in dynamics.

Syllabus:

Week 1

1. Day 1: dynamics refresher, overview of spacecraft subsystems, introduction to orbits
2. Day 2: Keplerian orbits and Orbital Maneuvers
3. Day 3: Orbital Perturbations
4. Day 4: Simulink implementation of an orbital simulation

Week 2

5. Day 1: Attitude parameters and Euler's Law
6. Day 2: Environmental Torques
7. Day 3: Attitude control via momentum exchange devices
8. Day 4: Simulink implementation of an orbital simulation including orbital local vertical local horizon tracking

Assessment: 2 Simulink assignments as outlined in the schedule.

Suggested reading and online resources:

1. Lectures slides
2. Space Vehicle Dynamics and Control, Bong Wie