



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

SPACE ROBOTICS, AUTOMATION AND CONTROL SYSTEMS

Space Robotics, Automation and Control Systems are an interdisciplinary research field which mixes typical expertise from ICT and industrial engineering departments.

The University of Bologna has been involved in space robotics research for several decades. The activities range from dynamic and kinematic modeling of multibody systems, to their active control.



The research of the University of Bologna covers a wide range of topics:

- Analysis of robotic systems and manipulators
- Robotic hands and arms
- Telemanipulation
- Design and control of robotic systems for space exploration (rovers, arms for sampling and picking, end-effectors, tools)
- Design and control of robotic systems for satellite service and maintenance (robotic arms and grippers)
- Dynamic modeling of multibody systems with rigid and compliant components
- Innovative actuators, motion measurement and analysis
- Elastodynamic modelling of mechanical system
- Experimental analysis of vibration
- Vibration qualification testing

HIGHLIGHTS

The University of Bologna participates in several **projects and experiments** funded at EU and national level: [DEXMART](#), [TRIDENT](#), [AIROBOTS](#), [SHERPA](#), [WIRES](#), [AIRBORNE](#), [MARIS](#).

The **PhD program**, currently in progress, deals with the mission synthesis for tailored vibration qualification tests: “Advanced Mission Synthesis Algorithms for Vibration-based Accelerated Life Testing”.

Infrastructures:

- Electrodynamics Shaker Dongling ES-2-150 with Slip Table Dongling GT400M-1; closed-loop control S/W LMS SCADAS III SC302VB; Differential Laser Vibrometer Polytec HSV 2002 and High Speed Rotational Laser Vibrometer Polytec RLV 5500
- Laboratory on Automation and Robotics (LAR), Center for Complex Automated Systems (CASYS): laboratories equipped with many robotic systems (mobile, collaborative, industrial), fast prototyping facilities, vision systems (e.g. Vicon, Optitrack, etc.), CNC machines, CAD tools, flying rooms

Different research groups have established an **extensive network of collaborations** with institutions and research centers at national and international level, such as: ASI (Italian Space Agency), IIT (the Italian Institute of Technology); ISME (Italian Center on Integrated System for Marine Environment), ESA.