HISTORY OF THE DEPARTMENT

The University "Politecnico di Milano" was founded in 1863. Its mission is to teach technologies and educate students to become researchers. The University is continuously updating its tradition as a school that focuses on quality and innovation in teaching and research. Scientific research at Politecnico di Milano has always been oriented toward innovation and quality, always seeking a strong relationship with the industrial world through technology transfer. Attuning to the needs of the industrial sector helps research to continuously explore new areas and stay at the leading edge of science and technology.

The scientific community of Politecnico di Milano is made of more than 1,300 professors and research fellows, with 38,200 students (2013 update). According to QS World University Rankings 2012/2013, Politecnico di Milano ranked 28th worldwide in the area of Engineering and Technology. On a worldwide scale, it is the first Italian university entering the QS ranking among the top 30 technical universities. Furthermore, Politecnico di Milano participates in the coveted "club" of universities ranked in the top 100 in the world in the most prominent international rankings, along with only 15 other European universities.

Politecnico di Milano is currently articulated in 12 departments, where research is co-ordinated and carried out, and 6 schools, where education is co-ordinated and implemented. Several service Centres provide support for technical and administrative purposes.

DIPARTIMENTO DI SCIENZE E TECNOLOGIE AEROSPAZIALI

The Dipartimento di Scienze e Tecnologie Aerospaziali (Department of Aerospace Science and Technology, DAER-PoliMi) was established within Politecnico di Milano as an autonomous institute in the 1950s. The personnel of DAER-PoliMi currently consists of 43 faculty, 27 technical and administration staff, 70 research assistants and Ph.D. students. The main activity within the Department is scientific research.

The Department itself is the main reference body for the B.Sc. (Laurea) course in Aerospace Engineering, the M.Sc. (Laurea Magistrale) course in Aeronautical Engineering and Space Engineering, and the Ph.D. (Dottorato di Ricerca) course in Aerospace Engineering. M.Sc. and Ph.D. courses are offered in English. Each year, about 250 students complete the B.Sc., 180 the M.Sc., and 15 the Ph.D. In parallel, DAER-PoliMi staff is strongly involved in several research activities with academia, industries and research bodies worldwide.

Politecnico di Milano
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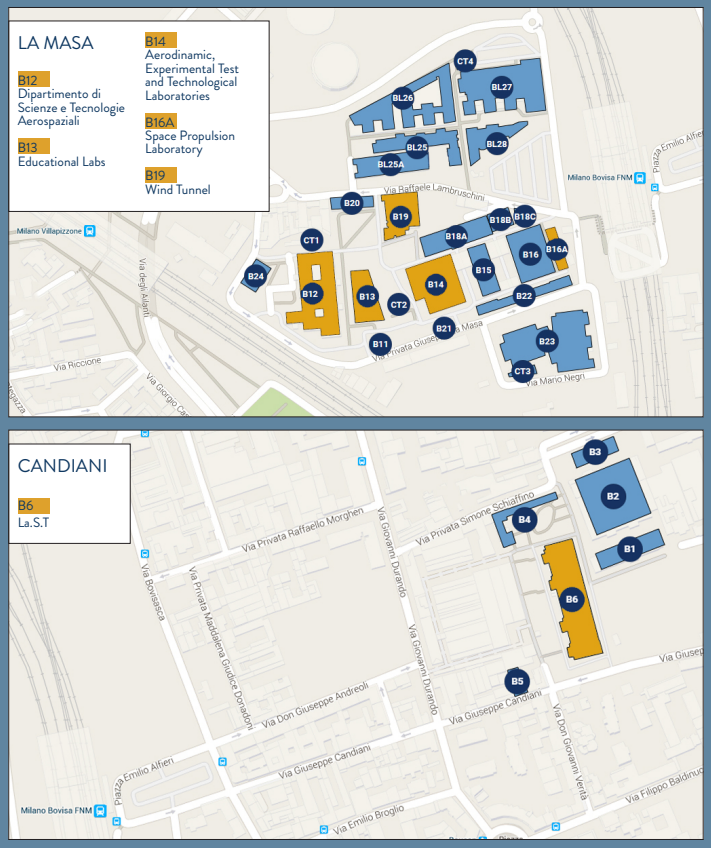
DOVE SIAMO
CAMPUS BOVISA - La Masa e Candiani



DAER 015/2016 - Rev.0

POLITECNICO
MILANO 1863

DIPARTIMENTO DI SCIENZE
E TECNOLOGIE AEROSPAZIALI

SCIENTIFIC LAB

SME
Space Missions Engineering

SCIENTIFIC LABS

DEPARTMENT OF AEROSPACE SCIENCE AND TECHNOLOGY (DAER)

Research activities within the Aerospace Science and Technology Department (DAER) of Politecnico di Milano are organized in scientific laboratories. These laboratories represent the core of the research competences developed at DAER over the years. They are highly specialized, agile and vital competence centers.

SCIENTIFIC LABS

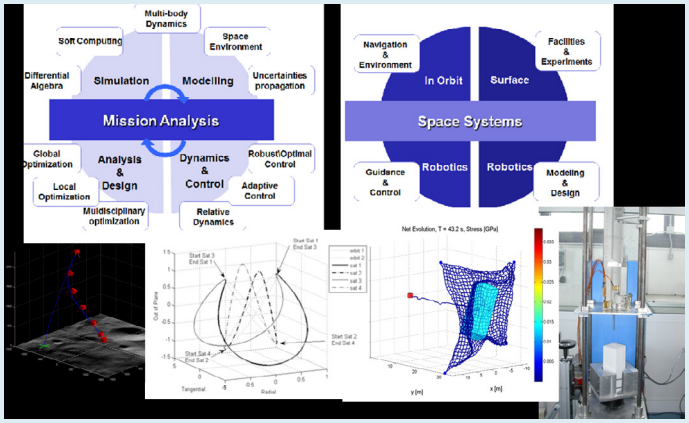
The Department has formed 14 research laboratories, which contribute to the majority of research activities.

- AMATECH - Aerospace MAterials and TECHnologies
- ASCL - Aerospace Systems and Control Lab
- ASDL - AeroStructures Design Lab
- AVLab - Aeroelasticity and Vibroacoustics Lab
- CrashLab
- FlowCon - Instability and Flow Control Lab
- FMSlab - Flight Mechanics & Flight Systems Lab
- FRAME - Fixed and Rotary-wing Aircraft Multidisciplinary Eng.
- PFDLab - Physical Fluid Dynamics Lab
- POLI-Wind - Wind Energy Lab
- RAL - Rotorcraft Aerodynamics Lab
- SIAMS - Structural Integrity of Advanced Materials and Structures
- SME - Space Missions Engineering
- SPLab - Space Propulsion Laboratory and Nanoenergetics

SME

SPACE MISSIONS ENGINEERING

Advanced Mission Analysis; robust GNC design; space objects detection and orbit propagation (Debris,NEOs); robotics for Active Debris Removal and Debris Mitigation; Space Situational Awareness; flexible systems for space applications; visual navigation and precision landing; robotics for exploration.



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ERC KEYWORDS

PE9_15 Space Sciences; PE7_10 Robotics; PE7_4 Systems engineering, sensorics, actorics, automation; PE8_1 Aerospace Engineering

FREE KEYWORDS

- Orbital dynamics; Optimization and control

ONGOING ACTIVITIES

- Non-Keplerian orbits. a) analysis of ballistic capture orbits in the real n-body problem; b) refinement of the attainable set concept and its potential applications; c) development of numerical methods to approximate the invariant manifolds; d) development of algorithm to optimize low-energy, low-thrust orbits.
- Optimal control and space trajectory optimization. a) analysis and improvement of the approximate methods for solving nonlinear optimal control; b) development of trajectory optimization schemes for treating the low-thrust orbits in n-body models; c) search for shape-based solutions in n-body models; d) refinement of the existing methods for solving the indirect problems.
- High-order methods for guidance, control, and uncertainty management. a) derivation of high order algorithms able to include control saturation; b) implementation of high-order methods for the fast computation of Poincarè sections in generic dynamical systems; c) development of novel methods for the high order expansion of invariant manifolds.
- Dynamics of space debris and NEOs. a) improve the existing high-order methods for orbit determination; b) develop highly accurate models for dynamics of space debris and NEOs; c) improve the current techniques for the high-order propagation of space debris and NEOs; d) develop a system for combining observations of objects, orbit determination, and propagation.
- Methodologies to support the system design: refinement of the current distributed MDO architecture to support complex mission scenarios alternative pruning.
- Advanced technologies: a) refinement of the numerical simulator for the flexible systems GNC design. Breadboarding and testing of the critical hw\sw components in the navigation and control chain. b) experiment set up, and models characterization for the angular momentum exchange with no contact between orbiting vehicles. c) improvement of the GNC tool for landing, experimental testing and navigation algorithms validation with hardware in the loop.
- Intelligent operations: a) multi-agents architectures exploitation to increase robustness in autonomous failure identification. b) automatic acquisition of knowledge related to causal dependencies between symptoms and faults.
- Planetary sampling: follow-up of the activities undertaken on the SD2 system for the Rosetta mission, studying mechanisms suitable for the planned future exploration missions to low gravity bodies.