# Politecnico di Milano

The Politecnico di Milano is a University Founded in 1863 that teaches technologies and trains students to become researchers.

The University continues to update its tradition as a school that concentrates on quality and innovation in teaching and research training, which increasingly find concrete expression in the forging of bonds with business and industry. The Politecnico di Milano scientific research has always been oriented toward innovation and quality and seeks to forge a strong relationship with the business and productive world, through technological transfers. Being attuned to the needs of the industrial sector helps research to continuously explore new areas and stay at the leading edge.

The scientific community of Politecnico di Milano is constituted by more than 1300 professors and research fellows, while the students are 38200 (2013 update).

According to QS World University Rankings 2012/2013, Politecnico di Milano ranked the 28th position worldwide in the area of Engineering and Technology. It is the first Italian university entering the QS ranking among the top 30 technical universities on a world scale. Politecnico di Milano enters the coveted "club" of universities ranked in the top 100 in the world in the most prominent international rankings, which includes only 15 European universities.

Politecnico is organized into Departments, where research is performed and co-ordinated, and into Schools, where teaching is performed and co-ordinated. Service Centres provide support for technical and administrative purposes. At present, within Politecnico di Milano, there are 12 Departments, each chaired by a Director, and 6 Schools, each chaired by a Dean. Politecnico is represented by a Rector, and major decisions are taken within the Senate and the Administration Council.

## Dipartimento di Scienze e Tecnologie Aerospaziali

The Dipartimento di Scienze e Tecnologie Aerospaziali (DAER-POLIMI), within Politecnico di Milano, was established as an autonomous institute in the 1950's. The personnel of DAER-POLIMI is currently of 43 Teaching Staff, 27 Technical and Administration Staff, 70 Research Assistants and PhD students.

The main activity within the Department is education, and the Department hosts the Laurea (B.S.), Laurea Magistrale (M.S) and Dottorato di Ricerca (Ph.D.) in Aerospace Engineering. Each year 250 students complete the B.S. courses, 180 the M.S. and 15 the Ph.D. DAER Master in Aeronautics and Space Engineering courses are offered in English. IN parallel the DAER personnel is strongly involved in many research activities with Academies, Industries and Research Bodies worldwide.

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Dipartimento di Scienze e Tecnologie Aerospaziali

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## www.aero.polimi.it

A comprehensive document about the Aerospace Science & Technologies Dept. research current activities and vision can be downloaded here (link):

http://www.aero.polimi.it/include/POLIMI-DAER-research.pdf





# Dipartimento di Scienze e Tecnologie Aerospaziali

POLITECNICO DI MILANO





## Scientific Laboratories at DAER



**ACDL** - Aerostructure **Conceptual Design.** Development of multi-fidelity analysis and design methods to enable fast and efficient generation of aerostructures.

Current topics include: automatic generation of aero-structural models; fast structural sizing including aeroelastic analysis, buckling analysis and optimization; morphing aircraft based on compliant structures.

#### **AMATECH - Aerospace** Materials and Technologies. Advanced Composite Technologies. Smart structures: sensorized/ actuated by fiber optics/



shape memory alloys integration. Morphing structures. Innovative materials development: self-healing, biocomposites. Thermal and positronium based characterization techniques.



### AVLab - Aeroelasticity and Vibroacoustics Laboratory. The AVLab develops aeroelastic and vibroacoustic design-tailored and high-fidelity modeling tools with the aim of simulating the

dynamic response of modern aerospace vehicles and structural components. Both passive and active approaches for flutter suppression, load alleviation, shape control and vibration and noise reduction are investigated. The activity is also focused on advanced design solutions for large telescope adaptive mirrors.

## CrashLab.

Experimental analysis and numerical modeling of metal and composite structures under crash and impact conditions,



including occupant's biomechanics, bird impact and fluid-structure interaction.



FMSlab - Flight Mechanics & Flight Systems Laboratory. Conceptual/ preliminary aircraft and UAV design; airplane and rotorcraft modelling and simulation; performance and handling qualities analysis; design,

analysis and testing of onboard sensor systems, actuator systems and cockpit instrumentation; flight testing.

control.



**FlowCon - Instability and Flow Control Lab.** Turbulent drag reduction, consolidation and development of the technique known as the streamwise-traveling waves.

**PFDLab - Physical Fluid Dynamics** Rarefied Gas Dynamics. Multiphase And interfacial flows, Fluid Dynamics of dense vapors and supercritical fluids.





**POLI-Wind.** The POLI-Wind Laboratory conducts research in the area of wind energy engineering, mainly in two focus areas: development of technology for wind tunnel testing and design of wind

energy systems. In the first focus area, the Lab has developed the first aeroelastically-scaled and actively controlled models expanding the use of wind tunnels towards the domains of aeroelasticity and control. In the latter area, the Lab develops high-fidelity modeling and simulation techniques, advanced model-based control laws and observers, stability analysis and identification methods.

FRAME - Fixed and Rotarywing Aircraft Multidisciplinary Engineering. Rotorcraft Aero-servoelasticity, Fluid Structure Interaction, Morphing structures for rotorcraft, Rotorcraft Pilot Couplings, Vibration

**RAL - Rotorcraft Aerodynamic Laboratory.** Numerical coupled CFD/CSD methods for helicopters with elastic blades; unstructured moving grids; investigation of rotorfuselage mutual interferences. Large and medium subsonic Wind Tunnels with a rotor driving system; dynamic

stall experiments on blade sections.

**SIAMS - Structural Integrity Of** Advanced Materials and Structures. The lab mission consists in developing bridges from advanced non-linear computational approaches to design procedures based on structural integrity rather than on material allowables. Activities include development of robust techniques for efficient simulations of complex



damage scenarios in polymeric and ceramic composite materials, development of multi-scale approaches for virtual characterization of materials in the presence of defects, design of structural health monitoring systems.



**SME - Space Missions** Engineering. 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.

SPLab - Space Propulsion & Nanoenergetics. Advanced solid propellants; nano-powders characterization and use in solid fuels and propellants; diagnostic tools; hybrid propulsion.

