ING-IND/04
AEROSPACE STRUCTURES AND DESIGN Labs

Structural Dynamics Lab

Development of experimental modal analysis technique based on both input/output and output-only measurements. Identification of structural dynamic properties from flying test and GVT of fixed and rotating wing vehicles. Environmental testing for design qualification and flight acceptance of space structures and mechanical components undergoing severe vibration levels. Vibration reduction methods via PZT patches passively used. Development of sensitivity-based structural updating techniques and structural damage identification methods.

Aerospace Composite Material Lab

Design, manufacturing and testing of high performance composite materials for aerospace applications. Embedding of sensors/actuators for health monitoring. The laboratory is equipped with the following facilities: autoclave for vacuum bagging technique with 440mm diameter, and 770mm length, curing cycle with programmable logic controller for temperatures up to 200°C, pressures up to 8 atm and 10mbar of vacuum; tooling facilities for post-processing of composites; ultrasonic device for non-destructive testing with linear phased array probe with 64 transducers at 3.5MHz and encoder. The Lab is involved in the development of natural fiber composites for aeronautics and other fields of application.

Smart Structures Lab

Development of active structures for vibration control, health monitoring and shape morphing in aerospace systems. Exploitation of piezoelectric materials for wireless sensors networks and energy harvesting capabilities. Vibration control of active structures, active control of composite structures, electro-active polymers, smart thermal protection system. The laboratory is equipped with the following facilities: LMS SCADAS III advanced platform for data acquisition and analysis for vibration engineering, electrodynamic shaker, electronic equipment for circuit design, breadboarding and testing, equipment for piezoelectric material treatment, telecom devices for wireless network communications.

Computational Mechanics Lab

Numerical simulations of aerospace structures by finite element procedures for nonlinear analysis (large displacements, large strains, material nonlinearity e.g. rubber) and multiphysics (thermal and thermoelastic analysis, piezoelectric analysis).

Computational Space Robotics and Multibody Dynamics Lab

The activities of the laboratory are relevant to the development of space manipulators and robotic arms from the mechanical, dynamical, and control point of view. Interactions with autonomous space systems are also investigated, studied, and simulated numerically and experimentally.

Computational Dynamics and FSI Lab

Development of multidisciplinary reduced-order models (ROM) for the dynamics of aerospace structures and for the solution of stability and response problems induced by fluid-structures interactions (FSI) in aircraft, launch vehicles, and rotorcraft. Use of ROMs for multidisciplinary design and optimization (MDO) of innovative aircraft configurations.

Concurrent Engineering Lab

Preliminary design of satellite systems in the frame of multidisciplinary analyses and pre-phase A sizing criteria in a concurrent engineering SW and HW environment.