



PhD in INGEGNERIA AEROSPAZIALE / AEROSPACE ENGINEERING - 40th cycle

**PNRR 630 Research Field: DECOUPLING TECHNIQUES BASED ON SUBSTRUCTURING
FOR FIXED-BASED ANALYSIS**

Monthly net income of PhDscholarship (max 36 months)
€ 1500.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
<p>Motivation and objectives of the research in this field</p>	<p>Qualification tests are performed on components or structures to confirm their ability to withstand operational environments. Typically, the structure is placed on a shake table, which is used to generate vibrations using single or multiple shakers to simulate operational conditions. There is a desire to conduct a modal survey in this setup for efficiency in time and cost, and to minimize risks associated with handling and directly vibrating the structure. The modal survey is aimed to obtain mode shapes and frequencies in order to update and validate a finite element model. The main challenge is that the dynamics of the shake table often interact with those of the tested structure, especially if it is large and heavy, which is common in aerospace structures like satellites or large battery packs. The objective of the research is to investigate reliable methods and procedures to remove the impact of the shake table on the dynamics of the structure, resulting in fixed-base Frequency Response Functions (FRFs) of the structure. This allows for a direct comparison between the results of the experimental modal analysis and the numerical modes of a model fixed at the base.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research will be carried out in collaboration with Siemens Industry Software, including a 6 months period of stay at the company's office in Leuven and 6 months at KU Leuven. Recent promising techniques available in the literature for achieving the desired shaker/structure</p>



	literature for achieving the desired shaker/structure decoupling will be investigated, with the aim of thoroughly understanding the advantages and disadvantages of each method, their practicality, and relaxing their requirements, thus overcoming present issues and limitations. The ultimate goal is to build a very general mathematical and technical framework that allows the decoupling of the structure dynamics in a vast range of scenarios covering a wide span of applications.
Educational objectives	The candidate will acquire high-profile skills and will be working with the support of Siemens Industry Software on a significant and challenging problem in structural dynamics and testing, dealing with both theoretical, numerical and experimental methodologies. The candidate is supposed to provide original contributions to the development and validation of innovative tools.
Job opportunities	Future job opportunities are primarily in the aerospace and mechanical fields. Job opportunities comprise national and international academic and nonacademic institutions and organizations, engaged in innovation, research and technical development.
Composition of the research group	1 Full Professors 1 Associated Professors 0 Assistant Professors 0 PhD Students
Name of the research directors	Prof. Lorenzo Dozio

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad



Amount monthly	750.0 €
By number of months	12

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Siemens (Leuven, BE)
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	KULeuven
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
The PhD candidate will receive a desk, possibly through a hot-desking procedure, and a personal computer, if needed. Apart from the compulsory ones, the PhD candidate will have the opportunity to follow additional courses and receive economic support to attend summer schools and participate in conferences. There will be the possibility of paid teaching assistantship.