



Politecnico di Milano

PhD Programme in Mechanical Engineering

Research Area n. 1: Advanced Materials and Smart Structures

Research Field: Advanced Methods for Mechanical Design

Scholarship and Financial support	
Monthly net income of PhD scholarship (max 36 months)	€ 1200 (In case of a change of the welfare rates during the three-year period, the amount could be slightly modified)
Number of scholarships	1
Beginning of PhD	01/05/2017
Deadline for application	10/03/2017
Context of the research activity	
Motivations and objectives of the research in this field	Assembly represents one of the most important phases in the production of industrial systems and has a primary importance in determining the final cost of the product. At the same time disassembly is assuming a more and more important role in determining the environmental impact of the industrial production. While the Design of Assembly concepts and the related joining methods able to reduce the assembly/disassembly time and effort have been introduced and are common when polymers are used, the different physical and mechanical properties of metals makes this step more difficult and challenging. Research is needed to find out new joining methods for metal parts able to guarantee fast operation, reduced

	<p>time and cost, adequate stiffness and strength. In particular, the snap-fit solutions are very attractive but not yet finalized due to the need of additional multidisciplinary knowledge involving material science, technology, strength of materials and design. The research is aimed at finding out design solution of snap-it, in particular for tubular components and by using laser-cutting devices, to guarantee adequate accuracy and affordable cost. The developed concepts and solutions will be implemented in a software able to guide the designer toward the optimal solution.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>Doctoral activities will involve building a (personal) robust experience in engineering design of metal structured with new joining concepts and can specifically focus on one of the following research fields: 1. Preliminary analysis; 2. Analysis of the State of the Art, 3. Concept definition of the snap-fit joints; 4. Detailed design of the joints; 5. Realization of physical prototypes of the joints and functional and strength assessment; 6. Implementation of the design procedure and solutions in dedicated software; 7. Realization of full-scale structures of the development joints as practical demonstrators.</p> <p>Definition of snap-fit joint and first validation by numerical (FEM) approaches.</p>
<p>Educational objectives</p>	<p>The methodology of the research will involve rigorous experimental approaches and numerical modelling applied to engineering design able to lead the applicant to a deep understanding of advanced methods for mechanical design able to consider both the strictly technical and technological issues and also the economic constraints.</p> <p>The experimental part will be done in cooperation with the SITEC Lab team as well as by considering all the resources and equipment of Mechanical Engineering Department necessary for the research.</p>
<p>Job opportunities</p>	<p>The PhD course provides doctoral candidates with high-level scientific training, fostering and refining research and problem solving abilities by focusing on both theoretical/numerical and experimental skills. At the end of his/her PhD course the candidate will be one of the main experts in the European context of advanced mechanical design and realization of metal structures by the laser cutting process and will be able to offer his/her</p>

	skills and knowledge both to industrial companies or research institutes.
Composition of the research group	http://www.mecc.polimi.it/ricerca/personale-docente/personale-docente/prof-mario-guagliano/ Number of Full Professors: 5 Number of Associated Professors: 6 Number of Assistant Professors: 5 Number of Post-Docs 4 Number of PhD students 10 Number of contracted researchers 4
Names of the research directors	<i>Prof. Mario Guagliano</i> http://www.mecc.polimi.it/ricerca/personale-docente/personale-docente/prof-mario-guagliano/
E-mail address, phone number and web-page	mario.guagliano@polimi.it 02 2399 8206 http://www.mecc.polimi.it/ricerca/sezioni/costruzione-di-macchine-e-veicoli/ ,
List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research	1. BLM Group (www.blmgroup.com) 2. SITEC, Laboratory for Laser Applications (sitec.mecc.polimi.it)
Additional support	
<u>Funding for educational activities</u> (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): funding per PhD student per year	2 nd year: per student € 1370 3 rd year: per student € 1370
<u>Teaching assistantship:</u> availability of funding in recognition of support to teaching activities by the PhD student	There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.
<u>Computer availability:</u>	1 st year: individual use 2 nd year: individual use 3 rd year: individual use
<u>Desk availability:</u>	1 st year: individual use 2 nd year: individual use 3 rd year: individual use