Prof. **Stefania BRUSCHI**

Full professor, M.Sc., Ph.D.
Born 20th December 1973

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Educational Qualifications

1998: M.Sc. in Materials Engineering, University of Ferrara (Italy)

2002: PhD in Industrial Manufacturing Engineering with dissertation "A new approach in testing and modelling the material response in hot forging operations", University of Parma (Italy)

Post-Doctoral and Teaching Experience

1999-2002: Teaching assistant and supervisor of students of the Mechanical Engineering and Management Engineering degrees, University of Padova

2003-2006: Assistant Professor in Manufacturing Engineering, University of Padova

2006-2011: Associate Professor in Manufacturing Engineering, University of Trento

Since October 1st, 2011, Full Professor in Manufacturing Engineering, University of Padova

Since October 1st, 2019, Head of the Department of Industrial Engineering, University of Padova and member of the Academic Senate of the University of Padova

2004- present: Lecturer in "Fundamentals of Manufacturing Technology" and "Lab of Virtual Prototyping of Metal Forming Operations, University of Padova

2008-2011: Lecturer in "Fundamentals of Manufacturing Technology", University of Trento

2003-2006: Responsible of the Laboratory of Net-Shape Forming, University of Padova

2006-2011: Responsible of the Laboratory of Manufacturing Technologies, University of Trento

Research areas and activities

Major research interests deal with modelling metal forming processes with main focus on material response to deformation and microstructural evolution during and after deforming phases. In these fields, original approaches based on advanced numerical techniques (FEM, AI, ...), physical simulation experiments and inverse-analysis have been developed and applied.

The following topics have been addressed:

- New approaches in testing and modelling material response to deformation in hot and warm conditions. Within this topic, innovative testing procedures to qualify material behaviour in bulk forming operations have been designed and set up, as well as new models (both analytical and neural network-based) have been developed and applied to a wide variety of metallic materials (e.g. steels, superalloys, light alloys,..)
- New approaches to design and optimize forming and post-forming operations (mainly hot forging and ring rolling). These approaches are based on the integration of innovative physical and numerical techniques, involving testing both on field and lab environment. Particular attention has been paid the analysis of the causes of geometrical distortions of components due to both the deforming and the post-deforming phases, which has allowed the development of a model capable to predict the shape of the forged component at room temperature. The developed model is a FE-based thermo-mechanical-metallurgical one, suitably calibrated in terms of material behaviour and boundary conditions, involving the design and carrying out of advanced testing procedures to determine mechanical and microstructural parameters of the different steel phases during the cooling phase.
- New approaches in evaluating the fracture occurrence in metal forming operations conducted at both room and elevated temperature. In the case of deforming in cold conditions, a ductile fracture criterion with a linear damage accumulation law was implemented and demonstrated to be effective in the damage and fracture occurrence prediction in cold forging process chains; whereas, in the case of forming at elevated temperatures, the theory of Continuum Damage Mechanics was applied, but properly modified to take into account the microstructural features characterizing the material under deformation.
- New approaches applied to innovative stamping operations, conducted at elevated temperatures, to evaluate (i) the material formability of the new generations of HSS and high resistant aluminium alloys during through the conventional approach of forming limit curves and the innovative one based on the Continuum Damage Mechanics; (ii) the material anisotropy and texture; (iii) the phase transformation-related parameters as a function of the applied load; (iv) the friction and heat transfer coefficient at the interface blank-dies.
- New approaches in identifying the material rheological parameters in machining operations thanks to the combined use of analytical and artificial intelligence-based techniques.
- New approaches in evaluating the integrity of Additive Manufactured alloy surfaces machined under various lubricating/cooling conditions, such as cryogenic cooling, both at conventional and micro-level

The research activities have been carried out in the framework of international European projects (Brite-Euram, Growth, Eureka-Factory), Government funded programs (MIUR-PRIN) and research contracts with Italian and European manufacturing companies.
The reported research activities are documented by more than 200 Scopus-indexed papers published in refereed journals and international conference proceedings.

Memberships

Member of the European Scientific Association for Material Forming (ESAFORM) since 2001.
Member of the Italian Association of Manufacturing Technologies (AITeM) since 1998.
Fellow member of CIRP (The International Academy for Production Engineering) since 2016; Secretary of CIRP STC-F since August 2019.
Member of the Editorial Board of the Journal of Materials Processing Technology.
Member of the Advisory Board of the *Cluster of Excellence* MERGE "Merge Technologies for Multifunctional Lightweight Structures" financed by the German Research Foundation.

Padova, October 7th, 2019

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