Prof. Leonardo Orazi

Scientific Curriculum

DISMI - Department of Sciences and Methods for Engineering
UNIMORE - University of Modena and Reggio Emilia
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Biography

Feb 1968 — Born on Februrary the 28^{th}, 1968 — *Rimini, Italy*

Jul 1987 — High School Diploma Mechanical Technician. (final mark 60/60) — *ITIS - L. da Vinci, Rimini*

Nov 1987 – Dec 1993 — M.Eng. in Mechanical Engineering (final mark 92/100) — *University of Bologna, Italy*

Thesis title: "Crash test for racing cars".

Nov 1995 — Post Degree — *University of Modena and Reggio Emilia*

Leonardo Orazi was admitted in the X cycle of Doctoral School for both Applied Mechanics and Mechanics of Materials, choosing the second one.

Nov 1994 – May 1998 — Ph.D. in Mechanics of Materials — *University of Pisa, Italy*

Leonardo Orazi obtained his PhD in Mechanics of Materials with a dissertation titled "Mathematical modeling of structural crash: parameters affecting the fatigue threshold" (in italian). He studied fracture mechanics and fatigue threshold. He conducted experimental activities at the Institute of Metallurgy of University of Bologna. During the three years course he set-up a complete fully automated system for the determination of the ΔK_{th}

Apr 1999 – Mar 2001 — Postdoctoral researcher — *University of Bologna, Italy*

Postdoctroral grant with topic *Maintenance and Repairing Strategies for Mechanical Systems* at Department of Mechanical, Nuclear and Aeronautic Engineering and Metallurgy (DIEM).

Jul 2001 — Researcher — *University of Modena and Reggio Emilia*

He becomes researcher in Manufacturing Engineering and since then he has been worked at University of Modena and Reggio Emilia. Since 2001 he has been held the lectures of "Mechanical Manufacturing Processes" and "Non Conventional Manufacturing Processes" for the courses in Mechatronics Engineering and the lectures in "Manufacturing" and "Integrated Manufacturing System" for the course of Management Engineering.

Dec 2014 — Associate Professor — *University of Modena and Reggio Emilia*

He becomes Associate Professor in 'Technology and Manufacturing Systems 09 B1 ING-IND16' at the same University, Department of Sciences and Methods for Engineering

Mar 2023 — Full Professor — *University of Modena and Reggio Emilia*

He is currently Full Professor in 'Technology and Manufacturing Systems 09 B1 ING-IND16' at the same University, Department of Sciences and Methods for Engineering

Professional Activity

1998 - 2003 — Technical consultant — *ITALSIGMA Srl*

Leonardo Orazi worked as technical consultant for ITALSIGMA between 1998 and 2003. He actively collaborated in the development of electric-hydraulic testing machines for materials and components. In particular he was in charge for the development of control software and graphical user interface, the development of methods for signal acquisition and the implementation of testing procedures based on national, international and companies standard and the the set-up and installation of the testing machines to final customers. The activities were conducted in strict collaboration with ITALSIGMA Research and Development team.

In the following a non exhaustive list of the projects developed for different customers:

Università La Sapienza *Rome*
Development of functions for the generation of cycle tests based on statistical and recorded parameters for oleo-dynamic machine.

SAMO SpA *Cadriano* (*Bologna*)
Development of procedures for testing machine for biomedical and prostheses applications.

Lamborghini SpA *Sant'Agata Bolognese* (*BO*)
Development of control system for oleo-dynamic testing machine for automotive components.

Material Characterization Center - CSM *Castel Romano* (*Rome*)
Development of control system for 1 MN oleo-dynamic testing machine for welded parts.

University of Modena and Reggio Emilia *Modena*
Development of control system for 25 kN oleo-dynamic testing machine for material characterization.

Nordica SpA *Volpago del Montello* (*TV*)
Development of electro-hydraulic testing machine for the characterization of skies and snowboards.

Prince SpA *Volpago del Montello* (*TV*)
Development of electro-pneumatic testing machine for the characterization of tennis raquets and stringing.

Research activities

2014 – on going

Ultrashort Laser Manufacturing

Since 2014 Leonardo Orazi investigated the use of ultrashort laser for manufacturing and material processing on metals, dielectrics and polymers. He focused his activity on laser micro and nanotexturing and on the generation of LIPSS (Laser Induced Periodic Surface Structures) for applications like tribology, wettability, plasmonics, biomedical and the treatment of surfaces for polymer injection molding. This activity was performed through a series of collaborations with research groups and companies operating with ultrafast laser sources (pico- and femtosecond) and it has led, in recent years, to the design and the set-up of the *BrigthLab* facility, a laboratory equipped with state of the art beamlines for the development of ultrashort laser based manufacturing process chains.
These activities led to more than 30 international publications and two patents. The research group directed by Prof. Orazi established a network of international collaborations, becoming members of European Research Projects and belonging to the "European LIPSS comunity". The acquired know-how permitted to activate industrial collaborations with companies for the technological transfer of laboratory results.

2011– 2013

Laser Shock Peening

Development of models for the simulation of Warm Laser Shock Peening process with the introduction of innovative mechanical models and the prediction of the induced dislocation density.

2007 – 2013

Laser Hardening

Prof. Leonardo Orazi work on laser hardening processes. He developed methods for thermal treatments in conditions far from equilibrium, modeling the generation of austenite, martensite, intermediate phases and the tempering effects in case of overlapping tracks. This activity resulted in more than 20 international publications. He moreover developed original simulation codes for industrial applications of laser hardening. He developed models to predict steel hardening of complex parts, by using general energy distributions and in case of overlapping paths. These models are based on the numerical solutions of carbon diffusion equations and are highly efficient for industrial applications.

2006 – 2013

Laser Micromanufacturing

He performed research activities focused on laser micromanufacturing with pulsed lasers in nanosecond regime. He studied models for laser/matter interaction with temperature dependent parameters and keeping in count the influence of the plasma plume. He developed numerical simulation systems for ablative processes with highly efficient solution schemes. Prof. Orazi developed a system for the automatic determination of the correlation between process parameters and ablation rate in function of the material and the optical system set-up. He moreover supervised the development of the numerical code CALM (Computer Aided Laser Manufacturing). CALM can generate instructions for laser processing free-form surfaces with systems up to 5 mechanical + 3 optical axes.

2003 – 2007

CAD/CAM Systems and Reverse Engineering

He studied CAD/CAM methods, with particular attention to Time Compression techniques in product development. He developed advanced functions based on "Constrained Free Form Deformation" techniques for the editing of hybrid CAD models. These functions operate on arbitrary sets of parametric and unstructured tessellated surfaces generated by scanning systems. The functions were implemented in a deformation geometric engine used for vertical CAD solutions for the footwear.
He developed functions and procedures based on local curvatures to analyze defects of free-form surfaces for molds and parts..

1997 – 2004

Fracture Mechanics and Fatigue

Research activities focused to correlate the microstructural characteristics of materials and fatigue and fracture properties, in particular the fatigue threshold of metallic alloys, metal matrix composites and friction stir welded joints. Development of a system for the automatic measurement of the ΔK by analyzing the propagation of fracture in Compact Tension ASTM E399 specimens.

Affiliations

2009 – 2019

INTERMECH MO.RE. *University of Modena e Reggio Emilia*

Responsible of GRITT (Industrial Research and Technological Transfer Group) of "Technologies' of InterMech - MO.RE., "Interdipartimental Center for Applied Research and Services for Advanced Mechanics and Engine Technology"of University of Modena and Reggio Emilia, center affiliated to the Emilia-Romagna High Technology Network.

2010 – on going

EN&TECH *University of Modena e Reggio Emilia*

Prof. Orazi is responsibile of GRITT (Industrial Research and Technological Transfer Group) "Advanced Manufacturing Systems" of En&Tech - MO.RE., "Interdipartimental Center for Applied Research and Services for Integrated Technologies for Sustainable Research, Efficient Conversion of Energy, Energetic Efficency of Buildings, Lighting and Domotics" of University of Modena and Reggio Emilia, center affiliated to the Emilia-Romagna High Technology Network.

2002 – on going AITeM *ITALIAN ASSOCIATION FOR MANUFACTURING TECHNOLOGIES*

Prof. Orazi has been affiliated to AITeM since 2002, he participated to all the editions of the bi-annual scientific congress organized by AITeM.

2015 – on going CIRP *INTERNATIONAL ACADEMY FOR PRODUCTION ENGINEERING*

Prof. Orazi is Associate Member of CIRP.

PRESENTATIONS AT SCIENTIFIC CONGRESSES

Prof. Leonardo Orazi presented more than 30 talks in scientific national and international congresses, in particular:

National Scientific Congresses 4

International Scientific Congresses 20

Invited talks / Keynotes 2

Short Technical Presentation 5

Following the list of participation:

Sep 2005 Settimo Convegno AITeM *LECCE (IT)*

Orazi L., Tani G. - *Shape Evaluation Procedures for Free-Form Surfaces*

Jul 2006 5^{th} International Conference on Mechanics and Materials in Design *OPORTO (PT)*

Tani G., Orazi L., Fortunato A., Cuccolini G. - *Laser ablation modeling for CNC machine tool application in mould manufacturing*

Nov 2006 IMECE 2006 - ASME International Mechanical Engineering Congress *CHICAGO (US)*

Tani G., Orazi L., Fortunato A., Cuccolini G. - *3-D Modelling of Laser Ablation of Metals in Mould Manufacturing*

Apr 2007 LPM20007 - 8^{th} International Symposium on Laser Precision Microfabrication *WIEN (AT)*

Tani G., Orazi L., Fortunato A., Cuccolini G. - *The influence of plasma plume in laser milling for mold manufacturing*

Jun 2007 FLAMN07- Foundamental of Laser Assisted Micro & Nanotechnologies *SAINT PETERSBURGH (RU)*

Tani G., Orazi L., Fortunato A., Campana G., Ascari A. - *3D Transient Model for CO_2 Laser Hardening*

Sep 2007 Ottavo convegno AITeM *MONTECATINI (IT)*

Tani G., Orazi L., Fortunato A., Campana G., Cuccolini G. - *Laser hardening modelling and comparison between induction and laser hardening on a mechanical part*

Jul 2008 ESDA2008 - ASME 2008 Engineering Systems Design and Analysis Conference *HAIFA (IL)*

Tani G., Orazi L., Cuccolini G. - *An automated Procedure for the Geometrical Characterization of Root Canals*

Ago 2008 — CIRP 2008 General Assembly — *Manchester* (*UK*)

Tani G., Orazi L., Fortunato A. - *Prediction of hypo eutectoid steel softening effect due to tempering phenomena in Laser Surface Hardening*

Sep. 2008 — Nono Convegno AITeM — *Torino* (*IT*)

Orazi L. - *Laser Hardening of Hypo-eutectoid steels: an effective and efficient model*

Jun 2009 — LiM 2009 - WLT Conference Lasers in Manufacturing — *Munich* (*DE*)

Fortunato A., Orazi L., Campana G., Ascari A., Cuccolini G., Tani G. - *Laser hardening of large cylindrical martensitic stainless steel surfaces*

Oct 2009 — MSEC 2009 - ASME Int. Manufacturing Science and Engineering Conference — *West Lafayette* (*US*)

Orazi L., Cuccolini G., Tani G. - *Automatic Prediction of the Material Removal Rate in Laser Manufacturing of Titanium and Nickel Alloy*

Jan 2010 — CIRP 2010 Winter Meeting — *Paris* (*FR*)

Cuccolini G., Orazi L., Tani G., Vaccari A. - STC-S Short Technical Presentation: *An automated procedure for laser milling of textures for mould manufacturing*

Ago 2011 — CIRP 2011 General Assembly — *Budapest* (*HU*)

Tani G., Orazi L., Fortunato A., Ascari A., Campana G. Dini G. - *Warm Laser Shock Peening: New Developments and Process Optimization*

Ago 2012 — CIRP 2012 General Assembly — *Hong Kong* (*CN*)

Orazi L., Cuccolini G., Fortunato A.- STC-E Short Technical Presentation: *Laser micromanufacturing of Free Form Surfaces*

Feb 2013 — CIRP 2013 Winter Meeting — *Paris* (*FR*)

Fortunato A., Ascari A., Orazi L., Tani G. - STC-E Short Technical Presentation: *Laser assisted bending of high-resistance steel sheets*

Jul 2014 — CIRP ICME2014, Intelligent Computation in Manufacturing Engineering — *Capri* (*IT*)

Orazi L., Liverani E., Ascari A., Fortunato A., Tomesani L. - *CNC paths optimization in laser texturing of free form surfaces*

Ago 2014 — CIRP 2014 General Assembly — *Nantes* (*FR*)

Orazi L. et al - *Laser Surface Hardening of Large Cylindrical Components Utilizing Ring Spot Geometry*

Feb 2015 — CIRP 2015 Winter Meeting — *Paris* (*FR*)

Orazi L., Gnilitskyi I., Lucchetta G., Fortunato A. - STC-S Short Technical Presentation: *Surface treatments of metals by means of Nonlinear Laser Lithography*

Ago 2015 — CIRP 2015 General Assembly — *Cape Town* (*ZA*)

Orazi L. et al - *Nonlinear laser lithography to control surface properties of stainless steel*

Feb 2016 — CIRP 2016 Winter Meeting — *Paris* (*FR*)

Orazi L., Gnilitskyi I., - STC-S Short Technical Presentation: *Laser Surface Nanotexturing for biocompatible applications*

May 2018 — LIMS 2018 - Luce Imaging Microscopia Spettri di Applicazione — *Frascati* (*IT*)

Orazi L. - *Laser Induced Periodic Surface Structures: from physical phenomena to industrial applications*

Jun 2018 — EUSPEN 2018 - 18th International Conference and Exhibition — *Venice* (*IT*)

Gnilitskyi I., Rota A., Orazi L. - *Superhydrophilic Properties Driven by Highly-regular Laser-induced Periodic Structures on Si Surface*

Ago 2018 — CIRP 2018 General Assembly — *Tokyo* (*JP*)

Sorgato M., Masato D., Lucchetta G., Orazi L. - *Effect of Different Laser-Induced Periodic Surface Structures on Polymer Slip in PET Injection Moulding*

Sep 2018 — NanoInnovation 2018 — *Rome* (*IT*)

Orazi L. - *Ultrashort Laser Micro and Nanotexturing: advances and applications*
Orazi L. - *Laser nano-patterning of materials for implants*

Feb 2019 — SPIE Photonics West 2019 — *San Francisco* (*US*)

Orazi L., Gnilitskyi I., Bulgakova N., Mocek T. - *Highly regular LIPSS: Physical considerations and industrial applications*

Jun 2019 — NanoInnovation 2019 — *Rome* (*IT*)

Orazi L. - *Laser patterning of surfaces for* (*nano*) *mechanical applications*

Jun 2019 — SMT33, International Conference on Surface Modification Technologies — *Naples* (*IT*)

Orazi L. et al- *Osteoblast cell response to LIPSS-modified Ti implant*

Jul 2019 — Int. Conference on Nanomaterials for Biosensors and Biomedical Applications — *Jurmala* (*LV*)

Orazi L. - *Laser surface nano-patterning for biomedical and industrial applications*

Ago 2021 — CIRP 2021 General Assembly — *Munich* (*DE*)

Orazi L., Romoli L., Schmidt M., Li L. - Keynote Talk: *Ultrafast Laser Manufacturing: from physics to industrial applications*

Sep 2021 — IEEE NAP 2021 - 11^{th} Int. Conf. Nanomaterials: Applications & Properties — *Odessa* (*UA*)

Orazi L. - Invited Talk: *Surface Micro- and Nano-Structuring by Ultrafast Laser Processing*

Feb 2024 — SPIE Photonics West 2024 - Laser based Micro- and Nanoprocessing XVIII — *San Francisco* (*USA*)

Orazi L. - *Adaptive optics solution to improve laser-induced periodic surface structuring* (*LIPSS*)

Feb 2024 SPIE Photonics West 2024 - Laser based Micro- and Nanoprocessing XVIII *San Francisco (USA)*

Orazi L. - *Ablation rate assessment of GHz femtosecond laser in burst mode through fast numerical simulation*

Didactic Activity

Nov 1997 – Apr 1999 Consorzio Nettuno *University of Bologna*

Contract Professor of Machine Design - Online courses of Consorzio Nettuno, University of Bologna.

Nov 1998 – Apr 1999 Degree course in Engineering Management *University of Modena and Reggio Emilia*

Teaching assistant for the course of *Availability and Safety of Mechanical Structures and Applied Statistics for Mechanical Engineering*.

Jan 2002 – Dec 2022 Degree and Master Degree courses *University of Modena and Reggio Emilia*

Leonardo Orazi performed didactic activities at the Department of Sciences and Methods for Engineering - University of Modena and Reggio Emilia for a total amount of about 3600 hours of lectures. Following, the details of the didactic activities as recorded by the University of Modena and Reggio Emilia, (CFU: University Credits).

Jan 2002 – Mar 2002	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2002 – Jun 2002	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*5 CFU*
Jan 2003 – Mar 2003	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2003 – Jun 2003	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*5 CFU*
Jan 2004 – Mar 2004	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2004 – Jun 2004	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*5 CFU*
Jan 2005 – Mar 2005	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Jan 2005 – Mar 2005	Manufacturing Studies - Degree Management Eng	*1.5 CFU*
Apr 2005 – Jun 2005	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*5 CFU*
Apr 2005 – Jun 2005	Products Development - Master Degree Management Eng	*1.5 CFU*
Sep 2005 – Nov 2005	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Jan 2006 – Mar 2006	Manufacturing Studies - Degree Management Eng	*1.5 CFU*
Jan 2006 – Mar 2006	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2006 – Jun 2006	Products Development - Master Degree Management Eng	*1.5 CFU*
Sep 2006 – Nov 2006	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Jan 2007 – Mar 2007	Manufacturing Studies - Degree Management Eng	*1.5 CFU*
Jan 2007 – Mar 2007	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2007 – Jun 2007	Products Development - Master Degree Management Eng	*1.5 CFU*
Oct 2007 – Nov 2007	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Jan 2008 – Mar 2008	Manufacturing Studies - Degree Management Eng	*1.5 CFU*
Jan 2008 – Mar 2008	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2008 – Jun 2008	Products Development - Master Degree Management Eng	*1.5 CFU*
Oct 2008 – Nov 2008	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Jan 2009 – Mar 2009	Manufacturing Studies - Degree Management Eng	*1.5 CFU*

Jan 2009 – Mar 2009	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2009 – Jun 2009	Products Development - Master Degree Management Eng	*1.5 CFU*
Sep 2009 – Dec 2009	Manufacturing Studies - Degree Management Eng	*3 CFU*
Mar 2010 – May 2010	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*3 CFU*
Mar 2010 – May 2010	Manufacturing Technology - Degree Mechatronics Eng	*6 CFU*
Apr 2010 – Jun 2010	Products Development - Master Degree Management Eng	*1.5 CFU*
Sep 2010 – Nov 2010	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2011 – May 2011	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*3 CFU*
Mar 2011 – May 2011	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2011 – Dec 2011	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2012 – May 2012	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2012 – May 2012	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2012 – Dec 2012	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2013 – May 2013	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2013 – May 2013	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2013 – Dec 2013	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2014 – May 2014	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2014 – May 2014	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2014 – Dec 2014	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2015 – May 2015	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2015 – May 2015	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2015 – Dec 2015	Manufacturing Studies - Degree Management Eng	*3 CFU*
Sep 2015 – Dec 2015	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2016 – May 2016	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2016 – May 2016	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2016 – Dec 2016	Manufacturing Studies - Degree Management Eng	*3 CFU*
Sep 2016 – Dec 2016	Integrated Manufacturing Systems - Master Degree Management Eng	*3 CFU*
Mar 2017 – May 2017	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2017 – May 2017	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2017 – Dec 2017	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2018 – May 2018	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2018 – May 2018	Manufacturing Technologies - Degree Mechatronics Eng	*5.3 CFU*
Sep 2018 – Dec 2018	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2019 – May 2019	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2019 – May 2019	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2019 – Dec 2019	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2020 – May 2020	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2020 – May 2020	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2019 – Dec 2019	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Mar 2020 – May 2020	Computer Aided Engineering and CAM - Master Degree Mechatronics Eng	*6 CFU*
Mar 2020 – May 2020	Manufacturing Technologies - Degree Mechatronics Eng	*6 CFU*
Sep 2020 – Dec 2020	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Sep 2020 – Dec 2020	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Sep 2021 – Dec 2021	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*

Sep 2021 – Dec 2021	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Mar 2022 – May 2022	Manufacturing Processes - Degree Mechatronics Eng	*6 CFU*
Sep 2022 – Dec 2022	Integrated Manufacturing Systems - Master Degree Management Eng	*6 CFU*
Sep 2022 – Dec 2022	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Mar 2023 – Jun 2023	Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Sep 2023 – Dec 2023	Integrated Manufacturing Systems - Master Degree Management Eng	*1 CFU*
Sep 2023 – Dec 2023	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Sep 2023 – Dec 2023	Virtual Solutions for Smart Manufacturing- Master Degree Digital Automation Eng	*6 CFU*
Mar 2024 – Jun 2024	Manufacturing Processes - Master Degree Mechatronics Eng	*5 CFU*
Sep 2024 – Dec 2024	Integrated Manufacturing Systems - Master Degree Management Eng	*1 CFU*
Sep 2024 – Dec 2024	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*
Sep 2024 – Dec 2024	Virtual Solutions for Smart Manufacturing- Master Degree Digital Automation Eng	*6 CFU*
Mar 2025 – Jun 2025	Manufacturing Processes - Master Degree Mechatronics Eng	*4 CFU*
Sep 2025 – Dec 2025	Virtual Solutions for Smart Manufacturing- Master Degree Digital Automation Eng	*6 CFU*
Sep 2025 – Dec 2025	Integrated Manufacturing Systems - Master Degree Management Eng	*1 CFU*
Sep 2025 – Dec 2025	Non Conventional Manufacturing Processes - Master Degree Mechatronics Eng	*6 CFU*

May 2003 – Oct 2005 Phd Course *University of Modena and Reggio Emilia*

Leonardo Orazi is member of the board of doctoral school in *Industrial Management Engineering and Enterprises Integration* of the Department of Sciences and Methods for Engineering.

Nov 2005 – on going Phd Course *University of Modena and Reggio Emilia*

Since november 2005 Leonardo Orazi is member of the board of doctoral school in *Industrial Innovation Engineering* of the Department of Sciences and Methods for Engineering.

Post- Degree Tutoring

Jan 2007 –Dec 2009 PhD tutor XXII cycle *University of Modena and Reggio Emilia*

Dr Gabriele Cuccolini - *Analysis and simulation of Laser Micromachining and laser surface hardening processes*

Jan 2010 – Dec 2010 Post-Doc Tutor *University of Modena and Reggio Emilia*

Dr Gabriele Cuccolini - *Sviluppo di procedure CAM avanzate per microlavorazioni laser 3D*

Nov 2012 – Oct 2015 PhD tutor XXVIII cycle *University of Modena and Reggio Emilia*

Dr Iaroslav Gnilitskyi - *Ultrashort Laser Nano structuring: methods, mechanisms and applications*

Nov 2015 – Oct 2017 PhD tutor XXXI cycle *University of Modena and Reggio Emilia*

Dr Mohamed Darwish - *Design, Analysis and Numerical Simulation of Supersonic Nozzles for Laser Cutting*

Jan 2016 – Dec 2018 Post-Doc Tutor *University of Modena and Reggio Emilia*

Dr Iaroslav Gnilitskyi - *Modellistica di Tecnologie Meccatroniche per sistemi di Automazione*

Apr 2018 – Mar 2020 Post-Doc Tutor *University of Modena and Reggio Emilia*

Dr Iaroslav Gnilitskyi - *Utilizzo di Sistemi Laser ad impulsi ultracorti per il trattamento di film sottili*

Dec 2018 – Nov 2019 Post-Doc Tutor *University of Modena and Reggio Emilia*

Dr Mohamed Darwish - *Progettazione e simulazione di ugelli supersonici per il taglio laser*

Nov 2021 – Oct 2022 Post-Doc Tutor *University of Modena and Reggio Emilia*

Dr Vincenzina Siciliani - *Ultrashort Laser texturing di materiali per applicazioni industriali e biomedicali*

Jan 2022 – on going PhD tutor XXXVII cycle *University of Modena and Reggio Emilia*

Dr Manuel Mazzonetto - *Digital Manufacturing per la Fabbrica Green del Futuro*

Nov 2022 – on going PhD tutor XXXVIII cycle *University of Modena and Reggio Emilia*

Dr Vincenzina Siciliani - *Laser Micro Manufacturing of glass-based microfluidic devices*

Mar 2024 – current Post-Doc Tutor *University of Modena and Reggio Emilia*

Dr Giulia Zaniboni - *Development and set-up of polymer injection system functionalized through laser texturing and nanocoating*

Jan 2025 – current Post-Doc Tutor *University of Modena and Reggio Emilia*

Dr Keltoum Oubellaouch - *Set-up and implementation of a laser texturing system for the surface modification of molds for polymer injection*

Publications

Leonardo Orazi is author of about 100 pubblications on international journals and international conference proceedings. The most part of these works were published on peer-review journals indexed in *Scopus* e *Web of Sciences* database and belonging to the first and second Scimago quartile (Q1, Q2).

Bibliometric indicators

Scopus detabase reports the following indicators:

Documents: 100
Impact Factor: 19
Number of Citations: 1531

In the following, the list of publications containing also the works not indexed by *Scopus* or *Web of Sciences*:

Publications on International Journals

[1] Orazi L (1997) *Influence of Testing Techniques and Micromechanical properties on DK Threshold*. Materiálové inžinierstvo 9 2–9.

[2] Orazi L (1999) *Design of Experiments for Evaluating DKth in AISI 304 Stainless Steel*. OIAZ 144 164–168.

[3] Herold H et al (2000) *An experimental and theoretical approach for an estimation of* ΔK_{th}. Fatigue & Fracture of Engineering Materials & Structures 23, 9 805–812.

[4] Orazi L (2007) *Constrained free form deformation as a tool for rapid manufacturing*. Comput Ind 58, 1 12–20.

[5] Orazi L, Tani G (2007) *Geometrical inspection of designed and acquired surfaces*. Int J Adv Manuf Technol 34, 1–2 149–155.

[6] Tani G et al (2007) *The influence of plasma plume in laser milling for mold manufacturing*. Journal of Laser Micro Nanoengineering 2 225–229.

[7] Tani G et al (2008) *Laser ablation of metals: A 3D process simulation for industrial applications*. J Manuf Sci Eng Trans ASME 130, 3 0311111–03111111.

[8] Tani G et al (2008) *Prediction of hypo eutectoid steel softening due to tempering phenomena in laser surface hardening*. CIRP Ann Manuf Technol 57, 1 209–212.

[9] Tani G et al (2009) *Laser ablation simulation for copper*. Int. J. Nanomanufacturing 3, 3 279–294.

[10] Fortunato A et al (2010) *Hybrid metal-plastic joining by means of laser*. Int. J. Mater. Form. 3, 1 1131–1134.

[11] Fortunato A et al (2010) *A new computationally efficient model for martensite to austenite transformation in multi-tracks laser hardening*. J. Optoelectron. Adv. Mat. 12, 3 692–696.

[12] Orazi L et al (2010) *An automated procedure for material removal rate prediction in laser surface micromanufacturing.* Int J Adv Manuf Technol 46, 1–4 163–171.

[13] Orazi L et al (2010) *An efficient model for laser surface hardening of hypo-eutectoid steels*. Appl Surf Sci 256, 6 1913–1919.

[14] Fortunato A et al (2011) *A new computationally efficient model for tempering in multitrack laser hardening in medium carbon steels*. J Manuf Sci Eng Trans ASME 133, 2.

[15] Tani G et al (2011) *Warm Laser Shock Peening: New developments and process optimization*. CIRP Ann Manuf Technol 60, 1 219–222.

[16] Ascari A et al (2012) *The influence of process parameters on porosity formation in hybrid LASER-GMA welding of AA6082 aluminum alloy*. Opt Laser Technol 44, 5 1485–1490.

[17] Fortunato A et al (2012) *Numerical evaluation of the reflectivity coefficient in laser surface hardening simulation*. Surf. Coat. Technol. 206, 14 3179–3185.

[18] Fortunato A et al (2012) *Numerical simulation of nanosecond pulsed laser welding of eutectoid steel components.* Optics& Laser Technology 44, 7 1999–2003.

[19] Cuccolini G et al (2013) *5 Axes computer aided laser milling*. Optics and Lasers in Engineering 51, 6 749–760.

[20] Fortunato A et al (2013) *A Comprehensive Model for Laser Hardening of Carbon Steels*. J. Manuf. Sci. Eng 135, 6.

[21] Orazi L et al (2014) L*aser surface hardening of large cylindrical components utilizing ring spot geometry*. CIRP Ann Manuf Technol 63, 1 233–236.

[22] Demchishin AV et al (2015) S*tructure, phase composition and microhardness of vacuum-arc multilayered Ti/Al, Ti/Cu, Ti/Fe, Ti/Zr nano-structures with different periods*. Appl Surf Sci 342 127–135.

[23] Orazi L et al (2015) *Nonlinear laser lithography to control surface properties of stainless steel*. CIRP Annals 64, 1 193–196.

[24] Gnilitskyi I et al (2016) *Mechanisms of high-regularity periodic structuring of silicon surface by sub-MHz repetition rate ultrashort laser pulses*. Appl. Phys. Lett. 109, 14 143101.

[25] Gnilitskyi I et al (2016) *Nano patterning of AISI 316L stainless steel with Nonlinear Laser Lithography: Sliding under dry and oil-lubricated conditions*. Tribology International 99 67–76.

[26] Gnilitskyi I et al (2017) *High-speed manufacturing of highly regular femtosecond laser-induced periodic surface structures: physical origin of regularity*. Sci Rep 7, 1 8485.

[27] Orazi L et al (2017) *Laser Nanopatterning for Wettability Applications*. Journal of Micro and Nano-Manufacturing 5, 2.

[28] Rotella G et al (2017) *Innovative high-speed femtosecond laser nano-patterning for improved adhesive bonding of Ti6Al4V titanium alloy*. CIRP Journal of Manufacturing Science and Technology 18 101–106.

[29] Sorgato M et al (2018) *Effect of different laser-induced periodic surface structures on polymer slip in PET injection moulding*. CIRP Ann Manuf Technol 67, 1.

[30] Antolini F, Orazi L (2019) *Quantum Dots Synthesis Through Direct Laser Patterning: A Review*. Front. Chem. 7 1–16.

[31] Darwish M et al (2019) *Simulation and analysis of the jet flow patterns from supersonic nozzles of laser cutting using OpenFOAM*. Int J Adv Manuf Technol.

[32] Gnilitskyi I et al (2019) *Cell and tissue response to nanotextured Ti6Al4V and Zr implants using high-speed femtosecond laser-induced periodic surface structures*. Nanomedicine: Nanotechnology, Biology and Medicine 21 102036.

[33] Gnilitskyi I et al (2019) *Tribological Properties of High-Speed Uniform Femtosecond Laser Patterning on Stainless Steel*. Lubricants 7, 10 83.

[34] Orazi L et al (2019) *Investigation on the Inert Gas-Assisted Laser Cutting Performances and Quality Using Supersonic Nozzles*. Metals 9, 12 1257.

[35] Darwish M et al (2020) *Modeling and analysis of the visualized gas-assisted laser cutting flow from both conical and supersonic nozzles*. Int J Adv Manuf Technol 106, 9 4635–4644.

[36] Darwish M et al (2020) *Numerical modeling and Schlieren visualization of the gas-assisted laser cutting under various operating stagnation pressures*. International Journal of Heat and Mass Transfer 147 118965.

[37] Darwish M et al (2020) *Numerical analysis of the gas-assisted laser cutting flow from various supersonic nozzles*. J. Manuf. Process. 56 382–389.

[38] Orazi L et al (2020) *Generation and Characterization of Laser Induced Periodic Surface Structures on Plastic Injection Molds*. Lasers Manuf. Mater. Process. 7 207–221.

[39] Orazi L et al (2020) *Fast LIPSS based texturing process of dental implants with complex geometries.* CIRP Ann Manuf Technol 69, 1 233–236.

[40] Orazi L, Reggiani B (2020) *Innovative method for rapid development of shoes and footwear*. Int J Adv Manuf Technol 106, 5 2295–2303.

[41] Orazi L, Reggiani B (2020) *Point Inversion for triparametric NURBS.* Int J Interact Des Manuf 15, 55-61.

[42] Orazi L et al (2021) *Ultrafast laser manufacturing: from physics to industrial applications*. CIRP Annals 70, 2 543–566.

[43] Orazi L et al (2021) *Experimental investigation on a novel approach for laser surface hardening modelling*. Int J Mech Mater Eng 16, 1 2.

[44] Ricci Y et al (2021) *Design and Fabrication of a Pillar-based Piezoelectric Microphone exploiting 3D-Printing Technology*. IEEE Sensors Letters 1–1.

[45] Martin C et al (2022) *Selectively Tunable Luminescence of Perovskite Nanocrystals Embedded in Polymer Matrix Allows Direct Laser Patterning*. Advanced Optical Materials 10, 14 2200201.

[46] Orazi L, Reggiani B (2022) *A novel algorithm for a continuous and fast 3D projection of points on triangulated surfaces for CAM/CAD/CAE applications*. Journal of King Saud University - Computer and Information Sciences 34, 4.

[47] Saqib M et al (2022) *Tailoring surface properties, biocompatibility and corrosion behavior of stainless steel by laser induced periodic surface treatment towards developing biomimetic stents*. Surfaces and Interfaces 34 102365.

[48] Gnilitskyi I et al (2023) *Effects of anisotropic and isotropic LIPSS on polymer filling flow and wettability of micro injection molded parts*. Optics & Laser Technology 158 108795.

[49] Sanguedolce M et al (2023) *Effects of Ti6Al4V mechanical and thermal surface modification on the adhesion of a chitosan-bioactive glass coating*. Int J Adv Manuf

Technol 125, 9 4621–4629.

[50] K. Oubellaouch et al (2024) *Assessment of fiber orientation models predictability by comparison with X-ray µCT data in injection-molded short glass fiber-reinforced polyamide*. Int J Adv Manuf Technol, 130, 9, 4479–4492.

[51] Oubellaouch K et al (2024) *An innovative process chain for the production of antibiofouling polymer parts using ultrafast laser texturing*. Int J Adv Manuf Technol 134, 7 3653–3664.

[52] Betti A et al (2024) *Evaluating Laser-Based Microfabrication in Microfluidics: An Experimental and Computational Trial*. Advanced Engineering Materials 26, 21 2401105.

BOOKS CHAPTER

[1] G. Rotella et al., (2024) *Surface Functionalization of Metallic Biomaterials: Present Trend and Future Perspectives," in Selected Topics in Manufacturing: Emerging Trends from the Perspective of AITeM's Young Researchers* L. Carrino, L. M. Galantucci, and L. Settineri, Eds., Cham: Springer Nature Switzerland, 295–341.

INTERNATIONAL CONFERENCE PROCEEDINGS

[1] Herold H et al (2000) *Fatigue threshold in aluminium alloys*. EUROMAT 99: Metal matrix composites and metallic foams 5 104–110.

[2] Cammarota GP et al (2002) *AA6082 Friction stir welded joints: propagation during impact test*. Proceedings of the 1^{st} Youth Symposium on Experimental Solid Mechanics.

[3] Ceschini L et al (2002) *High strain rate superplasticity in aluminium matrix composites*. Proc. Inst. Mech. Eng. Part L J. Mat. Des. Appl. 216, 1 43–48.

[4] Morri A et al (2004) *Experimental system to determine the start of fracture propagation during impact test*. Prooceedings of the 3rd Youth Symposium on Experimental Mechanics 1 127–128.

[5] Tani G et al (2005) *Analysis and Monitoring of VARTM-SCRIMP Fabrication Process*. Proocedings of the Advancing with Composites 2005 - International Congress on Composites Materials 113–116.

[6] Tani G et al (2006) *3-D modelling of laser ablation of metals in mould manufacturing*. American Society of Mechanical Engineers, Manufacturing Engineering Division, MED.

[7] Tani G et al (2006) *Process Planning in Laser Milling*. Proceedings of the ICME 06 International Congress 95–100.

[8] Tani G et al (2006) *Laser Ablation Modeling for CNC Machine Tool Application in Mould Manufacturing*. Proceedings M2D'2006 1–12.

[9] Tani G et al (2007) *Metallurgical phases distribution detection through image analisys for simulation of laser hardening of carbon steels*. Proceedings of the ASME International Manufacturing Science and Engineering Conference 2007, MSEC2007 311–318.

[10] Tani G et al (2007) *Laser Hardening Simulation for 3D surfaces of medium carbon steel industrial parts*. Proocedings of LIM2007 321–326.

[11] Tani G et al (2007) *Laser milling simulation system for moulds manufacturing*. Proceedings of SPIE - The International Society for Optical Engineering 6454.

[12] Tani G et al (2007) *3D modelling of LASER hardening and tempering of hypoeutectoid steels*. Proocedings of LPM2007.

[13] Tani G et al (2007) *A numerical model for laser Ablation with Plasma*. Proceedings of LANE2007 289–294.

[14] Tani G et al (2007)*Laser Hardening Modelling: Comparison between Induction and Laser Hardening on a Mechanical Parts*. AITeM 2007 Conference Proceedings 1–10.

[15] Tani G et al (2007) *Laser hardening process simulation for mechanical parts*. Proceedings of SPIE - The International Society for Optical Engineering 6454.

[16] Tani G et al (2007) *The influence of plasma plume in laser milling for mold manufacturing*. Proceedings of LPM2007.

[17] Tani G et al (2008) *3D transient model for CO2 laser hardening*. Proceedings of SPIE - The International Society for Optical Engineering 6985.

[18] Tani G et al (2008) *Optimization strategies of laser hardening of Hypo-eutectoid steel*. CIRP Conf. on Manufacturing Systems and Technologies for the New Frontier 355–360.

[19] Fortunato A et al (2009) *Laser Hardening of Large Cylindrical Martensitic Stainless Steel Surfaces*. Proceedings of the Fifth International WLT-Conference on Laser in Manufacturing 2009 421–426.

[20] Fortunato A et al (2009) *A new computationally efficient model for tempering in multi-tracks laser hardening*. Proceedings of the ASME IMECE Conference 2009, MSEC2009 2 667–675.

[21] Orazi L et al (2009) *Automated characterization of the material removal rate in laser manufacturing of TiAl6V4 and inconel 718*. Proceedings of the ASME International Manufacturing Science and Engineering Conference 2009, MSEC2009 1 807–816.

[22] Tani G et al (2009) *An automated procedure for the geometrical characterization of root canals*. 2008 Proceedings of the 9*th* Biennial Conference on Engineering Systems Design and Analysis 2 93–101.

[23] Ascari A et al (2010) *Investigation on porosity formation in AA6082 hybrid Laser-GMAW welding*. ASME 2010 International Manufacturing Science and Engineering Conference, MSEC 2010 2 229–236.

[24] Fortunato A et al (2013) *Laser shock peening and warm laser shock peening: Process modeling and pulse shape influence*. Proceedings of SPIE - The International Society for Optical Engineering 8603.

[25] Fortunato A et al (2013) *An exhaustive model for the laser hardening of hypo eutectoid steel*. High-Power Laser Materials Processing: Lasers, Beam Delivery, Diagnostics, and Applications II 8603 86030F.

[26] Gnilitskyi I et al (2015) *Laser-Patterning Stainless Steel with Nonlinear Laser Lithography for Enhanced Tribological Properties*. 2015 European Conference on Lasers and Electro-Optics - European Quantum Electronics Conference CM_2_5.

[27] Gnilitskyi I et al (2015) *Nonlinear laser lithography for enhanced tribological properties*. Conference on Lasers and Electro-Optics Europe - Technical Digest 2015-August.

[28] Orazi L et al (2015) *CNC paths optimization in laser texturing of free form surfaces*. Procedia CIRP 33 440–445.

[29] Gnilitskyi I et al (2016) *Self-assembling of Gold Nanoparticles on Si-based Laser Nanotextured 1D Surface for Plasmonic Application*. Conference on Lasers and Electro-Optics (2016), paper STh4K.3 STh4K.3.

[30] Gnilitskyi I et al (2016) *Diffraction Gratings Prepared by HR-LIPSS for New Surface Plasmon-Polariton Photodetectors & Sensors*. Frontiers in Optics 2016 (2016), paper JW4A.88 JW4A.88.

[31] Gnilitskyi I et al (2016) *Formation and Application of highly-regular LIPSS on Surface of Silicon Crystals*. Frontiers in Optics 2016 (2016), paper JTh2A.113 JTh2A.113.

[32] Gnilitskyi I et al (2016) *Highly Regular Nanostructuring of Si Surface by Ultrashort Laser Pulses*. Conference on Lasers and Electro-Optics (2016), paper STh1Q.4 STh1Q.4.

[33] Gnilitskyi I et al (2016) *Cell and Tissue Response to Modified by Laser-induced Periodic Surface Structures Biocompatible Materials for Dental Implants*. Conference on Lasers and Electro-Optics (2016), paper AW4O.6 AW4O.6.

[34] Gnilitskyi I et al (2017) *Multifunctional Properties of High-speed Highly Uniform Femtosecond Laser Patterning on Stainless steel*. Conference on Lasers and Electro-Optics

(2017), ATu1C.5.

[35] Gnilitskyi I et al (2017) *Highly-regular laser-induced periodic surface structures: Experiment and atomistic modeling*. 2017 Conference on Lasers and Electro-Optics Europe European Quantum Electronics Conference (CLEO/Europe-EQEC) 1–1.

[36] Gnilitskyi I et al (2018) *Ultrafast Laser Texturing on Si with Burst-mode Picosecond Laser Pulses*. Conference on Lasers and Electro-Optics (2018), paper AM1M.6 AM1M.6.

[37] Gnilitskyi I et al (2018) *Superhydrophilic Properties Driven by Highly-regular Laser-induced Periodic Structures on Si Surface*. 18*th* International Conference Proceedings : Venice 2018 2.

[38] Antolini F, Orazi L (2019) *Solid state synthesis of CdS quantum dots through laser direct writing*. AIP Conference Proceedings 2145, 1 020016.

[39] Orazi L et al (2019) *Osteoblast Cell Response to LIPSS-Modified Ti-Implants*. KEM 813 322–327.

[40] Reggiani B et al (2019) *Effects of Surface Treatments on the Fatigue Response of High Strength Fasteners*. KEM 813 352–357.

[41] Biondani F et al (2020) *Surface micro and nanostructuring of three-dimensional components of micro medical devices*. CIRP Conference on Electro Physical and Chemical Machining.

[42] Biondani F et al (2020) *Surface micro and nanostructuring of three-dimensional components of micro medical devices*. Procedia CIRP 95 915–920.

[43] Orazi L et al (2022) *Ultrafast laser micromanufacturing of microfluidic devices*. Procedia CIRP 110 122–127.

[44] Sanguedolce M et al (2022) *Surface Characterization Of Ultra-Short Laser Textured Titanium For Biomedical Application*. Procedia CIRP 110 128–132.

[45] Ongaro C et al (2022) *An Alternative Solution for Microfluidic Chip Fabrication*. J. Phys.: Conf. Ser. 2385, 1 012029.

[46] V. Siciliani et al (2024) *Adaptive optics solution to improve laser-induced periodic surface structuring* (*LIPSS*). SPIE Photonics West 2024 - Laser-based Micro- and Nanoprocessing XVIII, 34–42.

[47] M. Mazzonetto et al (2024) *Ablation rate assessment of GHz femtosecond laser in burst mode through fast numerical simulation*. SPIE Photonics West 2024 - Laser-based Micro- and Nanoprocessing XVIII, pp. 43–53.

[48] K. Oubellaouch et al (2024) *A melt flow index-based approach for the viscosity curves determination* Materials Research Proceedings 2024, 2720–2729.

[49] Mazzonetto M et al (2024) *Development of micro-texture patterns of cemented carbide cutting tools to improve cutting performance*. Procedia CIRP 124 608–611.

National Journals

[1] Ceschini L et al (2002) *Comportamento superplastico di materiali compositi a matrice metallica*. La Metallurgia Italiana 44 37–44.

[2] Ceschini L et al (2002) *Superplastic behaviour of metal matrix composites*. La Metallurgia Italiana 94, 1 37–46.

[3] Fortunato A et al (2009) *La saldatura laser tra plastica e metallo*. Applicazioni Laser 23 34–37.

[4] Ascari A et al (2011) *Il trattamento termico superficiale mediante laser*. Applicazioni Laser 32 40–41.

[5] Orazi L et al (2011) *Microlavorazioni di superfici complesse*. Applicazioni Laser 33 44–50.

[6] Ascari A et al (2013) *Laser micro-welding of high carbon steels*. Riv. Ital. Saldatura 65, 4 507–513.

Proceedings of National Conferences

[1] Tani G, Orazi L (2002) *Metodologie per la misura ed il controllo di stampi con tecniche di Reverse Engineering*. Il ruolo del Reverse Engineering nelle tecniche di Time Compression 1 69–79.

[2] Orazi L, Tani G (2003) *Application of Reverse Engineering and Analysis Techniques for Surface Quality Control of Automotive Components*. Proceedings of the 6th AITeM Conference 1 185–186.

[3] Orazi L, Tani G (2004) *Modifiche di Geometrie Acquisite mediante sistemi di Reverse Engineering*. Il ruolo del Reverse Engineering nelle tecniche di Time Compression 125–143.

[4] Orazi L, Tani G (2005) *Shape evaluation procedure for free form surfaces*. Proceedings of AITeM 2005 Conference 56–69.

[5] Cuccolini G et al (2009) *An automated procedure for laser milling of textures for mould manufacturing*. 9^{th} AITeM Conference - Enhancing the Science of Manufacturing - Proceedings 1 239–242.

[6] Cuccolini G et al (2009) *Reverse Engineering for the geometrical characterization of root canals in dental implant*. 9^{th} AITeM Conference - Enhancing the Science of Manufacturing - Proceedings 1 127–129.

[7] Orazi L (2009) *Laser hardening of hypo-eutectoid steels: an effective and efficient model*. 9^{th} AITeM Conference "Enhancing the Science of Manufacturing - Proceedings 1 49–52.

[8] Tani G et al (2009) L*ASER hardening of 3D complex parts: industrial applications and simulation results*. 9^{th} AITeM Conference "Enhancing the Science of Manufacturing - Proceedings 1 243–244.

Patents

Prof Orazi is author and co-author of two international patents. In details:

18 Jan 2018 — Method for Ultrafast Laser Writing of Highly-Regular Periodic Structures — *PCT/CZ2017/050027*

Inventors: ORAZI L, Gnilitskyi I, Thibault D, Bulgakova N, Mocek T

The patent protects a method for the generation of LIPSS, Laser Induced Periodic Surface Structures characterized by high regularity.

15 Jan 2020 — Preform Mold Component — *PCT/IB2020/050305*

Inventors: Sorgato M, Lucchetta G, ORAZI L, Masato D, Bessegato F, Cavalet A, Zoppas M

The patent concerns the development of laser texturing methods to manufacture vent surfaces with anti-fouling properties in molds for polymer injection.

Research Projects

Scientific Research Projects

Feb 2007 – Mar 2009 — PRIN 2006 - SIMEX — *Role: participant*

Participation at the project *SIMEX: Simulazione Matematica del Processo di Tempra Laser*. Development and implementation of numerical simulation models for laser hardening process.

Jan 2018 – Jun 2022 H2020-ICT-30-2017 - MILEDI *Role: local unit coordinator*

Coauthor of the proposal and coordinator of the UNIMORE local unit in the european project *MILEDI - MIcro QD-LED DIrect micro patterning*. Design and set-up of the laser laboratory and of methods for laser induced generation of high efficiency quantum dots. Budget 378125 €

Jan 2018 – Jun 2023 H2020-MSCA-RISE-2016 - NANOSURF *Role: local unit coordinator*

Coauthor of the proposal and coordinator of the UNIMORE local unit in the european project *NANOSURF - Development of novel dental implants with advanced mechanical properties and improved nanostructured surface.* Laser texturing techniques for surfaces of biomedical parts. Budget 144000 €

Mar 2023 – current PR-FESR - SAFER *Role: scientific coordinator*

Author of the proposal and scientific coordinator of the Emilia Romagna regional project *SAFER - Injection molding of polymer parts functionalized by laser texturing.* Laser texturing techniques for surfaces of plastic injection molds. Budget 286667 €

Industrial Research Projects

Feb 2003 – Dec 2003 Microsystem Srl *Role: scientific coordinator*

Algorithms for the hybrid modeling of molds for footwear. Budget 12000 €.

May 2010 – Apr 2011 CB Ferrari Srl *Role: scientific coordinator*

Automatic generation of the part program for laser micromanufacturing on 5 controlled axis machines. Budget 30000 €.

Jun 2012 – Dec 2012 CB Ferrari Srl *Role: scientific coordinator*

implementation of advanced software functions for laser micromanufacturing on 5 axis controlled machines. Budget 2400 €.

Jan 2016 – Jun 2017 SISMA SpA *Role: scientific coordinator*

Development of advanced fucntions for laser texturing. Budget 36000 €.

Sep 2016 – Ago 2017 SACMI Sc *Role: scientific coordinator*

Laser micro and nanotexturing for injection molding of semi fused plastic. Budget 36000 €.

Mar 2017 – Dec 2017 SISMA SpA *Rolescientific coordinator*

Development of advanced functions for laser texturing of 3D surfaces. Budget 39000 €.

Feb 2018 – May 2019 SISMA SpA *Role: scientific coordinator*

Development of advanced methods for laser texturing of 3D surfaces. Budget 39000 €.

Jun 2019 – Dec 2020 SISMA SpA *Role: scientific coordinator*

Validations of advanced methods for laser texturing of 3D surfaces. Budget 36000 €.

Jun 2023 – Dec 2023 DMM Srl *Role: scientific coordinator*

Laser texturing techniques for the coloration of metallic surfaces. Budget 45000 €.

Nov 2024 – Jun 2025 Tetra Pak Spa *Role: scientific coordinator*

High speed laser marking for packaging applications. Budget 22000 €.

Nov 2024 – Jul 2025 ML Engraving Srl *Role: scientific coordinator*

Advanced Functions for the generation of industrial textures. Budget 45000 €.

Jul 2024 – Jul 2025 LUM - Libera Università del Mediterraneo *Role: scientific coordinator*

Increasing of the energy efficency in injection molding. Budget 23000 €.

Jul 2024 – Jul 2025 UFI Hydrogen *Role: scientific coordinator*

Laser texturing for components of PEM based electrolysers. Budget 48000 €.

Jul 2024 – Jul 2025 Project Services Srl *Role: scientific coordinator*

Integrated system for the coloration of metallic surface. Budget 45000 €.

Honors

Jun 2016 Athenaeum Research Funds *University of Modena and Reggio Emilia*

He won the department FAR (Athenaeum Research Funds) call with the project *Laser Nanotexturing of surfaces for biomedical applications.*

Sep 2015 - on going Affiliation to Scientific Society *CIRP*

Affiliated as Associate Member at CIRP - International Academy for Production Engineering. Operating mainly in STC-E and STC-S technical committee.

Oct 2018 Invited Talk *Sumy State University, Ukraine*

Invited speaker at "VI International Research and Practice Conference for Student and Young Scientist" with a prolusion titled *Laser surface processing for biomedical applications*

Sep 2021 Invited Talk *Odessa, Ukraine*

Invited speaker at "IEEE NAP - 2021 - 11^{th} International Conference Nanomaterials: Applications & Properties" with a prolusion titled *Surface Micro- and Nano-Structuring by Ultrafast Laser Processing*

Service To The Scientific Community

Peer Review Activity

2005 – on going Reviewer

Prof. Orazi can demonstrate an extensive activity as peer-reviewer for several journals and international congresses in the field of manufacturing technologies, in particular for journals related to laser processing (e.g. Optics and Laser Technology, The International Journal of Advanced Manufacturing Technologies and Lasers in Manufacturing and Material Processing).

Web of Sciences database reports more than 70 peer review records since 2014.

Scientific Committee

Jul 2019 — Scientific Committee — *Jurmala, Latvia*

Member of the Scientific Committee of the International Congress "Nanomaterials for Biosensors and Biomedical Applications"

International Relationships

Oct 2017 - Sep 2020 — Collaboration Agreement — *HiLASE Centre, Institute of Physics, Czech Academy of Sciences, Czech Republic*

Contact point for the relationship between University of Modena and Reggio Emilia and HiLASE centre

Apr 2018 - on going — Collaboration Agreement — *University of Latvia, Latvia*

Contact point for the relationship between University of Modena and Reggio Emilia and University of Latvia

Apr 2018 - on going — Collaboration Agreement — *Sumy State University, Ukraine*

Contact point for the relationship between University of Modena and Reggio Emilia and Sumy State University

Reggio Emilia,

Prof. Leonardo Orazi