PoliBA

research catalogue 2020

Politecnico di Bari

research
catalogue
2020

UNIVERSITY
INDUSTRY
ENGAGEMENT
KNOWLEDGE

Politecnico
di Bari

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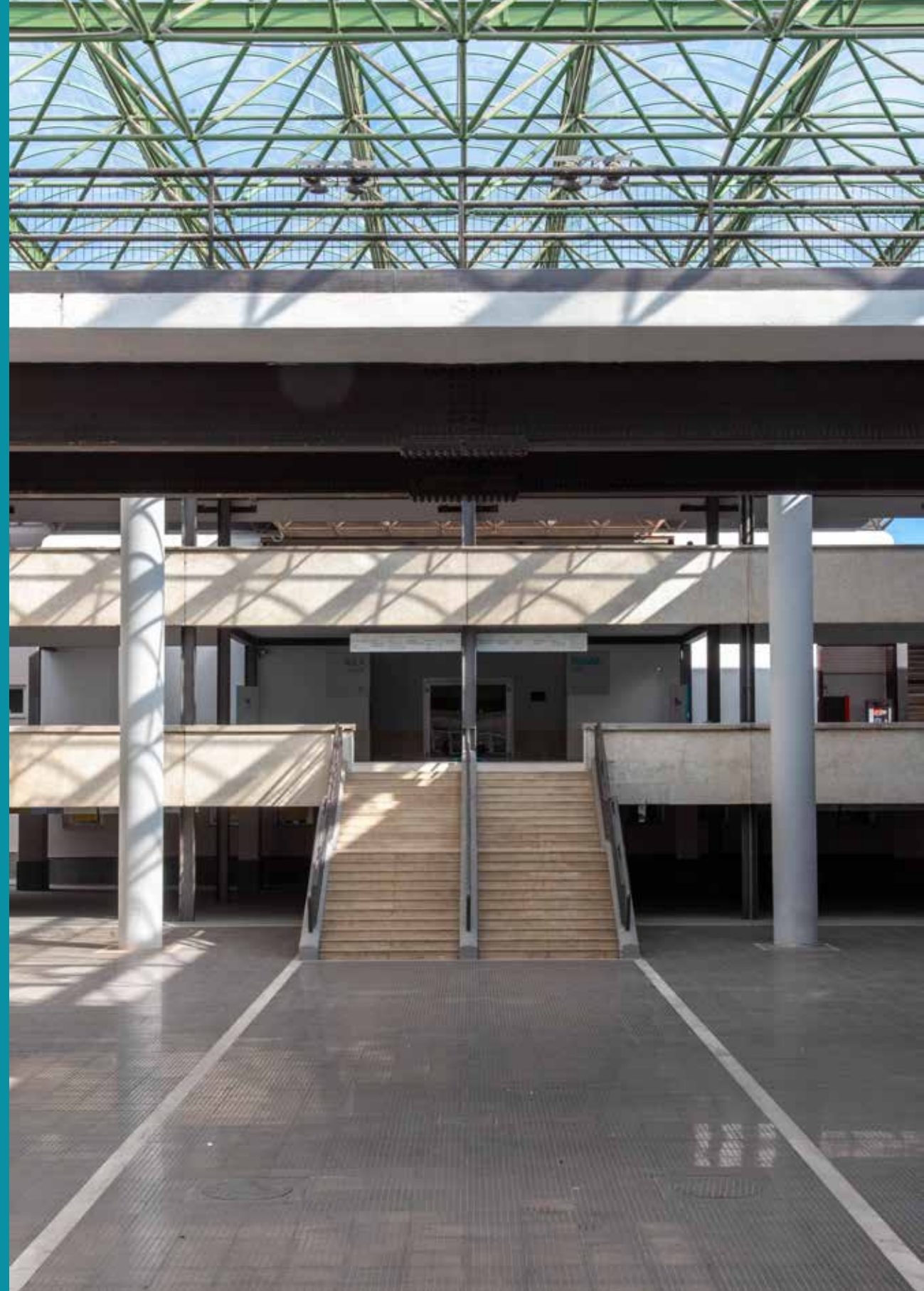
RECTOR'S WELCOME

prof. eng. Francesco Cupertino

Politecnico di Bari is a research university that, according to the Italian regulations, focuses its activities in the studies of Engineering and Architecture, and it is one of the three existing in Italy and the only one in the centre-south.
It was founded in 1990 from the Faculty of Engineering and also by the establishment of the Faculty of Architecture and, therefore, it has a well longer tradition that dates back to 1943-1944, with the first courses taught in an Italy still divided by war.
Our researchers are at the top of international rankings for excellence in several flagship areas for both new technologies and typical engineering sciences.
We have about 12,000 students, attending Bachelor courses, Master courses and PhD courses. The courses cover the main areas of Engineering and Architecture and are articulated on the two locations of Bari and Taranto. Our students have the opportunity to complete their training with periods of study abroad, in other European and non-European universities, thanks to a large number of international cooperation programs with prestigious foreign universities.
With some of them, the achievement of the so-called double degree has also been provided, a path through which it is possible to obtain a double degree, valid in both states in which the two universities are located. Politecnico is a rigorous university that requires a commitment in terms of study and dedication and a commitment that is rewarded with a high return on the labour market and high rates of employment.
The ambition is always to provide, together with a substantial technical preparation, a complete training for professionals determined to tackle the growing challenges of a global market, full of pitfalls but also of opportunities to be grasped. Our graduates successfully work on the territory, but also in the main worldwide multinational corporations and in prestigious foreign universities, to prove the value of the studies.
Politecnico daily strengthens its relations with companies, both in terms of research, shadowing and placement, while some companies have permanent presence in public/private laboratories where virtuous synergies allow to obtain always better research results, but also the opportunity to let our students be acquainted, through internships carried out during the course of studies, with the business reality.
This year, in addition to numerous cultural activities, the new Poligym, located in the campus, will also be available, to allow living the all-round university experience, in collaboration with the University Sports Centre.In conclusion, a young and dynamic university, for students who want to build their future work on solid bases, but also a place where to become aware citizens of Europe and of the world and to carry out research in the flagship fields of applied science and technology.



INTERNATIONAL COLLABORATION

Source: Scopus (2018)

14 ERASMUS+ International credit mobility programme with over 50 Universities

4 partners POLIBA2CHINA programme

7 DOUBLE DEGREES

Ranked 3rd in Italy for students satisfaction

More than 10 EU Horizon 2020 financed projects

Project Title	Brief description	Partners involved (Names and countries of origin)
ERASMUS+ INTERNATIONAL CREDIT MOBILITY PROGRAMME (KA107)	Set of projects funded by European Union to promote international mobility of students and staff, between Programme Countries (EU) and Partner Countries (Non-EU)	Afghanistan, Algeria, Albania, Bosnia & Herzegovina, Chile, Egypt, Georgia, Israel, Kosovo, Montenegro, Serbia, Syria, Russian Federation
POLIBA2CHINA	student mobility and academic cooperation programme with Chinese partners, funded by Apulia Region - FESR	Shandong University of Technology, South China University of Technology, Huaqiao University, Fuzhou University
MOUs	Memorandum of Understanding	Bilateral Cooperation Agreement signed with Several UE and not UE Countries
DOUBLE DEGREES	Double Degrees in Mechanical Engineering, Internet Engineering and Building Engineering	Polytechnic University of New York (USA), Cranfield University (UK), Universidad de Sevilla – ETSIE (SPAIN), University of Nice Sophia Antipolis (FRANCE)
GRANT EXTRA UE	Grant and research project funded by International Partners	Us Army (USA), Office of Naval Research (USA)

Research and Technology Transfer

18 SPIN OFF

13 PATENTS

128 RESEARCH GRANTS

1,9 M€ SPONSORED RESEARCH AND INDUSTRIAL CONSULANCY

900 SCIENTIFIC PUBLICATIONS

Included in the QS WORLD UNIVERSITY RANKINGS and #301 by Subject areas. #9 top 10 Italian Best in Architecture and Design ranking

21 INDUSTRY-SPONSORED PhD SCHOLARSHIPS (2017-2019)

THE POLYTECHNIC IN FIGURES

500
TEACHERS, RESEARCHERS AND STAFF

12.000
STUDENTS

5
DEPARTMENTS

around **12.000** undergraduate and postgraduate students

of which about **31% are women**

about **3.000 students** registered every year

about **150** enrolled in **Research Doctorate** courses

11 three-year Degree courses
13 Master's Degree courses
01 single-cycle Degree course
04 post-Degree courses
04 PhD courses
01 Post-graduate School

07 study courses with double degree agreements
05 study courses delivered in English
160 incoming Erasmus students
281 outgoing PoliBa Erasmus students

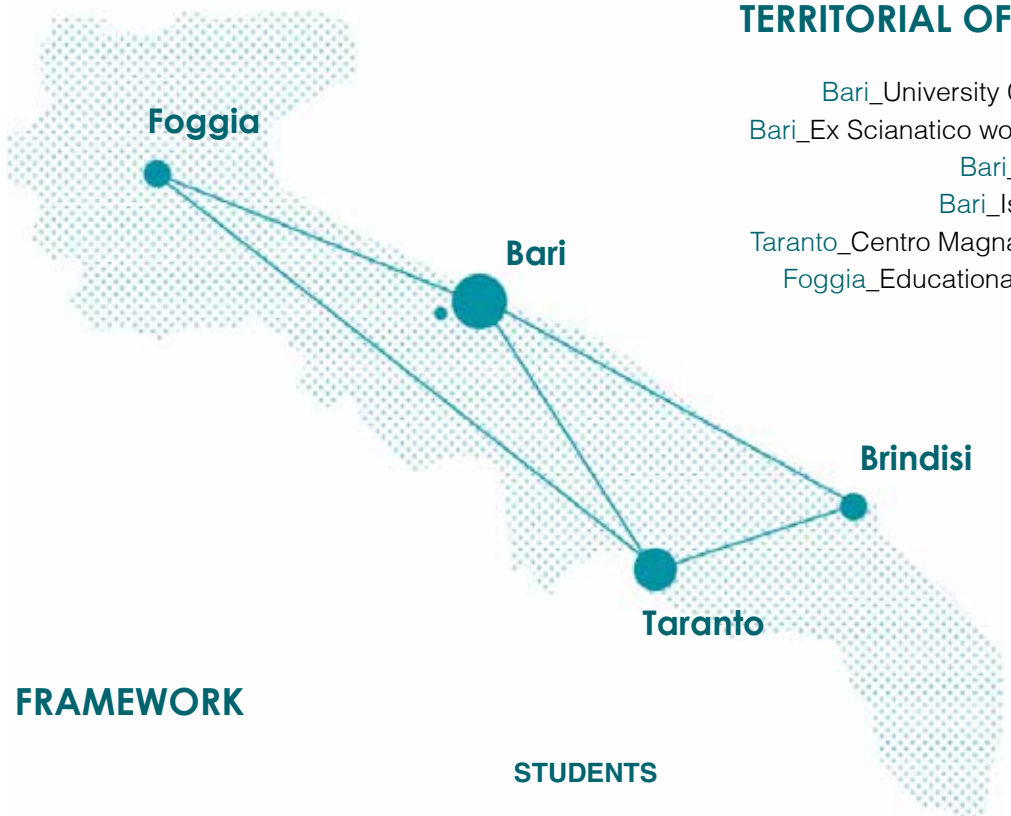
about **1.900 graduates each year**, of which more than 500 within the legal term

employment rate at 3 years from the two-year master's degree **82.4%**

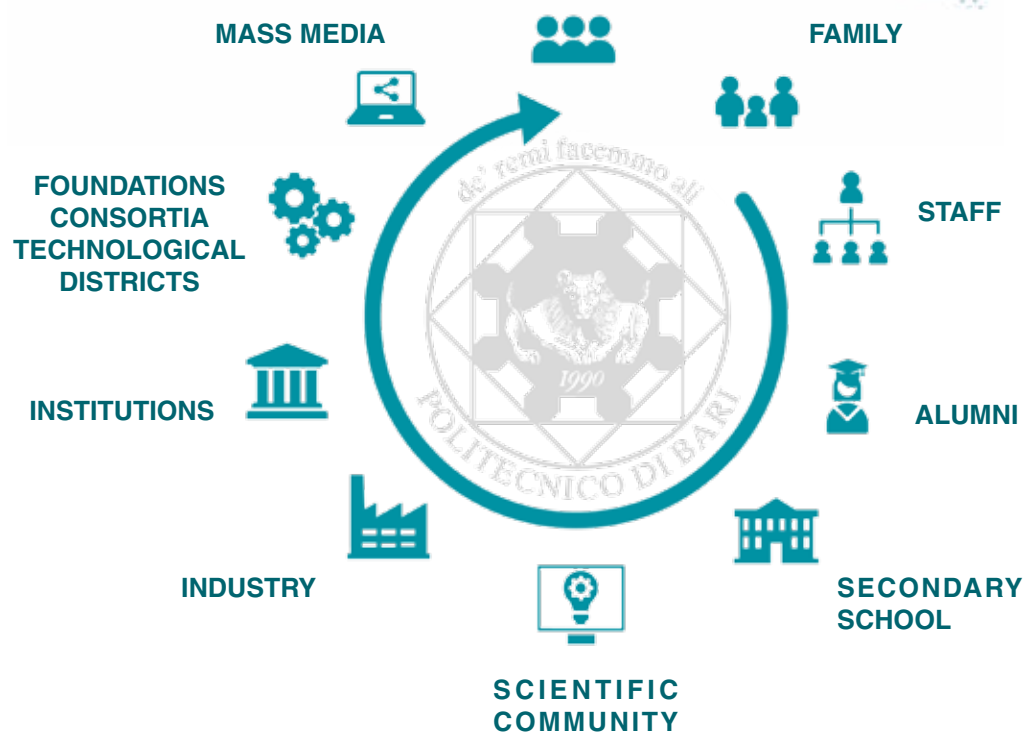
employment rate at three years from degree single-cycle **76.8%**

TERRITORIAL OFFICES

Bari_University Campus
Bari_Ex Scianatico workshops
Bari_Japigia
Bari_Isolato47
Taranto_Centro Magna Grecia
Foggia_Educational Center



FRAMEWORK




BOSCH
BOSCH
THE ONLY IMPOSSIBLE
JOURNEY IS THE ONE

CONTENTS

Since the beginning, the policy of Politecnico di Bari has been distinguished by its focus on the quality of research and education, on the internationalization and on innovation. International exchange activities in the teaching and learning area include several agreements with Institutions abroad, most of all in EU.
The team of Politecnico is dedicated to fulfilling the educational and research mission of University, and to advancing a vision for the future of the University where the tradition of academic excellence is combined with a strong commitment in serving society.
Nowadays the staff of Politecnico is composed of around 287 researchers/ professors, and 256 members of administrative staff. The total enrollment amounts to around 12.000 undergraduate and postgraduate students. Several facilities are available at the campuses including leisure and sport facilities.

Since 2012, Politecnico di Bari is structured in the following departments:

DICAR Department of Civil Engineering Sciences and Architecture
DICATECh Department of Civil, Environmental, Land, Building Engineering and Chemistry
DEI Department of Electrical and Information Engineering
DMMM Department of Mechanics, Mathematics and Management
DIF Department of Physics, jointly with the Università di Bari

Politecnico di Bari is also structured in the following two interdipartimental centers:
- Magna Grecia;
- Interdepartmental Center “Startup Lab”.

Referring to the academic year 2019/2020, the educational offer is articulated in 23 degree courses: Laurea (three years), Laurea Magistrale (two years), Masters and PhD courses.
Politecnico di Bari is therefore an university where education and research combine to meet the actual needs of the society (societal challenges) and, in particular, those of the students. Both basic and applied research activities are carried out in the Departments and in the Research Centres of Politecnico. They are supported by the Industrial Liaison Office to cover activities from research to market with a new focus on innovation-related activities, such as piloting, demonstration, test-beds, patents, and spin-offs.

DICAR

Department of Civil Engineering Sciences and Architecture

The Department of Civil Engineering Sciences and Architecture (DICAR) of Politecnico Bari is a centre of excellence that carries out theoretical and applied research on topical issues: on the relationship between city and landscape, in order to define innovative and sustainable settlements and housing models for the contemporary city; on the relationship between the new and the ancient, in order to define principles and innovative techniques for the restoration, reconstruction and enhancement of archaeological and architectural heritage; on the relationship between architecture and construction, in order to reinforce the structural concept of formal research into architecture; on the use of "smart" digital technologies to industrial and manufacturing processes (Industry 4.0), with significant experiments in the textile and furniture sector. These researches are aimed to preserve and enhance the Heritage, assumed to be a problematic field, but at the same time an identity one, of Euro-Mediterranean area.
They are carried out in the degree courses (Architecture and Industrial Design), Departmental Research Laboratories, the School of Specialization in Architectural Heritage and the Landscape and Ph.D. "Architecture: Innovation and Heritage".
The choice of application themes matches the requests coming from the local Institutions (Apulia Region, Metropolitan City, Superintendence Authorities, Regional Agency for the Home, Albanian Agency for Territory, Superintendence Authority of the Greek Monuments) and stakeholders in the production world (Architects' Order, National Association of Building Contractors). Close and successful collaboration with all these stakeholders allows graduates of the Department's degree courses to get closer to jobs and professions with better up-to-date knowledge experiences in respect of the development field of the Heritage 'new economy' (architectural, urban and landscape) and Industrial Design.

Web site and contacts

http://www.architettura.poliba.it

Department chair:

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Administration Manager:

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Keywords

City and Landscape
Architecture and Construction
Architecture and Heritage

Staff

Professors: 51
Technical and administrative: 18
Post Doctoral Research Fellows: 12
PhD Students: 33

PhD Course: Architecture: Innovation and Heritage

DICATECh

Department of Civil, Environmental, Land, Building Engineering and Chemistry

The Department of Civil, Environmental, Land, Building Engineering and Chemistry aims at achieving shared goals using a model aimed at promoting modern and interdisciplinary research.
The presence of large research infrastructures and expertise is strategic, with an impact testified by a large network of relationships with public and private actors. This plays a crucial role in developing new engineering solutions with large impact at national and international level.
The overall objective of the Department is to develop interdisciplinary research actions in defining and constructing new interpretative models, respecting the overall criteria of the land planning, land conservation, protection and management of the natural resources, development of environmentally sustainable processes, as in the design of new infrastructures and buildings as well as in the rehabilitation of existing ones.
Our mission is, in line with the priorities of the European agenda:
To promote a holistic approach to the scientific research.
To focus more on the research objectives.
To valorise the development sectors in which Italy and Apulia can maintain and strengthen a leading position and promote sustainable economic growth.

Web site and contacts

Http://www.dicatech.poliba.it/

Department chair:

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Keywords

Civil engineering
Environment and natural resources
Infrastructures
Building engineering
Chemistry

Staff

Professors: 69
Technical and administrative: 26
Post Doctoral Research Fellows: 22
PhD Students: 34

PhD Course: Risk and Environmental, Territorial and Building Development

DEI

Department of Electrical and Information Engineering

The Department of Electrical and Information Engineering (DEI) was established in 1982 to foster, coordinate, manage research/training and education/technology transfer activities in electrical and information engineering.
The Department is chaired by Prof. Saverio Mascolo and its staff includes 69 full time tenured researchers, 14 administrative assistants, and many PhDs and PostDocs.
DEI includes 12 Scientific Research Areas and more than 20 Laboratories: Computer Science, Control Systems Engineering; Converters, Electrical Machines and Drives; Electrical and Electronic Measurements; Electrical Energy Systems; Electrical Engineering; Electromagnetic Fields; Electronics; Medical Systems Engineering; Numerical Analysis; Operations Research; Telecommunications.
The Department provides 1 PhD course, 10 Master and Bachelor Degrees in Electrical and Information Engineering, with numerous international Master and Bachelor Double Degrees with renowned international Universities. DEI collaborates with prestigious Universities/Research Centers and large companies/ SMEs in the world.

Web site and contacts

Http://dei.poliba.it/

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Keywords

Automation
Computer Science
Electrical Engineering
Electronics
Information and Communication
Medical Systems Engineering
Technology

Staff

Professors: 69
Technical and administrative: 15
Post Doctoral Research Fellows: 43
PhD Students: 51

PhD Course: Electrical and Information Engineering

DMMM

Department of Mechanics, Mathematics and Management

The Department brings together scientific expertise in the context of Mechanical Engineering, Management, and Mathematics. The mission of Department is to pursue excellence in research and teaching in the following fields: Biomimetics and tribology of surfaces; Collective Intelligence; Complex Flow Simulation; Dynamics and control of vibrations; Energy Efficiency and Renewable Energy; Nonlinear differential equations; Combinatorial Geometry and Applications; Innovation management; Sustainable Management; Innovation in Industrial Plant Engineering; Contact friction mechanics; Micromachining, Additive Manufacturing and Reverse Engineering, Sustainable Production; Mathematical models in material science and quantum systems; Mechanical design for materials and structures; Industrial Augmented Reality; Robotics; Digital Enterprise Strategy and Models; Innovative Materials and Technologies; Innovative mechanical transmissions; Unità di Ricerca INDAM; Welding and Laser Manufacturing. The research topics are carried out by the 21 research groups of the Department in more than 30 Laboratories, including four networks of laboratories (EMILIA, MICROTRONIC, TISMA, and Trasforma). The DMMM has been selected by the Italian Ministry of Education, University and Research as a Department of Excellence and has been awarded special ministerial funding for the five years 2018-2022. The department provides 1 Ph.D. course, three bachelor degrees (Mechanical Engineering, Management Engineering, and Aerospace Engineering Systems), three Master Degrees (Mechanical Engineering, Management Engineering, and Aerospace Engineering), and several Double Degrees.

Web site and contacts

Http://dmmm.poliba.it/

Department chair:

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Department Deputy Chair:

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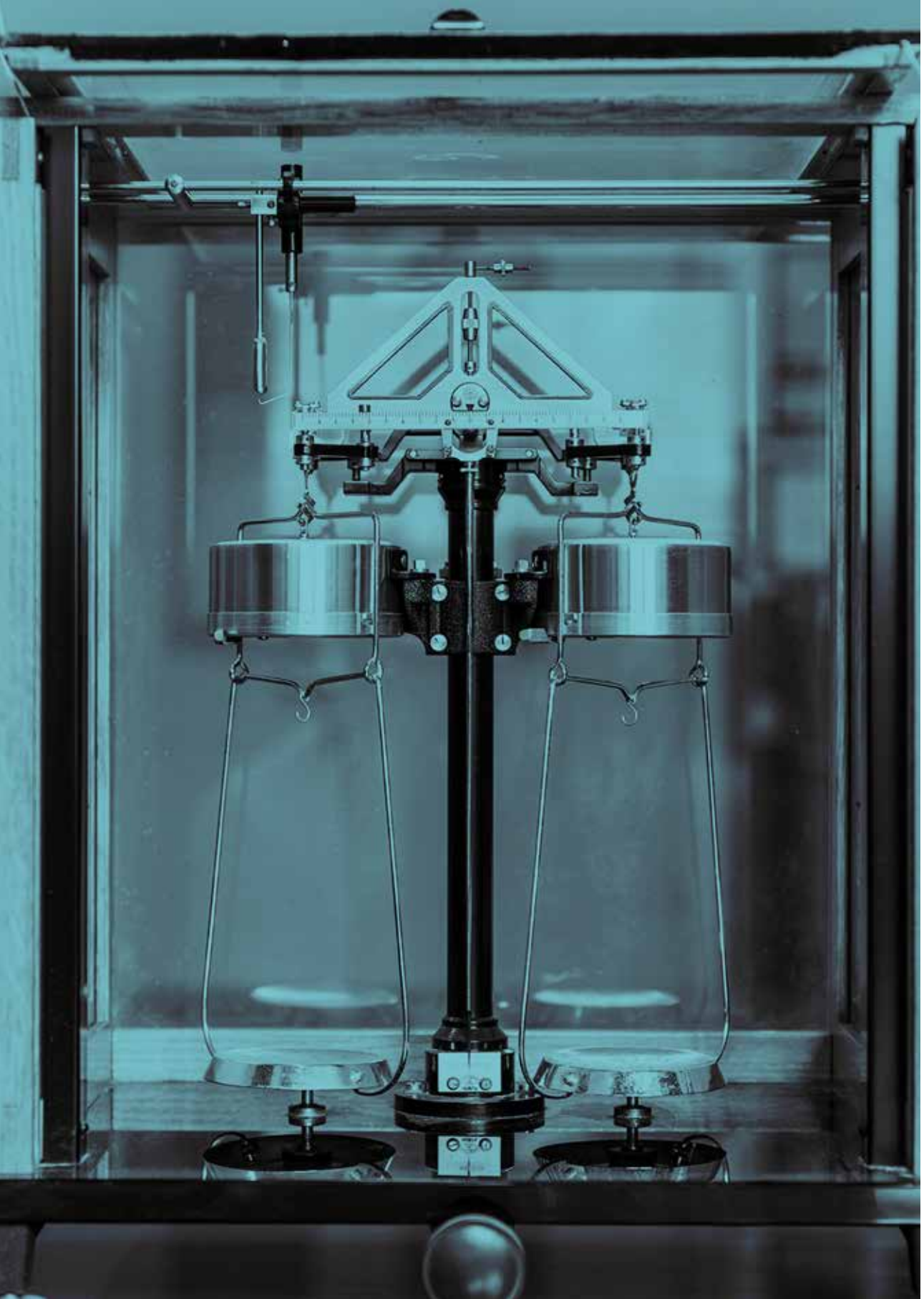
Keywords

Aerospace, Energy and Engines
Experimental Mechanics
Mechanical and Mechatronic Design
Management
Mathematics
Structural Diagnostic
Technologies and Plant Design

Staff

Professors: 85
Technical and administrative: 15
Post Doctoral Research Fellows: 26
PhD Students: 42

PhD Course: Mechanical Engineering and Management



DIF
Department of Physics

The Department of Physics “Michelangelo Merlin” “Michelangelo Merlin” in 1948 (formerly referred to as “Istituto di Fisica”) and since 1995 it is shared between the University and Politecnico di Bari.
The inter-university nature makes the DIF the only example existing in Italy among Physics departments.
The Department hosts the local branches of the following national research institutions: the National Institute of Nuclear Physics (I.N.F.N.); the Institute of Photonics and Nanotechnologies (IFN), the Institute of Atmospheric Pollution Research (IIA) and the Institute for Plasma Physics and Technologies (Nanotech) of the CNR (National Research Council). It also hosts the data center “RECAS” and the joint-research LAB PolySense in collaboration with THORLABS GmbH.
The Department has about 50 faculty members and 26 staff units, including both administrative and technical staffs. In the department there are 30 active laboratories and 1 library.
The main research topics, carried out by the 19 research groups of the Department consist in Nuclear and Sub-nuclear and astroparticle Physics, Physics of Matter, Optical Sensing, distributed Computing technology. The Inter-university Department of Physics represents an ideal laboratory where fundamental research and technological know-how strictly interact with each other.

Web site and contacts
Http://www.uniba.it/ricerca/dipartimenti/fisica

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Keywords
Nuclear, sub-nuclear and astroparticle physics
Optical Sensing
Physics of Matter
Big Data Computing
Theoretical Physics
Medical physics

Staff
Professors: 14
Technical and administrative: 1
Post Doctoral Research Fellows: 3

PhD Course: Physics

Interdepartmental Center “Magna Grecia”

Interdepartmental Center “Magna Grecia” was established in 2012 in Taranto, in the same campus that hosted for several years the II Faculty of Engineering of Politecnico di Bari.
The mission of the Center, which encompasses all five departments of Politecnico di Bari, includes:

- To strengthen, coordinate and support interdisciplinary research and third mission activities on environmental remediation and industrial regeneration (with a specific focus on aerospace activities), which are the main challenges that affect the area of Taranto as well as many other areas in the world;
- To contribute to the dissemination of the research findings achieved in the Centro
- To offer technical and logistic support for the graduated and undergraduated courses given in Taranto
- To host labs and scientific equipment used to carry out both teaching and research activities.

Main labs:
Electrical and Electronic Measurement Lab
Electromagnetic Fields and Telecommunications Lab
Environmental Chemistry/Technologies Lab
Geomatics Lab
Geotechnical Engineering Laboratory
Hydraulics and Maritime Hydraulics Lab
Interdisciplinary Additive Manufacturing Lab
Knowledge Management Lab - Competence Center on Business Process Management
Transportation and Mobility Planning Lab

The Center is open to scholars from other italian and foreign universities as well as to public and private organizations.

Keywords
Environmental remediation
Industrial regeneration
Circular economy
Aerospace technologies
Sustainable development
Sustainable cities and communities
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Administration manager: dr. Cesare Bucci – cesare.bucci@poliba.it

Interdepartmental Center “Startup Lab”

The StartUp Lab is aimed at supporting research, innovation and technological transfer activities by the Polytechnic University of Bari. In particular, the StartUp Lab has the following objectives:

- fostering the creation of innovative entrepreneurial ideas, with a focus on the opportunities emerging from the digital economy; in this context, StartUp Lab is involved in the activities of the Contamination Lab “DigiLab”, where a cultural melting pot of individuals takes place, involving different competence domains and experiences;
- developing innovative entrepreneurial activities, supporting teams in finding their successful way to the market, in particular embracing the PoliBa Factory projects in the field of manufacturing (MARS) and creative and digital communities (CROWD), as well as in the Health sector (H-HUB);
- providing education paths different from Engineering traditional courses, addressed at developing creativity, team working, soft skills, and management issues, by combining the academic view with the experience of practitioners, professionals, managers, startuppers and entrepreneurs;
- facilitating the access to grant opportunities and the dissemination of the results coming from the aforementioned activities.

At present, the Center is participated by 3 Departments, namely DMMM, DEI, and DICATECh.

Keywords
Entrepreneurship
Innovation
Technology management
Business

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BigRep
BigRep

LABORATORIES

The vital core of research activities in Politecnico di Bari is carried out in its thematic laboratories. These laboratories provide the necessary facilities and machineries for the development of innovative solutions in several research areas. The laboratories cooperate constantly with various national and international research institutions as well as different industrial partners.
Currently, Politecnico di Bari has more than 60 laboratories located in its research departments.

DICAR
Laboratories Department Engineering Sciences and Architecture
Architectural and Building Acoustics
Architectural Design Laboratory
Building Physics Laboratory
Design_KIND LAB
INMATEX - INteraction MAterial EXperience Lab
MITO Lab - Multimedia Information for Territorial Objects
Laboratorio Ufficiale Prove Materiali “M. Salvati”
Urban Planning and Sociology Laboratory

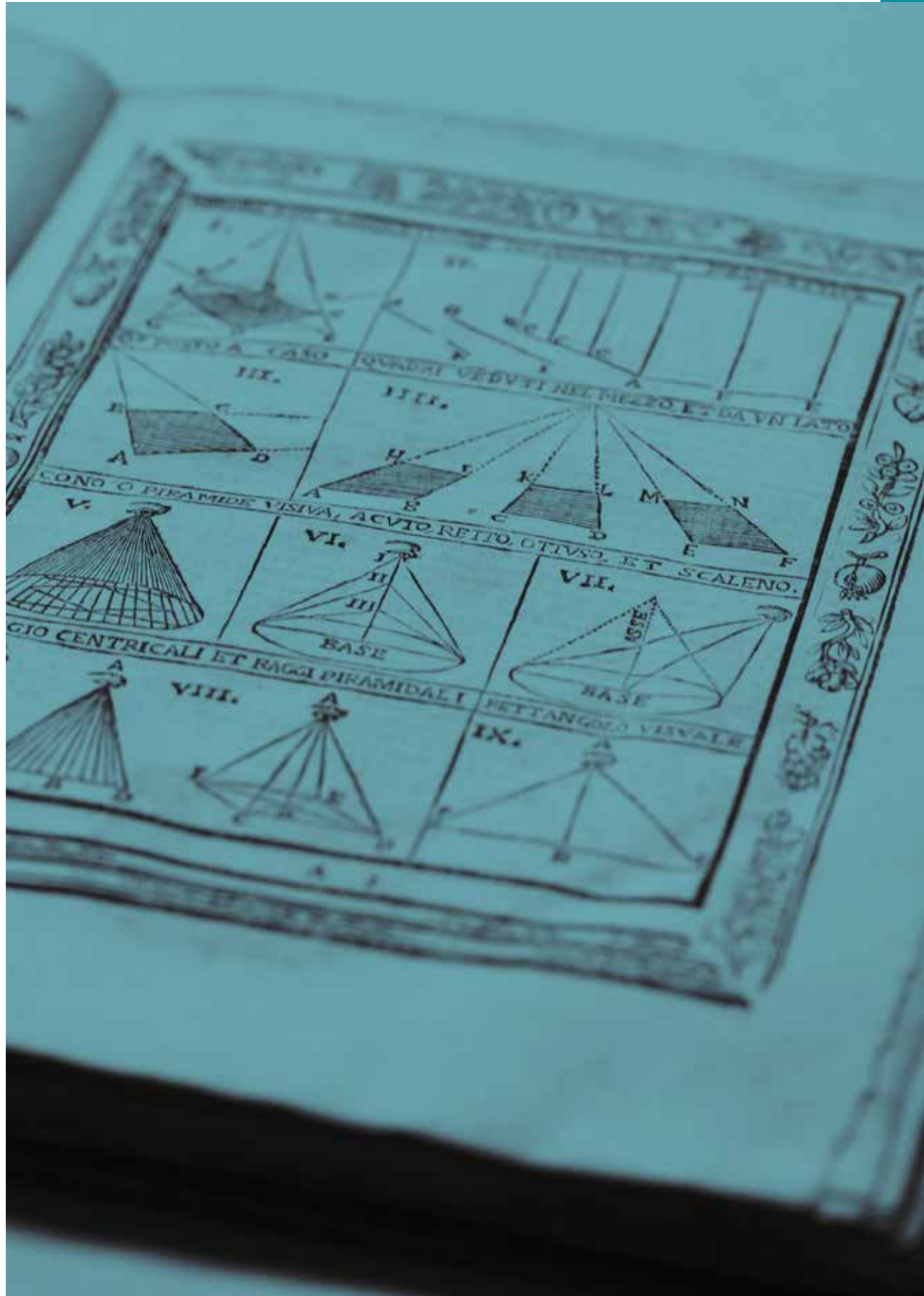
DEI
Laboratories Department of Electrical and Information Engineering
Advanced Electrotechnics
Advanced Environmental inFormatic Laboratory (AEFLAB)
Applied Electronics and Microelectronics
Apulia regional laboratory oh characterization of new organic and nanostructur ed materials
Artificial Vision Laboratory (AVLAB)
Clean room
Control and automation
Control of Computing and Communication Systems Lab (C3LAB)
Decision and Control Laboratory
Design of Electronic Integrated Sistems Lab (DEISLab)
Digital Electronics Systems and Applications lab (ELEDIGILAB)
Elec Lab
Electrical and Electronic Measurements Research Lab - Magna Grecia Center
Electrical and Electronic Measurements Research Lab - Bari
Electrical Machines and Drives
Electromagnetic Fields and telecommunications - Magna Grecia Center
Electronic devices laboratory
Electronic for signal processing laboratory
Electronics for Telecommunications
Industrial Informatics
Information Systems Laboratory (SisInf Lab)
Laboratory of Automation and Control (LCA)
Laboratory of Photonics Research Group
LabZERO
Optoelectronics Laboratory
Power Electronics
Prince - Electrical Energy Systems
Signal Processing Laboratory
Telematics Laboratory

DICATECh
Laboratories Department of Civile, Environmental, Land, Building Engineering and Chemistry
Applied Geomatics Laboratory (AGlab)
Coastal Engineering Laboratory (LIC)
Environmental Technologies Laboratory (ETL)
Geotechnical Engineering Laboratory
Laboratory of Buinding Technologies
Laboratory of Chemistry
Laboratory of Cognition and Spatial Planning
Laboratory of Environmental Geoengineering
Transportation Planning and Mobility

DIF
Laboratories Department of Physics
ALICE - Laboratory for ultra-thin silicon detectors
Gaseous Detector Lab
High Energy photosensors and electronics for space-born and ground-based experiments Laboratory
Mechanical Workshop
Laboratory for ultra-thin silicon detectors
ReCaS
Remote Sensing Lab
PolySense
Silicon Detectors Laboratory for High Luminosity Colliders

DMMM
Laboratories Department of Mechanics, Mathematics and Management
Advanced Forming & Manufactoring
Advanced Optical Methods and Structural Optimization
Business Planning
Demanufacturing Lab
E-business

EMILIA LAB (experimental integrated laboratory for aerospace)
Estensimetria (Strain Gauge Testing lab)
Flow Simulation and modelling of energy systems
Geomatics laboratory
Hybrid welding
Interdisciplinary Additive Manufacturing Lab (I AM Lab)
Knowledge Management Laboratory (KMLab)
Laboratory of Computer Numerical Control Machine Tools
Laboratory for hydraulic pumps and turbines
Laboratory for Internal Combustion Engines (MACI)
Laboratory for steady state conventional and MILD combustion (LACO)
Laboratory for the thermo-physical characterization of manufactured polymers
Laboratory for wave energy conversion devices and Wells turbines
Laboratory of experimental stress analysis
Laboratory of Industrial Systems Engineering (LISE)
Laboratory of Intelligent Computation for Manufacturing and Production Systems
Laboratory of Manufacturing Processes by Laser Technologies
Laboratory MICROTRONIC - micro-machining and 3D micro-measures for mechanical components
Laboratory for Rapid Prototyping and Reverse Engineering
Laboratory of testing on innovative materials and structures
Levantine Lab for Sustainable technologies (SESTANTE)
MATH - LAB
Mechanical and Thermal Measurements Laboratory
Metallography and Microscopy (M&M - Lab)
Noise and Vibration Laboratory (NVLab)
Optimization of Manufactoring Processes by Numerical Simulations (ManOnSim)
Physical Simulation of Manufactoring processes (PhySIMaP-Lab)
Polimare Lab
Residual Stress Lab
Robot mechanics Lab
static and dynamic mechanical test laboratory
Structural Diagnostic and Thermal Methods for Experimental Mechanics
Tribology Laboratory (TriboLab)
Virtual Reality and Reality Reconstruction Lab (VR3Lab)
Wind Tunnel (GAVE)



Architectural and Building Acoustics

Competencies and research activities

The laboratory is active on three different fields:

1- Measurement and characterization of sound field of indoor spaces by means of innovative recording techniques. The lab is equipped with two omnidirectional sound sources and several microphones (including a 32-channel microphone array, two B-format microphones, a binaural dummy head, two pairs of binaural microphones, and many others having variable or fixed polar
pattern) to obtain 3D sound maps and any other acoustic parameter. The Lab is also equipped with sophisticated simulation tools including acoustic ray-tracing tools and wave-based numerical methods, as well as with tools to perform measurements scaled-down physical models.

2- Material characterization in terms of sound absorption, sound insulation, and non-acoustical properties like flow resistance and dynamic stiffness. Measurements can be carried out, depending on the property to be measured, using small samples (e.g. to measure surface impedance and sound absorption in a standing wave tube), or using larger samples to be tested in the reverberant chamber. The lab is equipped with two side chambers where measurements of sound insulation properties may be also carried out.

3- Virtual reproduction of sound field and listening tests. The lab is equipped with an extra dry listening room where different playback configuration can be tested (multichannel surround, stereo-dipole binaural, etc.) in order to reproduce sound fields and carry out listening experiments
and comparison among different acoustic features. The room may also be used for the characterization of sound sources.

Thermo-physic characterization of materials

The research in this field has a long term tradition in characterizing building materials in terms of heat transmission, water vapor permeability and heat storage. In addition to certification activities for third parties the Lab has been experimenting on different self-developed low environmental impact composite materials including unfired clay materials, panels made of different by-products as agro-wastes, textile waste and sheep wool.

The laboratory is equipped with a climatic chamber, and instruments to measure thermal conductivity and thermal capacity measurements, as well as to determine hygric properties, water vapour permeability, moisture buffer value, sorption capacity. In terms of other material performances, the lab is equipped with a gas pycnometer to determine bulk porosity and true density. An instrument to determine the PSD (pore size distribution) is also available, together with the equipment to perform accelerated ageing tests. Fire reaction tests will also be available soon. Numerical simulation of hygrothermal behaviour of the materials is also possible by means of dedicated software.

Energy efficiency in buildings, indoor environment quality and sustainability

The laboratory is equipped to perform on-site characterization of thermal, visual, acoustic, comfort conditions together with air quality assessment. Several large scale surveys have been carried out in the past. Multiple sensors for thermal comfort assessment, illuminance and luminance meters, CO2 meters and VOC and particulate analyzers are available. In terms of energy efficiency it is possible to perform analyses and simulations of existing buildings as well as of new designs using different tools including complex dynamic simulators of the whole building behavior, as well as numerical tools (FEM) to model more detailed aspects. The lab is active in designing innovative building components like smart windows and high performance building envelopes. The lab is also active in terms of studying and optimizing the interaction between the building and devices like smart windows, smart thermostats, and other IoT-based sensors in order to optimize energy performance.

Collaborations with companies and institutions:

Bari Port Authority
CNR (ITC, NANOTEC, STIIMA)
Conferenza Episcopale Italiana
COOP Estense
De Carlo s.p.a.
Diocesi Bari-Bitonto
Diocesi di Grosseto
ENEA
ENEL
Ferramati
Fraunhofer Institut
Gordon confezioni
INAIL Puglia
Laterificio Pugliese
SPESAL ASL/Bari
Teatro Pubblico Pugliese
TERA srl
University of Alcoy (ES)
University of Bath (UK)
University of Biskra (DZ)
University of Nottingham (UK)
University of Oxford (UK)
University of Seville (ES)
University of Southern California, Los Angeles (US)
University of Washington, Seattle (US)
Xella Italia

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Architectural Design Laboratory

Competencies and research activities

The Architectural Design Laboratory is organized in two macro-areas of research: City Studies and Digital Fabrication. The Laboratory is a center of excellence in the study of city “forms”, considering all its manifestations and stratifications (ancient, modern, contemporary).

The research activities are based on a cognitive horizon that tries to interpret architectural, urban and territorial/landscape phenomena with a critical interest aimed at orienting the design choices on the basisof a theoretical process that – although opened to different schools of thought – does not renounces to consider the cultural value of the “Italian School” as inalienable and proposes its constant updating, both in terms of didactics and of the experimental exercise applied to the project. Among themain activities, the Laboratory focuses on the development of new settlement/housing “models” able to provide possible solutions in response to the new civil requests revealed by the study of today’s city. The interest in reconstructing the critical points of the urban institution through a process of “eidetic reduction” allows to set a possible horizon also for the recovery interventions and the re-generation strategies of the built (re-use/recycling, smart city, green / blue growth ...).Furthermore, the Laboratory has acquired its own know-how on the development of digital machines at the service of architecture, opening up new scenarios in the world of production. Digital manufacturing has found one of its fields of application in the research through the use of the stone in contemporary architecture and in industrial design products (experimental projects in collaboration with companies specialized in the sector, exhibitions, workshops and stages on the construction of complex stone buildings).

The Laboratory is therefore equipped with: technical and scientific skills, acquired in over twenty years, having worked in the field of architectural and urban design in an experimental form with didactic research developed above all in the degree laboratories and in the doctorate research. It uses scientific equipment for the graphic arts, for CAD / CAM / BIM and for rapid prototyping.

The Laboratory activities have been used for inter-university and inter-departmental collaboration, as well as for international experiences of collaborations mainly with Albania, France, Greece, Hungary, Turkey, China, Belgium, Germany and Middle Eastern countries. It has also actively participated to the preparation of the Venice Biennale.

The Laboratory has collaborated in projects with local institutions such as the Formedil of Bari, the Interporto of Puglia, the Fiera del Levante as well as offering consultancy services to public territorial bodies (region, municipalities, etc.) and to companies involved within the building sector.

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Arch. Phd Vito Cascione (Technical Staff) - vito.cascione@poliba.it

Building Physics Laboratory

Competencies and research activities

Architectural and building acoustics

The laboratory is active on three different fields:

1 - Measurement and characterization of sound field of indoor spaces by means of innovative recording techniques. The lab is equipped with two omnidirectional sound sources and several microphones (including a 32-channel microphone array, two B-format microphones, a binaural dummy head, two pairs of binaural microphones, and many others having variable or fixed polar
pattern) to obtain 3D sound maps and any other acoustic parameter. The Lab is also equipped with sophisticated simulation tools including acoustic ray-tracing tools and wave-based numerical methods, as well as with tools to perform measurements scaled-down physical models.

2 - Material characterization in terms of sound absorption, sound insulation, and non-acoustical properties like flow resistance and dynamic stiffness. Measurements can be carried out, depending on the property to be measured, using small samples (e.g. to measure surface impedance and sound absorption in a standing wave tube), or using larger samples to be tested in the reverberant chamber. The lab is equipped with two side chambers where measurements of sound insulation properties may be also carried out.

3 - Virtual reproduction of sound field and listening tests. The lab is equipped with an extra dry listening room where different playback configuration can be tested (multichannel surround, stereo-dipole binaural, etc.) in order to reproduce sound fields and carry out listening experiments and comparison among different acoustic features. The room may also be used for the characterization of sound sources

Thermo-physic characterization of materials

The research in this field has a long term tradition in characterizing building materials in terms of heat transmission, vapor permeability and heat storage. In addition to certification activities for third parties the Lab has been experimenting on different self-developed low environmental impact composite materials including unfired earth materials, panels made of agricultural wastes and pruning, materials made of textile waste and sheep wool. The laboratory is equipped with a climatic chamber, and instruments to measure thermal conductivity and thermal capacity measurements, as well as to determine igric properties, vapour permeability, moisture buffer behavior. In
terms of other material characteristics the lab is equipped with a pycnometer to determine bulk porosity, true density, and bulk density. An instrument to measure pore surface and dimensions is also available, together with tools to perform accelerate ageing tests. Fire reaction tests will also be available soon. Numerical simulation of thermo-fluid behavior of materials is also possible by means of dedicated software.

Energy efficiency in buildings, indoor environment quality and sustainability

The laboratory is equipped to perform on-site characterization of thermal, visual, acoustic, comfort conditions together with air quality assessment. Several large scale surveys have been carried out in the past. Multiple sensors for thermal comfort assessment, illuminance and

luminance meters, CO2 meters and VOC and particulate analyzers are available. In terms of energy efficiency it is possible to perform analyses and simulations of existing buildings as well as of new designs using different tools including complex dynamic simulators of the whole building behavior, as well as numerical tools (FEM) to model more detailed aspects. The lab is active in designing innovative building components like smart windows and high performance envelopes. The lab is also active in terms of studying the interaction between the building and innovative devices like smart windows, smart thermostats, and other IoT-based devices and sensors in order to optimize energy performance.
Collaborations with companies and institutions:
ENEA
CNR (ITC, NANOTEC, STIIMA)
Conferenza Episcopale Italiana
Teatro Pubblico Pugliese
INAIL Puglia
SPESAL ASL/Bari
Diocesi di Grosseto
Diocesi Bari-Bitonto
Bari Port Authority
University of Southern California (US)
University of Nottingham (UK)
University of Bath (UK)
University of Alcoy (ES)
University of Seville (ES)
University of Biskra (DZ)
COOP Estense
ENEL
Laterificio Pugliese
TERA srl
Gordon confezioni
Contact person:
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Design_KIND LAB

Competencies and research activities

The laboratory aims to establish a synergic connection between education, research and the third mission for the areas of Industrial Design that refer to the methodologies and applications developed in the digital environment.
Instrumentation, software, equipment and consumables offer support to research applications that require experimental tests both in the virtual and physical fields.
The laboratory, in synergy with the wider FabLab Poliba system, aims to consolidate the research lines concerning product and process innovation in the field of digital

standards, valid for the industry and for the so-called craftsmanship 2.0.
Collaborations with companies and institutions:
FabLab Bitonto
Apulia Maker
Crea 3d
PiMar
Romano Marmi
Marmi strada
Base Protection
Natuzzi
Contact person:
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INMATEX - INteraction MAterial EXperience Lab

Competencies and research activities

ABOUT INMATEX
"... In the digital age, materiality can be reactivated, because it was always a virtual condition. In arguing that materiality is not a questiono of materials but, fundamentally, of activating material relations, I aim to convey a sense of transformation of those relations."- Giuliana Bruno
What is INMATEX
INMATEX - INteraction MAterial EXperience Lab, is a research laboratory that deals with materials as tools for reactivating the perceptive-sensory characteristics of surfaces.
INMATEX classifies the materials through scales of sensory gradients evaluating their perceptive-sensorial characteristics based on interaction processes between surfaces.
The laboratory aims to define taxonomies of relationships between materials and to shift the attention in the choice of materials from a merely technical classification to a conceptual one. The Lab uses the technical-scientific skills of the science of materials in comparison with the fields of aesthetics, critique and history of the visual arts.
WHEN AND WHY
Inmatex was born from the meeting between the research about the design of surfaces, lead since 2011 at the Polytechnic of Bari - dICAR by Rossana Carullo and Rosa Pagliarulo, with the MAIND project in 2013. On this occasion the categorization methodology through sensory gradients was developed, aimed at guiding the processes of functionalization of materials of the partners of the project, such as several Apulian based companies, depending on their perceptive-sensorial implications.
WHO WE ARE
The research group is composed of members with interdisciplinary skills who conduct research on the specific themes of the multi-sensoriality nature of materials applied to the design of surfaces.
The laboratory, that also contains the Material Library with the exhibition of the sensory

scales and the prototypes developed, is located in room 40, third floor of the dICAR.

Collaborations with companies and institutions:

TARGETS FOR THE FUTURE

The goal of INMATEX is to raise awareness through the open source sharing of knowledge of the results acquired until now, and continuing the updating of the interactive database of sensorial scales and prototypes. INMATEX wants to be a point of reference for research, teaching and innovation on the design of surfaces for both students and enterprises starting from the territory of reference.

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MITO Lab - Multimedia Information for Territorial Objects

Competencies and research activities

The field of interest of MITO-Lab includes some priority areas of competence:

Integrated evaluation of projects, plans and policies;

Territorial strategies for sustainable development, Open data and digital democracy.

Public policies for common assets and real estate assets.

Within these thematic areas, research and innovation activities are gradually focusing on thematic focuses:

Methods of analysis and evaluation of territorial processes

Analysis and tools for soil saving

Models and feasibility criteria of urban regeneration programs

Strategic Environmental Assessment

Digital platforms for sharing geographical and environmental knowledge

Mass estimation systems and real estate valuations

The laboratory was realized by a funding of 1.200.000 euros, provided by the National Cohesion Plan of the Ministry of Development. The Mito-Staff (involved Researchers and Professors at Poliba) are Carmelo M. Torre (Ass. Prof. responsible of the LAb) Pierluigi Morano (Full Professor) and Alessandro Bonifazi (post doc Researcher). External collaborators/partners in the activity of MITO-Lab, are Andrea Arcidiacono (Professor at Polytechnic University of Milan), Beniamino Murgante (Professor at University of Basilicata), Francesco Scorza (Researcher at University of Basilicata), Francesco Tajani (Researcher at University of Rome “La Sapienza”), Felicia di Liddo (PhD candidate)

Collaborations with companies and institutions:

MITO Lab has been engaged in several activities in the field of Research & Development. Main researches have been developed in collaboration with Public Institutions and Research Groups “Coste Aperte- Open Coasts” (2015).

MITO-Lab has collaborated with the UNISCO Network Association for local development, providing a scientific support for the design and delivery of an integrated training path, on the field of EU development of Institutional Capacity.

“Open Coasts” program, took place in Brindisi from 27 October to 18 November 2015, with the scientific support of University Staff of MITO-Lab, and of foreigners experts from the academic and professional R&D world (Ricardo Tendero Caballero, Polytechnic University of Madrid and Mark Walton, President of ONG “Shared Assets”, London) in partnership with the Municipalities of Brindisi and Carovigno and with the sponsorship of the National Institute of Urban Planning. The main scope of “Coste aperte” has been the implementation of an Educational Training Program for Reearchers, Professionals and Public Servants, aiming to increase the compentencies about Management and Environmental Rehabilitation of Coastlines.

“TerAMo” (2016) Research Project in collaboration with regional Agency of Research “InnovaPuglia”, TerAMo is a research project funded with about 25.000 euros, aiming to the identification of the best indicators for the Monitoring Activity inside the Envirnomental Strategic Assessment of the Regional Plan for Rural Development, CsMOnitor, (2016-2017) a Project in collaboration with the Regional Agency of Research “InnovaPuglia” CsMonitor regards the analysis of “soil take” in the Apulian Region, aiming at the identificaion of main dynamics in the loss of natural soils due to urban growth. MITO lab was funded by “InnovaPuglia” with about 40.000 euros.

First Report of Soil Take in Apulia Region (2016-17).

The First Research Report of Apulia Region on Soil Take was produced with the main scope of identifying spatial indicators supporting economic and environmental studies on soil take, in collaboration with CRCS (the Center of Studies on Consumption of Soils) and in collaboration with researchers of University of Basilicata.

INNO-Nets Innovative Network for Agrofood Policies (2019-2020). INNO-Nets is an Interreg project funded by EU, including the participation of Polytechnic of Bari, the Alliance of Apulian Cooperating Companies and the Apulian Regional Agency of Research and Development (as Main Partners), The Greek Region of the jonian Islands (as Leading partner), University of Basilicata, Chamber of Commere of Saloniki (Associate partners) and the funding provided to the Polytechnic is about 130.000 euros, on a total amount of 1.200.000 for all partnerships.

The task of Mito-Lab is the deveopment of a open On Line Platform, that represents an Information Tool, related with economic production, property assets, and social actors in the field of the rural development and agrofood markets.

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Laboratorio Ufficiale Prove Materiali “M. Salvati”

Competencies and research activities

Laboratorio Ufficiale Prove Materiali “M. Salvati”, Official Laboratory of Materials Testing, was established by law (Law 553, 01.07.1961); since 1983, it took the name of the founder Prof. Michele Salvati.

The Laboratory, one of the largest and best equipped in the South of Italy for static

and dynamic tests on structural materials and on structures, has two large test rooms each one equipped with a bridge crane and a concrete slab 1 m thick. In particular, the bigger room has a testing surface of about 500mq and a working height of 15m, while the smaller room has a testing surface of about 350mq and a working height of 9m. Both are served by large driveway gates; another driveway gate lets the access to the room beneath the slab.
The whole laboratory area, including offices and several testing rooms, is of 2400mq. This allows for a wide range of tests on materials, structural models and 1:1 scaled structures.
The technical staff of the Laboratory is highly specialized in experimenting on materials and structures, both by destructive and non-destructive tests, for in-situ and laboratory applications.
The experience and the skills of the technical staff allow for a prompt conception and design of testing procedures and strategies in case of demands coming both from private companies or from research projects purposes.

Service:

FOR THIRD PARTIES: The institutional activity of Laboratorio “M. Salvati” consists of materials and structures tests and of structural monitoring on behalf of third parties. This activity declared to be of public utility according to Law 1086, 05.11.1971, is aimed at controlling the requirements prescribed by law on structural aspects of constructions, and at assessing the calibration of testing machines and instruments belonging to private laboratories (licensed by Ministry of Public Works).
FOR TEACHINGS: Laboratorio “M. Salvati” supports the teaching activities of professor belonging to the Dicar Department, such as tests, exercises, and lectures in the laboratory; B.Sc., M.Sc., and Ph.D. thesis on mainly experimental issues.
FOR RESEARCH: Laboratorio “M. Salvati” supports experimental activities and research projects requiring experimental analyses on materials and structures, and/or the development and the validation of new experimental techniques.

Facilities

Universal testing machines with a load capacity of 50, 300, 600 and 1000 kN for tests on stone materials, cementitious conglomerate, hydraulic binders, steel beams for concrete, prestressed concrete and metal carpentry, on pavement materials Press with a load capacity of 3000 and 5000 kN for tests on stone materials, cementitious conglomerates, on structural elements in full scale
Electromechanical universal testing machines under displacement control and for thermomechanical tests and fatigue testing machines with a capacity of 50 kN, equipped with a video extensometer
Tribometer, Charpy’s pendulum, bend-straightening and relaxation on steel
Machines for granulometric analyses of aggregates
Hydraulic jack and equipment for coring in situ
Testing equipment for concrete and mortars (muffle furnace, aging tanks, and cabinets, setting and hardening tests etc.)
Contrast modular structures
Hydraulic power unit for the movement of dynamic actuators and shaking tables
Equipment for in-situ tests on structures (test, check and monitoring): deformometers, comparators, clinometries, deflectometers, etc.
Calibration check for testing machines, pressure gauge and displacement comparators and transducers with equipment conforming to SIT standard
Contact ultrasonic tests, ultrasonic immersion tests and laser ultrasonic tests with device for scanning samples
Sonic and ultrasonic tests for masonry and concrete
Flat jack
Lockin active thermography
Georadar 3D
Radar interferometer for contactless distance structural monitoring
Dynamic identification tests with seismic accelerometers
Control units for structural monitoring
Vibrodyne for structures

Software

Matlab, Mathematica, Comsol, Abaqus, SolidWorks, Straus7, ARTeMIS software.

Main research projects:

Progetto PON_02 “MASSIME – Sistemi di sicurezza meccatronici innovativi (cablati e wireless) per applicazioni ferroviarie, aerospaziali e robotiche” (2013-2015)
Progetto della Regione Puglia Rete di Laboratori “Laboratorio per lo sviluppo delle fonti rinnovabili e dell’efficienza nei distretti energetici: Progetto ZERO (Zero EmissionResearch Option)” (2014-2017)
Progetto ReLuis2, Area Tematica 2, Linea 3: “Innovazione Tecnologica in Ingegneria Sismica”, Task 2: “Sviluppo ed analisi di nuove tecnologie per l’adeguamento sismico” (2010-2013);
7° Programma Quadro. Capacities Specific Programme Research Infrastructure. Progetto SERIES. Proposal P03-0034: “Assessment of the seismic behaviour of flat-bottom silos containing grain-like materials”. Prove da svolgersi presso il laboratorio EQUALS di 7° Programma Quadro RST (call FP7/PEOPLE/2001/NIGHTS). Project UNIFEDERLAB. Unità “Vibration” (2011)
7° Programma Quadro. Capacities Specific Programme Research Infrastructure. Progetto SERIES. Proposal P03-0034: “Seismic behaviour of structural systems composed of cast-in-situ concrete walls” (2010-2012)
European Territorial Cooperation Programme Greece-Italy 2007-2013. INTERREG III/A. Project title: “Structural Monitoring of ARTistic and historical BUILding Testimonies”, ResponsabilescientificoProf.ssa D. Foti (2012-2015)
PRIN 2010-2011 “Dinamica, Stabilità e Controllo di Strutture Flessibili” (2013-2016)
Progetto PON_01 “STEM-STELO: Sistemi e TEcnologie per la realizzazione di Macchine per lo Sviluppo dei Trasporti Eccezionali e della LOgistica di progetto” (2012-2015)
PRIN 2008 “Strutture leggere in materiale multiscala nell’ingegneria civile: rigidità e resistenza, assemblaggio e replicabilità industriale” (2010-2012)

Progetto Strategico della Regione Puglia “Ricerca e sviluppo di metodologie per la meccanica sperimentale e la diagnostica strutturale” (2006-2011)
Progetto Strategico della Regione Puglia “SISMA - Strutture Innovative e Sperimentazione di Materiali Avanzati” (2006-2011).

Collaborations with companies and institutions:
University of Minnesota, Minneapolis, USA
University of California at Berkeley, USA
Universidad de Alicante, Spagna
University of Arizona, USA
University of Bristol, UK
Università di Napoli
Università di Salerno
Università di Messina
Università di Catania
Università di Pavia
Boviar srl
Fagioli spa
Landnet srl
IFAC spa
Cartflow srl
Tecnomec Engineering srl
CNR

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Website:
https://www.youtube.com/watch?v=MyScscdKBZ8

Urban Planning and Sociology Laboratory

Competencies and research activities

The Urban Planning and Sociology Laboratory is a center of excellence in research on methodologies and problems of the governance of the contemporary city and territories.
It is equipped with technical and scientific skills that have been working for more than 15 years in the construction of knowledge systems on a georeferenced basis deriving from descriptive-interpretative models through highly qualified expertise (planners, landscape architects, researchers and operators in the CAD, GIS, TLR environment, DSS) and for the processing of data acquired from different types of sources (cartographic and alphanumeric).
It is equipped with workstations able to manage spatial data, on a vector and raster basis, large format color scanners, printers, and high-resolution large format plotters.
It is equipped with software for digital image processing and software for the management of local information systems and relational databases.

Collaborations with institutions and companies:
The Dicar Laboratory itself carried out a scientific partnership with the ARCA Puglia Centrale (then IACP Bari and Bat) on the occasion of the PRIN (Research Projects of National Interest) of the MIUR “La Città Pubblica” as a Design Laboratory, and the production of Guidelines for the sustainable redevelopment of urban outskirts financed in 2005 by MIUR.
Research that gave life to two publications; respectively AA.VV. (2009), Public City, Guidelines for urban redevelopment, Mondadori, Milan and that of the Local Research Unit of the Polytechnic of Bari; Martinelli, N. (edited by) (2009), For an Atlas of the Public City of Bari, Adda, Bari.
The latter with a partial financial contribution to the publication of the same IACP of Bari and Bat.
Moreover, the same research group carried out experience in the field as requested by the MIUR for the research in question collaborating with the Municipality of Bari and with the IACP Bari and Bat conducting the District Laboratory on the occasion of the PIRP of S. Marcello.

Contact person:
Prof. Nicola Martinelli - nicola.martinelli@poliba.it

Advanced Electrotechnics

Competencies and research activities

The scientific activity concerns the following two main topics of the Electrical Engineering:
Micromagnetism and Spintronics;
Modelling, diagnostics and reliability of renewable energy sources.
The first research topic studies: Magnetic materials modelling.Design of Spin-Transfer Torque (STT) MRAM and nano-oscillators.nDesign of nanodevices spin-orbit torque based.
Linear and nonlinear dynamics of magnetic excitations in magnetic films, multilayers, and finite-size samples: spin waves, solitons, skyrmions.
Applications of linear and nonlinear spin waves in microwave signal processing. Design of hybrid CMOS-STT-MRAM circuits. CUDA Applications.
The second research topic studies:
Modelling of grid-connected and stand-alone renewable energy sources. Smart-grids and micro-grids. Penetration of RES in power systems. Statistics for monitoring the performance of RES. Nondestructive techniques for diagnostics of RES. ICT for energy

Collaborations with institutions and companies:

since 2001, with the theoretical group of prof. Giovanni Finocchio, University of Messina, Italy.
since 2002, with the experimental group of prof. Ermanno Cardelli and Prof. Pietro Burrascano, University of Perugia, Italy.
since 2003, with the theoretical group of prof. Luis Torres and Luis Lopez-Diaz, University of Salamanca, Spain.
since April 2005, with the experimental group of prof. Dan Ralph, University of Cornell, Ithaca, NY, USA.
since 2008, with the experimental group of prof. Giovanni Carlotti and dr. Gianluca Gubbiotti, University of Perugia, Italy.
since November 2010, with the theoretical group of prof. Andrei Slavin, Oakland University, Rochester, MI, USA.
since 2013, with the theoretical group of prof. Adel Mellit, Renewable Energy Laboratory, Jijel University, Algeria.
since 2013, with the theoretical group of prof. Loredana Cristaldi, Politecnico di Milano, Italy. since 2013, with the theoretical group of Dr. Alessandro Massi Pavan, University of Manchester, UK.
since 2013, APIS Ltd, Spinoff, Bari, Italy.
since 2015, with the experimental group of prof. Johan Åkerman, Royal Institute of Technology, Stockholm, Sweden.

Contact person

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Silvano Vergura - silvano.vergura@poliba.itwww

Advanced Environmental inFormatic Laboratory (AeFLab)

Competencies and research activities

The AeFlab researchers work in the field of information systems with specific emphasis to environmental application (pollutant and odors, particulate and water, e-nose and e-tongue). Another field of interest is that of web semantic and common language disambiguation. In the previous activities there are more willingly applied artificial intelligence paradigms. AeFlab is also a registered as a Living Labs laboratory of Apulia Region.

Collaborations with companies and institutions:

ASI centro di geodesia spaziale di Matera
Autorità portuale di Taranto
Centro Internazionale Alti Studi Universitari- Università di Bari- Fasano (Br)
Chapter italiano dello IEEE Biometrics Council
Chapter italiano dello IEEE System Council
CINI - Consorzio Interuniversitario Nazionale per l'Informatica
CNR Bari, Pisa e Roma
International Association for Pattern Recognition
Kanagawa Institute of Technology - Prof. Chen
Omnitech Rome
myHermes S.r.l.
National Technical University of Athens – Prof. Dimitrios A. Tsamboulas
Politecnico di Milano
Politecnico di Torino
Robotics Institute, Carnegie Mellon University - Prof. Mel Siegel
Scuola Superiore S.Anna di Pisa
SITE, University of Ottawa - Prof. Emil Petriu
Space Software Italia - Taranto
SST - Lab. University-Industry joint telecomunication research laboratory
Telespazio - Roma e Matera
Universidade Da Coruña - Prof. Fernando Peña
Università di Bari
Università di Milano
Università di Pisa
University of Alberta - Prof. Witold Pedrycz

Contact person

Vincenzo Di Lecce - vincenzo.dilecce@poliba.it

Applied Electronics and Microelectronics

Competencies and research activities

Design of multichannel mixed-signal integrated circuits (ASIC) for the read-out of solid-state detectors used in high energy physics experiments and medical imaging

applications.
Prototyping (via access to the european consortium EUROPRACTICE) and characterization of integrated circuits.
Design and realization of hardware/firmware systems based on programmable devices (FPGA).
Characterization of solid-state detectors for physics experiments and medical imaging applications (Silicon Photomultipliers).
Collaborations with companies and institutions:
Collaborations with companies and institutions:
INFN
CERN - Geneva
Johannes Gutenberg Universitat - Mainz (PRISMA lab.)
Brookhaven National Laboratories, Upton (NY, USA)
SLAC Stanford, Menlo Park (CA, USA)
Fbk-IRST – Trento
Infineon Technologies, Villach (Austria)
National Semiconductors, Munich (Germany)
ST Microelectronics, Agrate Brianza
ITEL, Ruvo di Puglia
IAS, Brindisi
Contact person
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Apulia regional laboratory of characterization of new organicand nanostructured materials

Competencies and research activities
The laboratory is equipped with spectrometric Ellipsometer, micro-controlled surface Profilometer, system for the deposition of thin films made of Spin coater, UV lamp and heating plate, instrumentation for the characterization of thin films made of polarizing microscope including a BF /DF optical Kit .
Modelling, fabrication and characterization of active/passive photonic crystal devices, linear and nonlinear for applications in sensor technology and telecommunications systems.
Modelling and characterization of plasmonic nanostructures for applications in sensors and photovoltaics. Design, fabrication and characterization of polymer waveguides for biomedical and industrial sensor applications. Design and characterization of active photonic devices based on III-V-N semiconductor.
Collaborations with companies and institutions:
National Nanotechnology Laboratory (NNL), CNR Istituto di Nanoscienze – Lecce (Italy)
Centro di nanotecnologie bio-molecolari, Istituto Italiano di Tecnologia (IIT) – Arnesano – Lecce (Italy)

Department of Biomedical Sciences, University of Foggia (Italy)
Electromagnetic Fields and Photonics Group – University of Brescia (Italy)
Institute of Inorganic and Plasmas Methods, IMIP-CNR (Italy),
Microphotonics Group – St. Andrews University (UK)
Department of Materials Science, University of Patras (Greece)
National Research Council - Charles M. Bowden Research Center - Huntsville AL (USA)
LAAS-CNRSM, Toulose (France)
MERMEC GROUP – Monopoli (Italy)
Centro Laser – Valenzano (Italy)
SOMACIS pcb industries – Castelfidardo (Italy)
CINECA (Consorzio Interuniversitario Calcolo Parallelo) – Bologna (Italy)
AEgis Technologies Group Inc. – Huntsville - AL (USA)
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Artificial Vision Laboratory (AVLAB)

Competencies and research activities
Design, construction, engineering and installation of smart vision systems aiming to automate industrial processes (Industry 4.0, quality controls, ...), perform diagnostics (monitorings and inspections, even 3-D, of products and infrastructures, non-destructive testing, ...), and provide security (job security, personal identification, smart video-surveillance, ...).
Collaborations with companies and institutions:
Apulia Intelligent System
Contact person
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Clean room

Competencies and research activities
Clean room in class 100-1000 equipped with chemical hood, thermostat oven for ion exchange, spin coater and DC - AC sputtering equipment.
Design, fabrication and characterization of integrated optical devices by sputtering, ion-exchange, spin-coating techniques.
Design and characterization of plasmonic nanostructures for applications in sensors, photovoltaics, near field enhancement.
Design and characterization of beam steering from subwavelength apertures in metal substrates. polymeric sensors to biomedical and industrial applications.
Design and characterization of optical interconnecting devices for chip multiprocessor architectures.
Design and characterization of III-V-N of semiconductor active photonic devices

and photonic crystals for laser applications.
Collaborations with companies and institutions:
National Nanotechnology Laboratory (NNL), CNR Istituto di Nanoscienze – Lecce (Italy)
Centro di nanotecnologie bio-molecolari, Istituto Italiano di Tecnologia (IIT) – Arnesano – Lecce (Italy)
Department of Biomedical Sciences, University of Foggia (Italy)
Electromagnetic Fields and Photonics Group – University of Brescia (Italy)
Institute of Inorganic and Plasmas Methods, IMIP-CNR (Italy),
Microphotonics Group – St. Andrews University (UK)
Department of Materials Science, University of Patras (Greece)
National Research Council - Charles M. Bowden Research Center - Huntsville AL (USA)
LAAS-CNRSM, Toulose (France)
MERMEC GROUP – Monopoli (Italy)
Centro Laser – Valenzano (Italy)
SOMACIS pcb industries – Castelfidardo (Italy)
CINECA (Consorzio Interuniversitario Calcolo Parallelo) – Bologna (Italy)
AEgis Technologies Group Inc. – Huntsville - AL (USA)
Contact person
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Control and automation

Competencies and research activities
The purpose of the laboratory is the deepening, enhancement and dissemination of scientific research carried out with various Italian and international partners, both private and public.
In particular, the areas in which the laboratory operates are the following:
Discrete event systems: Petri nets, Critical observability, Identification, Opacity.
Modeling and control systems for industrial applications: manufacturing and process systems, coordination of agent and sensor networks, fault detection and recovery, problems relating to the areas of logistics, production and distribution, scheduling and planning problems, flow management of work.
Management and control of complex systems: intelligent transportation systems, road and rail traffic, modal and multimodal logistic systems, transport of dangerous goods; management of electric mobility, Smart Cities and smart buildings; modeling and management of healthcare systems.
Other ICT applications and Decision support systems in various application environments (transportation, logistics, production, building management, healthcare systems) with minimal or reduced human intervention.
Methodologies:
Optimization, Simulation;
Models to maximize the efficiency of technological products and processes;
Reduction of alternatives and choices especially when they are innumerable Smart solutions and Decision Support Systems.
Advanced algorithms and ICT applications able to predict and solve imminent situations and in various contexts applied.
European projects.
INEA CEF “FENIX, A European FEderated Network of Information eXchange in Logistics”, 2019-2022. Euros 800.000,00
EU Adriatic-Ionian Programme INTERREG V-B “FUTURE 4.0 ManuFactUring educaTion and training governance model for IndUstry 4.0 in the Adriatic-Ionian aREa”, 2018-2019.
EU H2020 “ELVITEN, Electrified L-category Vehicles Integrated into Transport and Electricity Networks”, 2017-2020.
EU H2020 “AEOLIX, Architecture for EurOpean Logistics Information eXchange”, 2016-2019.
EU H2020 “optiTruck, optimal fuel consumption with Predictive PowerTrain control and calibration for intelligent Truck”, 2016-2019.
EU H2020 “NEMO, Hyper-Network for electroMobility”, 2016-2019.
EU CIP-ICT-PSP-2013-7, COoperative loGISTICS for sustainable mobility of goods-CO GISTICS. Jan 2014- June 2017.
National projects:
Smart Cities and Communities and Social Innovation Pilot, “Applications post Directive 2010/65 in Italian port realities of the Suite MIELE to support the Authority to optimize the inteRoperability in the intermodAlity of city-port flows- ASMARA” 2014-2017.
PON 2007-2013 -“RES NOVAE - Reti, Edifici Strade: Nuovi Obiettivi Virtuosi per l’Ambiente e l’Energia” Regioni Obiettivo Convergenza Campania, Puglia, Calabria, Sicilia – Asse II, 2013-2015.
PON “Mechatronic innovative safety systems (wired and wireless) for railway, aerospace and robotic applications (MASSIME)”, 2013-2015
PON “LAMRECOR - Logistica Avanzata per la Mobilità di Persone e Merci: Modelli Matematici e Sperimentazioni per Nuovi Protocolli di Recapito della Corrispondenza”, 2013-2015.
PRIN 2007 prot. 2007ZMZK5T “Decision models for design and management of logistic networks characterized by high interoperability and information integration”, September 22, 2007, September 22, 2000.
PRIN 2005 prot. 2005092439 “Analysis, optimization, and coordination of logistic and production systems” September 2005, September 2007.
“Medical applications for the next future (NEXMEDIA).” 2012-2014.
“Modelling and control of logistic systems characterized by high information integration”, September 2008- September 2009, “Fondazione Caripuglia”.
The laboratory collaborates with the following research groups:
Prof. MengChu Zhou (New Jersey Institute of Technology, Newark, USA) on the subject of control and management of distributed production systems.

Research group led by prof. A. Giua from the University of Cagliari on the topic of fault detection and identification of Discrete Event systems;
University of Trieste, operational research group of Prof. Walter Ukovich for logistics studies in various application fields;
University of Genoa, research group of prof. R. Minciardi, prof. S. Sacone, prof. R. Sacile for studies on the transport of dangerous goods
École Normal de Cachan, France, Prof. Jean-Jacques Lesage for studies on health systems;
Laboratory of Knowledge and Intelligent Computing (KIC), Dept. of Informatics and Communications Technology, Artological Educational Institute of Epirus, Artas, Greece
Autamarocchi (development of fleet and vehicle management systems)
Colussi S.p.A. (optimization of the distribution logistics system)
OM Forklifts S.p.A. (solutions for warehouse logistics, planning and management of production processes)
Teorema Engineering s.r.l. (intermodal logistics)
Intermodal Terminal of Trieste - Fernetti S.p.A. (intermodal logistics)
Bertoli Safau Steelworks (production scheduling and planning)
Insiel Mercato (organization and management of health systems)
Policlinico di Bari (organization and management of health systems)
Insiel FVG (intermodal logistics, management of transport of dangerous goods)
AMIU - Bari (methodologies and algorithms for the rationalization of a solid urban waste collection system)
Eurocontrol (air traffic management)
Municipality of Bari (urban mobility)
Autovie Venete, Insiel FVG (transport of dangerous goods)

Contact person

Prof. Maria Pia Fanti - mariapia.fanti@poliba.it

Control of Computing and Communication Systems Lab (C3LAB)

Competencies and research activities

The Control of Computing and Communication Systems Lab (C3Lab) focuses on the analysis and control of network systems. The main research activities are set in the following fields:
Virtual Reality/Augmented Reality, 360 immersive video streaming
Adaptive video streaming
Web Real-Time Communication (WebRTC)
SDN control planes
Control and orchestration of CDN
Server overload control, SIP overload control
Congestion control

Secure cyber-physical Control systems
Control of such systems involves:
nonlinear control
switching control
time-delay system control
optimal control
robust control

Awards:

“Cisco Award 2013” funded by the “Cisco University Research Program” for the project “Architecture for Robust and Efficient Control of Dynamic Adaptive Video Streaming over HTTP”. Principal Investigator: Saverio Mascolo;
“Google Faculty Research Award 2014” for the project “Congestion control algorithm for Web real-time communication (WebRTC)”. Principal Investigator: Saverio Mascolo.

Collaborations with companies and institutions:

Google inc
Telecom Italia
University of Wuerzburg
University of New Mexico
University of Naples Federico II
Telecom ParisTech (Institut Mines-Télécom)
Telecom SudParis (Institut Mines-Télécom)
Consortium for the Research in Automation and Telecommunication (CRAT)

Contact person

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Decision and Control Laboratory

Competencies and research activities

The D&C Lab has as its major objectives, the promotion of the results obtained in the field of the scientific research - achieved in collaboration with private and public partners, in a regional, national, and international context- and the advancement of technology transfer of these research results.
The area of interest for the research is the scientific disciplinary sector of Automation (09/ G1). The staff of the laboratory provides research services and technology transfer in the following macro-areas:
Automation
Control and Re-engineering of Production Processes
Control Systems Engineering
Decision Support Systems
Discrete Event Systems
Distributed and Decentralized Control Techniques

Energy Management and Scheduling
Fault Detection and Recovery
Industry 4.0
Intelligent Transportation Systems
Intermodal and Multimodal Transport Management
Logistics Management
Multi-criteria Decision Making
Predictive Control Strategies
Railway traffic control
Robotics
Smart Cities and Smart Buildings

Collaborations with companies and institutions:

D&C Lab has collaborated with entities of different nature, such as private companies, public administrations and Municipalities, and other relevant research actors, both national and international.

Institutions:

BANQUE CENTRALE DU LUXEMBOURG - a study on the application of muti-criteria decision methods to public procurement tenders;
ENEA – Research project RAFAEL on the techniques for the critical infrastructure risk management and forecast in South Italy;
Municipality of Bari - Research projects (1) RES NOVAE definition of energy scheduling techniques in the smart home; (2) UCCSM: an urban control center for the energy management of Smart Cities at a regional level.

Research Centers and Universities:

Aix-Marseille University;
CENTRO RICERCHE FIAT - Research project Pico-e-Pro for the control of production process in the context of Industry 4.0;
Chalmers University;
Cracow University of Technology;
Delft University of Technology;
École Centrale de Lille;
Hamburg Helmut Schmidt University;
Manchester University;
Tsinghua University;
New Jersey Institute of Technology;
University of Cagliari.
Université de Nancy.
CANNILLO S.R.L. - Research project on integrated logistics to support the activities of procurement, distribution and supply of goods, within the cold chain;
DIVELLA S.P.A. - Research project on warehouse logistics and management;
DREAM PROJECT S.P.A. - Research project on the management and automation of the company internal logistics;
ENEL DISTRIBUTION - Research projects (1) RES NOVAE definition of energy scheduling techniques in the smart home; (2) UCCSM: an urban control center for the energy management of Smart Cities at a regional level;
FERROVIE DEL SUD EST E SERVIZI AUTOMOBILISTI S.R.L - Research project on offline and real-time trains scheduling;
GTS (GENERAL TRANSPORT SERVICE) S.P.A. - Research project on the management and automation of intermodal transport;
IBM - Research project RES NOVAE an urban control center for the energy management of Smart Cities;
MACNIL GRUPPO ZUCCHETTI - Research project on the management and automation of urban mobility of passengers;
NICOLA VERONICO S.R.L. - Research project on Vehicle Routing for the Optimization of Hazardous Waste Collection;
OM CARRELLI ELEVATORI S.P.A. - Research project on the analysis and optimization of logistics.
PLANETEK - Research project on the management and automation of urban mobility of passengers;
PRIMADONNA S.P.A. - Research project on the implementation of an automated warehouse;
SIMNT S.R.L. - Research project UCCSM realization of an urban control center for the energy management of Smart Cities at a regional level;
TERA S.R.L. - Research projects: (1) RES NOVAE definition of energy scheduling techniques in smart homes; (2) UCCSM realization of an urban control center for the energy management of Smart Cities at a regional level;
TANGARI S.R.L. - Research project on the management and automation of the company internal logistics.

Contact person

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Design of Electronic Integrated Sistems Lab (DEISLab)

Competencies and research activities

The Design of Integrated Systems Laboratory (DEIS Lab) has been involved in several national and international research projects, gaining multidisciplinary background knowledge aiming to import them to the field of applied electronics. It is node of the Embedded Systems and Smart.
Manufacturing Lab of the Italian Interuniversity Consortium (CINI).
The cardinal skills stem from decades of experience, and concern:
Design of Analog and Mixed Signal Integrated Electronic Circuits
Design of silicon detectors, sensors
Sensor Interfaces
Testing of analog and mixed-signal ICs and Design-for-Testability (DfT)

Implementation of Wireless Sensors Network (WSN)
WSN for real-time environmental monitoring (Healthcare and Wellbeing, Food safety and certification fields)
Design of ERS MEMS Vibrational Electrostatic Energy Harvester
Design of Remotely Powered Wireless Systems
Design and development of Pre-Impact Fall Detection and Gait Analysis digital platform (FPGA, Microcontroller) based on bio-signals
High Performance SVM classifier for Microcontroller and FPGA implementation
Design and Implementation of Brain-Computer Interfaces
Bare-Metal Microcontroller Programming
Bio-signals Processing and Feature Engineering
Computer vision on ROS for Robot Source Localization and Mapping
PCB prototyping for ATO systems
IC electronics for Brain Machine Interface

Collaborations with companies and institutions:
University of California at Berkeley, US
Berkeley Wireless Research Center, US
Ecolè Polytechnique fèdèrale de Lausanne
University of Glasgow, UK
Scuola Superiore Sant'Anna di Pisa – Istituto di Biorobotica
CERN (Geneva)
Istituto Nazionale di Fisica Nucleare (INFN)
Consiglio Nazionale delle Ricerche
Università di Bologna
Università di Roma La Sapienza
Azienda Ospedaliera Universitaria Policlinico di Bari - Scienze mediche di base, neuroscienze e organi di senso
Rete Ferroviaria Italiana – Settore Ricerca e Sviluppo
ST Microelectronics srl
NXP Semiconductors HTC (Eindhoven NL)
SITAEL
EXPRIVIA spa
CNRS
TMA Grenoble
Confindustria
Confagricoltura
Distretto Agroalimentare Regionale

Contact person
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Website:
http://dei.poliba.it/DEIS/index.html

Digital Electronics Systems and Applications Lab (ELEDIGILAB)

Competencies and research activities
Digital design with programmable logic devices especially FPGA and microcontrollers. Modelling of CNT-based digital devices. App development for embedded systems.
Research fields: high performances digital medical devices, wearable medical devices, telemedicine, home care, domotics.

Collaborations with companies and institutions:
Policlinico di Bari - Cardiology division

Contact person
Agostino Giorgio - agostino.giorgio@poliba.it

Elec Lab

Competencies and research activities
Currently, the main scientific activity of the Electrotechnical Laboratory concerns the following two topics:
modelling of devices based on piezoelectric materials;
shape optimization of piezoelectric energy harvesters excited by environmental or flow induced vibrations.
With reference to the first topic, the research activity includes the modelling of piezo-material hysteretic nonlinearities through phenomenological and physic based approaches.
Model numerical simulations are carried out by means of Finite Element and Single Degree of Freedom approximations of the devices under investigation. A new test bench to research the effects of vibration induced harvesting systems has been recently realized and is now operative. Among other key activities in the lab, research on numerical meta-heuristic optimization is conducted both from a theoretical and practical point of view.
Optimization has been widely used in the last few years in the lab as a tool for computer aided engineering, for example for the definition of the best characteristics of the piezo-electric components for energy harvesting. The laboratory is equipped with measurement tools for experimental validation activities; two Work Stations; tools for generating controlled vibrations on light bending beams (brushless BLDC vibration motor with eccentric rotating masses). A new wind tunel for the experimental tests of fluid structure interaction in energy harvesting applications has been recently acquired.

Collaborations with companies and institutions:
Since 2017, with the Prof. Dr.-Ing. Stefan Seelecke and his "intelligent Material Systems Lab" (iMSL) research group. Saarland University, Saarbrücken, Germany.

Contact person
Giuseppe Acciani - giuseppe.acciani@poliba.it

Electrical Machines and Drives

Competencies and research activities

ELECTRICAL DRIVES FOR ROBOTICS AND INDUSTRIAL AUTOMATION
Evolutionary Algorithms for identification and control
Control techniques for mobile robots and industrial manipulators
MORE ELECTRIC AIRCRAFT
Design of electrical machines power converters and control algorithms for a more efficient use of energy on- board the more electric aircrafts
ADVANCED CONTROL TECHNIQUES FOR ELECTRICAL DRIVES
Control of induction motor drive in the field weakening region
Sensorless control of electrical drives
Application of fuzzy and sliding-mode control to electrical drives
Fractional-order control for industrial electrical drives
FAULT DIAGNOSIS OF ELECTRICAL MACHINES
Evolutionary Algorithms for identification and control
Artificial Intelligence-based techniques for fault diagnosis of electrical machines
On-line fault diagnosis of electrical machines

Collaborations with companies and institutions:

University of Nottingham, UK
Politecnico di Torino
Università di Brescia
Università di Firenze
University of Aalborg, Denmark
Christian-Albrechts-Universität, Kiel, Germany
Curtin University, Perth, Australia
Universidad Politécnica de Cartagena, Spain
Universidad de Castilla La-Mancha, Albacete, Spain

Contact person

Silvio Stasi - silvio.stasi@poliba.it

Electrical and Electronic Measurement Lab Magna Grecia Center

Competencies and research activities

The Electrical and Electronic Measurement Lab activities have leaded to valuable results in terms of technology transfer, in the field of applied science and manufacturing accomplished through national and international Research projects. Main area of investigation includes the study, design, development and characterization of innovative sensors and instrumentation for scientific/industrial applications and the development of algorithms for medical imaging.
This Lab is equipped with instrumentation for measurement and generation of electrical quantities up to the gigahertz range of frequencies and thermal imaging.

A metrology room with controlled temperature and humidity is also available.
The following is a non-exhaustive list of skills of the research group members:
Smart instruments for measurements on components and systems;
Analysis and measurement on distorted electrical signals, in stationary and/or transient condition;
Model identification, parameters estimation and characterization of electrical machines, equipment, apparatus and electrical drives;
Measurement of non-electrical quantities through electronic and electro□optical sensors;
Environmental monitoring and Remote Sensing;
Assessment of industrial pollution;
Reliability of measurement using statistical quality control techniques;
Measurements and electronic instrumentation in the biomedical field;
Image processing for noise reduction on medical images;
Development and characterization of components and sensors for the aerospace industry.

Collaborations with companies and institutions:

Cittadella della carità - Taranto
Leonardo SpA– Land& Naval Defence Division-Taranto
ILVA SpA – Taranto
Vestas Italia srl -Taranto
Mermec –Monopoli
MASMEC Biomed – Modugno (BA)
Alenia Aermacchi -Grottaglie (TA)
Ospedale Taranto Nord “G. Moscati”- Dipartimento di Radiologia
Ospedale Santissima Annunziata - Taranto- Dipartimento di Radiologia
Arsenale Militare di Taranto
Comune di Taranto
Provincia di Taranto
Confindustria Taranto
Autorità Portuale - Taranto
Universitad Politecnica de Valencia

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Website: http://misure.poliba.it

Electrical and Electronic Measurements Research Lab - Bari

Competencies and research activities

The Laboratory of Electrical and Electronic Measurements is equipped with a large variety of generic and specialized instruments: from basic ones (digital oscilloscopes, arbitrary waveform generators, power supplies, etc.) for low frequency applications,

to advanced ones for signal generation and analysis up to the gigahertz range of frequencies. Advanced thermal imaging diagnostic instruments and a midsized (about 250 liters) climatic chamber are also available.
The following is a non-exhaustive list of skills of the research group members: ADCs (Analog to Digital Converters) error modelling and correction;
Design and prototipation of PC-, microcontroller- and DSP-based mixed signals Data Acquisition (DAQ) and processing systems;
Industrial circuits, PLC programming and machines diagnostic for faults prevention;
Wireless Sensor Networks (WSN) design and prototipation;
Mains signals (both high voltages and high currents) sensing, digitization and DSP-based numerical processing for real-time energy quality assessment for the alternative energies market;
Marine water purity measurements for early detection of Ostreopsis Ovatae algae eutrophication and other man-related pollution phenomena;
Energy harvesting and energy monitoring from renewable sources;
Characterization of UAVs (Unmanned Aerial Vehicles) and of their sub-systems for health status assessment, reliability and pre-flight check;
Time Domain Reflectometry measurement system and waveform analysis;
Cross-platform and web-based Rapid Application Development for ATE Systems (Automated Test Equipment) with Microsoft Visual Studio, Embarcadero RAD Studio, Android Studio, Eclipse, etc.
Hardware and Software design of SCADA/HMI Systems for industrial automation;
PCB design for mixed signals circuits with industrial standard EDA Tools (Altium Designer, Eagle CAD, KiCAD, etc.);
Firmware development and debugging for a large variety of industry-standard 8-/16-/32-bits microcontrollers and DSPs (Microchip AVR/dsPIC/PICmicro, ARM
Cortex-Mx, Texas Instruments C6748, etc.);
Statistical techniques for measurement uncertainty assessment and instrument calibration.
The Lab continuously works with important Italian companies in order to carry out technology transfer projects and to cooperate with international scholars for advanced scientific research.

Collaborations with companies and institutions:
MER MEC S.p.A. - Monopoli
SITAEL S.p.A. - Mola di Bari
MASMEC S.p.A. - Bari
SIPAL S.p.A. - Torino
Altanet S.r.l. - Altamura
ApuliaBiotech - Bari
DPM Elettronica S.r.l. - Foggia
Nardò Technical Center – Porche Engineering - Nardò (LE)
Centro Studi Componenti per Veicoli S.p.A.(CVIT) - Gruppo BOSCH – Modugno (BA)
Low Frequency Measurement Group – Politecnico di Torino
Departamento de Electrónica, Automática y Comunicaciones - Universidad Pontificia Comillas Madrid

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Electromagnetic Fields and Telecommunications Magna Grecia Center

Competencies and research activities

Competencies and research activities
The research activities of Electromagnetic Fields and Telecommunications Laboratory at Magna Grecia Center in Taranto are performed by the Microwave and Optical Engineering (MOE) group (http://moe-group.poliba.it/service.htm).
They are pertaining to the following main topics:
Microwave
Design, fabrication and characterization of antennas and microwave devices for aerospace and communication; substrate integrated waveguide devices (SIW); measurement of electromagnetic compatibility, electromagnetic exposure investigation, bio-compatibility.
Microwave applicators for thermal ablation medical therapy.
Modelling of accelerating cavities for proton linear accelerators (LINAC) for medical protontherapy.
Lab microwave facilities: i) LPKF ProtoLaser U3 for Rapid PCB Prototyping; ii) StarLab Antenna Test Station (SL18), 800 MHz to 18 GHz, automated anechoic chamber; iii) LPKF Electroplating of Through-Holes; iv) LPKF MultiPress S: Press for Producing Multilayers (up to 8 layers); v) R&S ESU EMI Test Receiver; vii) R&S ENV216 two-line V-network for disturbance voltage measurements on single-phase EUTs; viii) other instrumentation such as E.M. field power meters; Narda Area Monitor System 2600: Remote Monitoring of Electromagnetic Fields; a number of wide band antennas covering the RF-MW range; Optical spectrum analyzers Agilent N5224A PNA 10 MHz to 43.5 GHz; Rohde Schwarz FSH3; Agilent FireFox VNA, Microwave Signal Generators; Dielectric probe kit SPEAG for dielectric constant measurement 10MHz-50GHz; Weller soldering station.
Optics
Design, fabrication and characterization of fiber lasers. Modelling of photonic crystal fibers (PCF), for near infrared (NIR) and medium infrared (MID-IR) applications.
Modelling of innovative materials and rare earth doped optical devices in optical fiber and in planar optics; nonlinear device modelling; optical microresonators;
design, fabrication and characterization of optical devices for environmental monitoring and biomedicine.

Lab main optical facilities: i) Splicer GPX PTR Fiber Optic Glass Processing Unit; ii) PTR PTR Fiber Optic Recoater Fiber Optic Recoater; iii) Ytterbium fiber Lasers CW 30 W and CW 100 W; iv) Infrared Chamber; v) EDFA ; vi) UV-VIS Ocean Optics spectrometers; vii) equipped optical benches; viii) Nanoscan M2 beam quality measurement.

Collaborations with companies and institutions:

Somacis
ITEL
Emitech
Neetra
RTM
Quanta System
INFM
Centro Laser
EniTecnologie
OPTEL
IFN-CNR MERMEC
PLANETEK
SITAEL
District of Manduria (TA)
District of Statte (TA)
District Volturino (FG)
MISE – Bari
Università di Rennes - Francia
UMR-CNRS - Institut de Physique de Rennes (IPR) – France
Institut de Recherche en Ingénierie Moléculaire et Matériaux Fonctionnels, UMR CNRS - Le Mans - France
Laboratoire de Physique de l'Université de Bourgogne - France
Physics Dep. Shiraz University, Shiraz – Iran
The Institute for Photonics & Advanced Sensing (IPAS), Centre of Expertise in Photonics (CoEP) University of Adelaide - Australia
University of Tokyo – Giappone
Mesures Physiques Department
IUT Institut Universitaire de Technologie du Mans – Francia
INFM – Lecce
CNR-FSA – Trento
IROE-CNR - Firenze Politecnico di Milano
Politecnico di Torino

Contact person

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Electronic Devices Laboratory

Competencies and research activities

Design and test of electronic systems for domiciliary teleassistance.
Characterization and design of optoelectronic devices on PBG (Phothonic BandGap).
Numerical modelling and performance simulation techniques of electronic devices for I. C. CAD.
Design, realization and testing of nanometric electronic systems and FET on carbon nanotube.

Collaborations with companies and institutions:

Irena Knezevic, Associate Professor
Electrical and Computer Engineering
University of Wisconsin - Madison, 1415 Engineering Drive, Rm 3442, Madison, WI 53706, USA
Prof. Francis D'Souza, Distinguished University Research Professor
Department of Chemistry
UNT, University of North Texas, Denton, USA

Contact person

Anna Gina Perri - annagina.perri@poliba.it

Electronic for Signal Processing Laboratory

Competencies and research activities

The ESP Lab is equipped with hardware and software resources both to make experimental work in the field of electronic devices, circuits, systems and to develop procedures for digital applications. The staff of the laboratory provides research services and technology transfer in the following macro-areas:
Sensor design for digital radiography.
In the field of X-ray detection application, semiconductors characterized by high atomic mass and resistivity have been adopted to fabricate detectors with high X-ray sensitivity. These features are valuable in especially applications, such as in medical field. Both pixel matrix and micro-strip prototypes of GaAs X ray detectors have been analyzed and designed. The device behavior has been modeled taking into account trapping and generated carrier phenomena. The obtained numerical simulations confirm the electrical behavior of the device which has been verified in the ESP Lab.
Analysis and design of broadband multistage interconnection networks and of switching elements for multistage networks
Basic structure of a B-ISDN is the interconnection matrix. Researchers of ESP Lab have studied various switching matrixes taking into account both architectures and routing/control algorithms. Both Electronic and electro-optic switching elements for MINs (Multistage Interconnection Networks) and GSNs (Generalizzed Shuffle Networks) have been designed.

Procedure development for real-time one-dimensional signals
The study of biological signals is a difficult task because of their non-stationary behavior. For real-time detection of acute heart pathologies, real-time procedures have been developed for the localization of characteristic points in ECG and ICG signals. Both the obtained sensitivity and the positive predictivity have shown the validity of the implemented methods and their high noise immunity degree.
Procedure development for automated processing of digital images
Computer Aided Detection (CAD) analysis is valuable in supporting physicians for pathology detection since it improves the diagnosis sensitivity and specificity. CAD system normally operates as an automated second opinion or as a double reading system that indicates lesion locations and types of possible abnormalities. ESP Lab. researchers have developed automated CAD systems able to localize and detect both single microcalcification and microcalcification clusters in mammographic images. The obtained performance show the method validity.
Analysis and design of biomedical/environmental data capture and storage systems
In particular, RFID systems, adopting active tag, can be integrated with other wireless devices to realize portable networks such as PAN or data network in vehicles. Researchers of ESP Lab. have designed and analyzed various systems for custom applications using RFID devices.
Analysis and synthesis of complex digital circuits
Specifications of a modern digital system are often so complex to need a detailed characterization of both the functionality sets and the memories between which data are transferred, according to a well-defined synchronization. The distribution of tasks between various devices composing the system can differ according to both the functional blocks disposable in the design libraries and the design requirements such as area occupancy, data throughput, cost, latency, low power dissipation. In the ESP lab., various complex circuits have been analyzed and synthesized adopting different methodologies.
Collaborations with companies and institutions:
Faculty of Engineering, Science and Medicine - Department of Health Science and Technology
Center for Sensory
Motor Interaction
Aalborg University (Denmark);
IMEC
NES/Wireless
Leuven (Belgium)
Infineon Technologies GmbH
Villach (Austria)
STMicroelectronics
Bluetooth BU
Zaventem (Belgium)

SST lab
Masmec S.p.A.
El.Mo
MASVIS S.r. L.
Contact person
Maria Rizzi - maria.rizzi@poliba.it

Electronics for Telecommunications

Competencies and research activities
RF, microwave and mm-wave component and circuit design - hybrid and ASIC developments.
TLC system design and integration for personal communications, industrial and medical applications.
Integrated sensors wireless unit development for environmental monitoring.
Collaborations with companies and institutions:
Texas Instruments Europe
Conexant
Galileo Avionica, SELEX (now Leonardo)
SEASTEMA (FINCANTIERI)
GST
Contact person
Gianfranco Avitabile - gianfranco.avitabile@poliba.it

Industrial Informatics

Competencies and research activities
The laboratory hosts Apulian Bioengineering s.r.l., a spin-off company and innovative start-up founded in March 2019.
The In2Lab research activities mainly focus on Electronic and Information Bioengineering and ICT solutions for Industry 4.0:
Industrial Informatics and Real World Applications
Medical Informatics and Biometric Applications
Human Computer Interaction and Human Machine Interaction
Image Processing and Artificial Vision
Machine Learning and Soft Computing Applications
Intelligent Computer Aided Diagnosis, Prognosis, Rehabilitation and Therapy from biomedical data and signals
Robotics and Domotics
Virtual and Augmented Reality
Bioinformatics and Systems Biology
Safety and Security

Bioengineering
Artificial Intelligence
Collaborations with companies and institutions:
Apulian Bioengineering S.R.L. (www.apulianbioengineering.com)
Comau S.P.A.
Protom Group S.P.A.
R.I. S.P.A.
Cupersafety S.R.L.
Kinema S.R.L.
Mespo S.N.C.
Forte S.R.L.
LMA S.R.L.
NEWS S.R.L.
AMT Services S.R.L.
Item Oxygen S.R.L.
Consorzio CETMA
IRIS S.n.c.
BioResult S.R.L.
Masmec S.p.A.
Trait d'Union S.R.L.
eResult S.R.L.
SER & Practices S.R.L.
Graphiservice S.R.L.
Media Broadcast Communication s.a.s.
Fotolito 38 S.R.L.
Quorum Italia S.R.L.
Bautech S.R.L.
Escoop European Social Cooperative
Laboratorio di Analisi Cliniche Dr. Pignatelli S.R.L.
Agiler srl
Ena Consulting S.R.L.
Orizzonti Consulting S.R.L.
Code Architects S.R.L.
Murgia Sviluppo S.C.A.R.L.
Giuseppe Laterza and Figli S.p.A.
Medica Sud S.R.L.
Cardio on line Europe S.R.L.
Intact Health Care
Paperleap S.R.L.
Mosaico Digitale S.R.L.
Ligi Tecnologie Medicali S.p.A.
Molino Casillo Group

Scuola Superiore Sant'Anna di Pisa - Tecip Institute
Scuola Superiore Sant'Anna di Pisa - Biorobotics Institute
Dipartimento SMBNOS
Università degli Studi di Bari
Dipartimento DETO
Università degli Studi di Bari
Dipartimento di Ingegneria dell'Innovazione
Università del Salento
Consiglio Nazionale delle Ricerche CNR - IMM
Università degli Studi di Foggia - Ospedali Riuniti
IRCCS Istituto Tumori Giovanni Paolo II di Bari
Casa Sollievo della Sofferenza - IRCCS - San Giovanni Rotondo
RNBIO: Rete Nazionale di Bioinformatica
Biosistema S.C.A.R.L.
Co.Re.Ma.R. Puglia.
Contact person
Vitoantonio Bevilacqua - vitoantonio.bevilacqua@poliba.it

Information Systems Laboratory (SisInf Lab)

The research activities of the Information Systems Lab (SisInf Lab) have been evolving over the years around a common nucleus: intelligent systems and intelligent data management.
All the aspects related to Artificial Intelligence as well as those referring to Software Engineering and Industrial Informatics are part of the background knowledge of professors, Ph.D. students and research assistants working with SisInf Lab. This led to the presentation of new and innovative solutions in the fields of automated reasoning, big data analysis, formal verification of software systems, recommender systems and Internet of Things, just to cite a few.
Putting together different souls of computer science to propose smarter and smarter software solutions, algorithms and architectures is the main mission of SisInf Lab and this is made possible thanks to a strong set of competencies.
Competencies and research activities
Artificial Intelligence
Smart Munufacturing
Industry 4.0
Machine Learning
Big Data Analysis
Information Systems
Personalized Information Access
Recommender Systems
Information/Resource Retrieval

Web of Things
Semantic Web
Knowledge Graphs
Knowledge representation
Automated reasoning
Non-standard resoning
Opportunistic Reasoning
Smart Automotive
Model Checking
Adaptive Architectures

Collaborations with companies and institutions:

HP Labs (Palo Alto)
IBM
Corvallis S.p.A.
Exprivia S.p.A.
Reply
Engineering
TxT e-solutions
Fincons
University of Oxford
Knowledge Media Institute - The Open University
Alpen-Adria-Universität Klagenfurt
Universidad Autonoma de Madrid
Universitat Pompeu Fabra Barcelona
University of London, Birkbeck College
Athabasca University
Poznan University of Economics
DOCOMO Euro-Labs Munich
ISTI-CNR Pisa
University of Michigan
Poznan University of Economics
Technical University of Crete
Erasmus University of Rotterdam
Gdansk University of Technology
EURECOM
National University of Ireland aux Fonctionnels, UMR

Contact person

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Website

http://sisinflab.poliba.it

Laboratory of Automation and Control (LCA)

Competencies and research activities

Distributed optimization algorithms and consensus
Resource allocation in systems composed of heterogeneous agents
Assignment problems in distributed networks with communication constraints
Fault detection and identification of discrete event systems
Consensus algorithms

Methodologies:

Optimization, Simulation, Modelling
Models to maximize the effectiveness of technological products and processes
Reduction of the alternatives and choices
Advanced algorithms and applications of ICT skilled at predicting and solving immminenti situations and in different application contexts.

Collaborations with companies and institutions:

Prof. Zhou MengChu, New Jersey Institute of Technology in Newark, USA, control of production systems.
prof. A. Giua University of Cagliari on fault detection and identification of Discrete Event systems;
Prof. W. Ukovich University of Trieste, for studies on logistics in various application fields;
Prof. Jean-Jacques Lesage, Ecole Normal de Cachan, France, for studies on health systems;
Prof. C. Stylios, Technological Educational Institute of Epirus, Artas, Greece
Prof. Jean-Marc Faure, Ecole Normal de Cachan, France, for studies on transportation systems;
Prof. Zhiwu Li, Xidian University, Xi'An, China, for studies on fault detection of discrete event systems;
Autamarocchi (development of management systems and fleet vehicles)
Colussi S.p.A. (Optimization of logistics distribution system)
OM Forklifts S.p.A. (Solutions for warehouse logistics, planning and management of production processes)
Teorema Engineering LTD (Intermodal logistics)
Intermodal Terminal of Trieste - Fernetti S.p.A. (Intermodal logistics)
Steel Bertoli Safau (scheduling and production planning)
Insiel Market (organization and management of health systems)
Policlinico di Bari (organization and management of health systems)
Insiel FVG (intermodal logistics, management of dangerous goods transport)
Eurocontrol (air traffic management)
Municipality of Bari (urban mobility)
Venetian Autovie Insiel FVG (management of transport of dangerous goods)
ACEGAS (DSS for smart cities)

Contact person

Maria Pia Fanti - mariapia.fanti@poliba.it
Website
http://dee.poliba.it/LabControlli/index.htm Laboratory of Automation and Control (LCA)

Laboratory of Photonics Research Group

Competencies and research activities

The Photonics Research Group was formed by prof. V. Passaro in 2004. It is mainly involved in modelling, design and technology of photonic devices and sensors in group IV materials (silicon and compounds, germanium, carbide, tin), non linear integrated optical devices for fast signal processing, wavelength conversion, amplification, sensing, etc., fiber optic sensors and design of fiber optic passive optical networks for telecommunication systems.
Since 2004 the group has been published more than 100 papers in peer-reviewed international journals and more than 100 papers in book chapters and international conference proceedings.

Collaborations with companies and institutions:

The group has established prestigious collaborations with several national and international research groups, especially from:
University of Surrey
University of Southampton
University of Glasgow
Russian Academy of Sciences
University of Trento
Universidad de Valencia
Universidad Politecnica de Valencia
Mcquarie University
University of Massachusetts at Boston
National Institute of Optics at Pozzuoli
National Institute of Nuclear Physics at Bari.

Contact person

Vittorio Passaro - vittorio.passaro@poliba.it

LabZERO

Competencies and research activities

LabZERO is a multidisciplinary laboratory located at Politecnico di Bari and ENEA Research Center Brindisi. The mission of LabZERO is to enable strategic cooperation with enterprises and promote multidisciplinary research for the development of innovative technologies in the areas of energy efficiency and renewable energy sources in both urban and industrial sectors. Research and experimentation activities in LabZERO make use of simulation tools and technologically advanced equipment, in order to reduce the risks of applied research and support product innovation in the path “from concept to market”.

The laboratory provides innovative solutions for fast prototyping, for the certification of materials and the development of complex systems, in the fields of energy efficiency, energy conservation, sustainable manufacture, smart grids and smart cities.
LabZERO activities are based on the coordinated work of four research units: three units at Politecnico di Bari (DEI, DMMM, DICAR), and one at ENEA Research Center in Brindisi. It is part of the Apulian applied research system and aims to the integration with other R&D networks and industrial clusters.
A main strength of the LabZERO is the collaboration with entities of different nature. In fact, LabZERO works in close cooperation with about fifty stakeholders such as industrial developers, public territorial bodies, public administrations and Municipalities, and relevant research actors.
The main research activities of LabZERO concern:
Power system analysis and control
Smart grid and storage technologies and applications
Fast prototyping of electro-mechanical equipment and devices for smart city and home automation.
Hardware-in-the-loop (HIL) and power-hardware-in-the-loop (PHIL) applications
Prototyping and testing of components for smart grids and microgrids
Medium and low voltage distribution automation
Advanced protection systems
Electrical Vehicles infrastructures, smart charging and Vehicle to Grid (V2G)
Design and test of micro wind turbines
Sustainable manufacturing, de-manufacturing by cryogenics and recycling of waste of electric and electronic equipment (WEEE)
High performance building material characterization
Non-destructive tests for the mechanical characterization of materials and structures
Smart materials and devices for the thermoelectric generation from waste heat or solar energy.
Solar heating & cooling
Industry 4.0
Smart Manufacturing & Smart Farming
Main available pieces of equipment are:
A microgrid test facility
Real time digital simulator (RTDS)
RTDS Interface to IEC 61850 equipment
4-quadrants programmable power source with multiple AC and DC power output configurations
4-quadrants controllable Battery Energy Storage Systems
An experimental biomass externally fired combined cycle plant
An innovative open-air wind tunnel
Cryogenic testing device
Gas pycnometer and gas sorption analyzer
Laser-ultrasonic test bench
The laboratory has been involved in different industrial projects on:
Technical scientific agreement with Università degli Studi di Bari and ARPA Puglia (Agenzia Regionale per la Prevenzione e la Protezione Ambientale) for research and consulting activities in

the field of efficiency and energy saving.
Technical scientific contract with Università degli Studi di Bari and ARPA Puglia (Agenzia Regionale per la Prevenzione e la Protezione Ambientale) for technical advice on energy performances of buildings in a scientific and technological park
Contract with BOSCH S.p.A. for a training course on electrical safety
Cryogenic technologies for WEEE de-manufacturing (granted by MISE)
Design and prototyping of a public illumination system integrated with urban mobility and IoT services in partnership with an industrial cluster of ten SMEs (Niteko srl leader)
Design and prototyping of a home energy management system, or energy router, and cloud control tools for smart grids in residential and tertiary applications in partnership with an industrial cluster of nine enterprises (Fincons SpA leader)
Feasibility study for the integration and optimization of energy and material resources to increase efficiency and competitiveness and develop a smart industrial energy district in the industrial area of Brindisi (partner Confindustria Brindisi-ASI)
Smart grids applications on power distribution systems (with AMET S.p.A., the electric distribution company for the city of Trani)
Software applications for gas distribution grids (developed for the natural gas distributor in the city of Bari, Retegas Bari S.p.A.)
Main services:
Fast prototyping of electrical equipment & systems
Design and testing of control boards through hardware-in-the-loop (HIL)
Design and testing of power components through power-hardware-in-the-loop (PHIL)
Testing and setting of electrical protection systems
Power quality measurement and immunity tests
Measurements of low-frequency electromagnetic fields
Dielectric strength tests on cables
Main measurements from electrotechnical laboratory
Main lighting measures
Measurements for grounding system
Short circuit analysis
Power system simulation, analysis and control of complex transmission, distribution and industrial grids
Operator Training Simulator for the training of operators in industrial as well as transmission power systems
Design and verification in substation automation
Communication and network integration tests with IEC 61850 devices
Communication tests of the I/O list in SCADA applications under IEC 61850 protocol
Testing of micro wind power turbines
Mechanical characterization of materials through laser and nanosonic interferometry
Thermal cycles testing of materials using a climatic chamber
Cryogenic and demanufacturing techniques for recycling exhausted PV panels
Thermal diffusivity, specific heat, thermal conductivity measurements Measurement and characterization of thermo-electrical parameters of thin film materials
Modeling and simulation of materials, components and devices

Collaborations with companies and institutions:
Washington State University
University of Illinois Urbana-Champaign
École Polytechnique Fédérale de Lausanne
Università degli Studi di Bari
ALI6 S.r.l.
AMET S.p.A.
Applica Iot S.r.l.
ARPA Puglia (Agenzia Regionale per la Prevenzione e la Protezione Ambientale)
BOSCH S.p.A.
Blue H R&D SRL
CETMA (Centro di Ricerche Europeo di Tecnologie Design e Materiali)
CIAB (Consorzio Informatica Artigiani Bari)
Città Metropolitana di Bari
CNA Bari (Confederazione Nazionale dell'Artigianato e della Piccola e Media Impresa)
Comune di Bari
Comune di Bitetto
Comune di Capurso
Comune di Cellamare
Comune di Margherita di Savoia
Comune di Polignano a Mare
Comune di Palo del Colle
CONFAPI Bari e BAT (Confederazione italiana della piccola e media industria privata)
Confindustria Brindisi
Costellazione Apulia
Confindustria Puglia
Dgs S.p.A.
Dyrecta Lab S.r.l.
Elfim S.r.l.
EMI S.r.l.
EV Charging
Fincons S.p.A.
Garofoli S.p.A.
GEM ICT – Research & development S.r.l.
Ginex Gaetano
I-Com
Indice7
InResLab S.c.a.r.l.
Italian Cutting System S.r.l. (ICS)
Kad3 S.r.l.

Mediterranean Design Network S.r.l.
Niteko S.r.l.
Nomisma Energia
Provincia di Taranto
ReEnergy Projects 1 S.r.l.
Retegas Bari S.p.A.
Ricerca sul Sistema Energetico - RSE S.p.A.
SIC Divisione Elettronica S.r.l.
So.Co.In. / System S.r.l.
STC S.r.l.
Tera S.r.l.
UPI Puglia

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Optoelectronics Laboratory

Competencies and research activities

The research fields of the laboratory are modelling, design, fabrication and characterization of optoelectronic and photonic waveguiding components and devices for a wide spectrum of applications such as inertial navigation, biochemical sensing, optoelectronic modulation, optoelectronic beamforming and steering, optoelectronic signal processing and so on.
The main current research topic are:
1. Modelling, design, and optical characterization of miniaturized optoelectronic gyros for aerospace. In the framework of a well-established collaboration with the Italian Space Agency (ASI) and the European Space Agency (ESA), we are developing optoelectronic gyros based on the integrated optical technologies. We are working towards the demonstration of the first fully integrated photonic gyro-on-a-chip in InP technology. Two demonstrators of the sensing element, a low-loss ring resonator with radius =13 mm and a spiral resonator with length =60 mm, have been already fabricated/characterized in cooperation with the Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institute, and the Institute for Photonic Integration, TU of Eindhoven, respectively. The cavities show a Q-factor close up to one million. Recently a very innovative approach for enhancing the Q-factor of the ring resonators for gyros applications up to 109, with a calculated gyro resolution in the order of 0.001°/h, has been envisaged in the framework of an ESA funded project. This approach was patented in 2014 (patent numberEP056933). In the framework of a cooperation agreement between the ESA and the Optoelectronics Laboratory on optical gyroscopes based on ring resonators and photonic crystals, a PhD fellowship has been funded. In cooperation with LioniX International B.V., the photonic crystal ring resonator has been designed and manufactured. The research activity includes also the development of the readout electronics for resonant optical gyros. In cooperation with Sitael, a FPGA-based readout board has been designed, manufactured, and tested.
2.Biosensors based on photonic/plasmonic micro-cavities and hybrid photonic/plasmonic nanotweezers for future medicine. We are currently investigating an electro-photonic approach for the analysis and the monitoring of susceptibility at the single-bacterium level for the development of new drugs. Our method employs optical tweezers based on photonic crystal cavities for the trapping of individual bacterium. The susceptibility testing is carried out by impedance measurements. We are currently investigating a plasmonic biosensor for protein biomarkers detection. We have designed, fabricated and characterized a novel cavity that combines a photonic crystal nanobeam cavity with a plasmonic bowtie antenna. Furthermore, we have recently demonstrated the strong efficiency of the hybrid cavity as a nanotweezer for optical trapping, with long time trapping (≈several minutes) and very low optical power (in the order of μW). A multi-analyte biosensing platform with ultra-high resolution (= 0.2 ng/mL) has been recently designed for the detection in the human serum of a wide range of biomarkers, e.g. those allowing the lung cancer early diagnosis. The platform is based on a new configuration of planar ring resonator. The very strong light-matter interaction enabled by the micro-cavity allows a record limit-of-detection of 0.06 pg/mm^{2,} five times better than the state-of-the-art.
3.Integrated microwave photonics. Aiming at improving the performance of the currently available Synthetic Aperture Radar payloads, especially in terms of size, weight and power consumption, several photonic-based functionalities of the radar system, e.g. the generation of chirped waveform that the radar sensor transmits, the beamforming, and the direct (without down conversion) A/D conversion of the radar echo, have been investigated. In particular, we have recently designed an optoelectronic oscillator with ultra-high spectral purity and a photonic sub-system for linearly chirped microwave waveform generation having a large time-bandwidth product. Furthermore, several resonant delay lines have been designed for beamforming/beamsteering networks. Two graphene-based chip-scale resonant delay lines have been designed. The basic building block of both the devices is a couple of two vertically stacked ring resonators with a graphene/alumina graphene capacitor placed between the rings. Furthermore, a 1D photonic crystal made by a graphene capacitor pattern has been designed, demonstrating the highest figure of merit at the state-of-the-art, to our knowledge. We are currently working on a photonic-based reconfigurable front-end and a switching matrix for TLC payloads.

Collaborations with companies and institutions:

Selected collaborations with Universities and research centers:
Fondazione Bruno Kessler (FBK), Italy
Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, Berlin, Germany
Istituto Italiano di Tecnologie (IIT), Lecce section, Italy
National Council of Research, Italy
Technical University of Eindhoven, Institute for Photonic Integration, The Netherlands
Technische Universität München (TUM), Institute for Nanoelectronics, Germany
Technoscience, Parco Scientifico e Tecnologico Pontino, Roma, Italy
University of California Santa Barbara, Optoelectronics Research Group, USA
University of Glasgow, Nanophotonics and Optoelectronics Research Group, UK
University of Southampton, Silicon Photonics Group, UK

University of St. Andrews, Microphotonics and Photonic Crystals Group, UK
University of York, Photonics Research Group, UK
Zhejiang University, Micro-Satellite Research Center, China
Selected collaborations or contacts with companies
Aerospace Apulian District
Alcatel-Lucent, France/Italy
Center for Integrated Photonics (CIP), Ipswich, UK
CGS, Italy
Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT)
El.En., Calenzano, Florence, Italy
EvenTech, Riga, Latvia
GEM Elettronica, San Benedetto del Tronto, Italy
HighTech XL, Eindhoven, The Netherlands
Institute of Technology Antoine de Saint Exupéry, France
Leonardo
LioniX International B.V., Enschede, The Netherlands
Mechatronics Apulian District
MerMec, Monopoli, Italy
Planetek Italia
Sitael, Mola di Bari, Italy
Technobis Group, The Netherlands
Thales Alenia Space, Italy
Thales Research and Technology, France

Contact person

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Power Electronics

Competencies and research activities

MORE ELECTRIC AIRCRAFT
Design of electrical machines power converters and control algorithms for a more efficient use of energy on-board the more electrical aircrafts
MULTILEVEL CONVERTERS: MODULATION AND CONTROL
PI-based and passivity-based control of H-Bridges multilevel converters
Back-to-back drives for traction systems
Multilevel modulations and their implementation on FPGA systems
POWER CONVERTERS FOR DISTRIBUTED POWER GENERATION SYSTEMS
Three-phase step-up inverters
Anti-islanding methods
Synchronization and control methods for distributed power generation systems in different grid conditions.
POWER QUALITY ASSESSMENT CRITERIA AND ACTIVE COMPENSATION SYSTEMS
New power quality assessment criteria for non-linear loads
Predictive, fuzzy and fuzzy-predictive controls of active filters
Optimal tuning of active power filters via genetic algorithms and Nelder-Mead method
THREE-PHASE ACTIVE RECTIFIERS
LCL-filter design and passive/active damping of control loops
Back-to-back drive with reduced energy storage
Fuzzy-sensorless control for low-cost microcontrollers

Collaborations with companies and institutions:

University of Nottingham, UK
Politecnico di Torino
Università di Brescia
Università di Firenze
University of Aalborg, Denmark
Christian-Albrechts-Universität, Kiel, Germany
Curtin University, Perth, Australia
Universidad Politécnica de Cartagena, Spain
Universidad de Castilla La-Mancha, Albacete, Spain

Contact person

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Prince - Electrical Energy Systems

Competencies and research activities

Definition and the implementation of forecasting procedures.
Operation planning and real-time operation procedures.
Monitoring and the control of single devices through local controllers or actuators.
Real-time response functions of inverters.
Tests of islanding conditions feeding simulated and real loads.
Development of control logic for storage devices and electric vehicles in V2G configuration.
Mode transition management.
Fault system protection.

Collaborations with companies and institutions:

ABB S.p.A. - Power System Division – Genova
Autorità Portuale del Levante - Bari
Terna Rete Italia S.p.A. - Roma
Guastamacchia S.r.l. – Ruvo di Puglia (BA)
Terni Energia S.p.A. - Terni
TCT S.r.l. – Brindisi
ST Microelectronics – Catania

Enel S.p.A. - Roma
Somprogest
Rienergia
AQP

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Signal Processing Laboratory

Competencies and research activities

In the Signal Processing Laboratory, the main expertise is in Remote Sensing (design of Earth Observation satellite systems as Synthetic Aperture Radar, Doppler Altimeter and Multispectral sensors), in machine learning (supervised/ unsupervised classification, regression) and in multivariate Signal Processing applied to engineering problems and to other fields (physics, chemistry, biology, medicine).

Collaborations with companies and institutions:

University of Bari
Politecnico di Milano
AirBus Germany
Thales Alenia Italia
European Space Agency
Italian Space Agency
CNR-Bari
University of Sheffield
Aresys srl-Italy

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Telematics Laboratory

Competencies and research activities

Telematics Lab is a research laboratory at the Department of Electrical and Information Engineering (DEI) of Politecnico di Bari. Our mission is the research on the most relevant technologies in the area of telecommunication networks.
Currently, the main themes of our research are:
-IoT and Industry 4.0
-Network Security
-5G Systems
-Information Centric Networking
-Network Softwarization
-Nano networks
-Internet models and network measurements
Telematics Lab is (or has been) involved in the following recent projects:
-H2020 GUARD GUARD: A cyber-security framework to GUArantee Reliability and trust for Digital service chains. Years 2019-2021 (36 months).
-PRIN project no. 2017NS9FEY: Realtime Control of 5G Wireless Networks: Taming the Complexity of Future Transmission and Computation Challenges. Years 2020-2022 (36 months)
-Pre-commercial trials of 5G technology using spectrum in the 3.6 GHz-3.8 GHz range - Area Milano, funded by MISE. Years 2017-2021 (48 months)
-PON projects funded by the Italian MIUR: Pico&Pro (ARS01_01061), AGREED (ARS01_00254), FURTHER (ARS01_01283), RAFAEL (ARS01_00305)
-Apulia Region Research Project: E-SHELF (OSW3NO1), INTENTO (36A49H6)
-H2020 FANTASTIC 5G: Flexible Air iNTerfAce for Scalable service delivery wiThin wIreless Communication networks of the 5th Generation. Years 2015-2017 (24 months)
-H2020 BONVOYAGE: From Bilbao to Oslo, intermodal mobility solutions, interfaces and applications for people and goods, supported by an innovative communication network. Years 2015-2018 (36 months)
-H2020 SYMBIOTE: symbiosis of smart objects across IoT environments. Years 2016-2018 (36 months) International cooperation
-A de-verticalized machine-to-machine platform for smart building applications". Galileo 2015-2016 (12 months)
-COST Action IC0703 Data Traffic Monitoring and Analysis (TMA): theory, techniques, tools and applications for the future networks
-RES NOVAE: reti edifici strade nuovi obiettivi virtuosi per l'ambiente e l'energia. Years 2012-2015 (36 months). Funded by National Operative Program – Research and Competitiveness 2007-2013.
-DSS: Decision Support System for emergency management in marine environments. Years 2011-2013 (36 months). Funded by National Operative Program – Research and Competitiveness 2007-2013
-ERMES: Enhance Risk Management through Extended Sensors. Years 2011-2013 (36 months). Strategic Projects - funded by Apulia Region

Collaborations with companies and institutions:

8Bells
ATOS
Azkar – Dachser Trasportes
Experis
Fiware foundation
Fluidtime
Forth
Gruppo Maggioli
Huawey
Intel
Intracom S.A. Telecom Solutions
Italtel

JIG
Law and Internet Foundation
Macnil
MC2innovations
Minds&Sparks
Nask
NAVIGO
Networks
Nokia
Orange
Pozna□ Supercomputing and Networking Center
Samsung
Sensing and Control
Sequans
Sintef
SM-Optics
Technion – Israel Institute of Technology
Telecom Bretagne
TIM
Trenitalia
Ubiwhere
Unidata
Vipnet
Vodafone
WINGS
Wobcom

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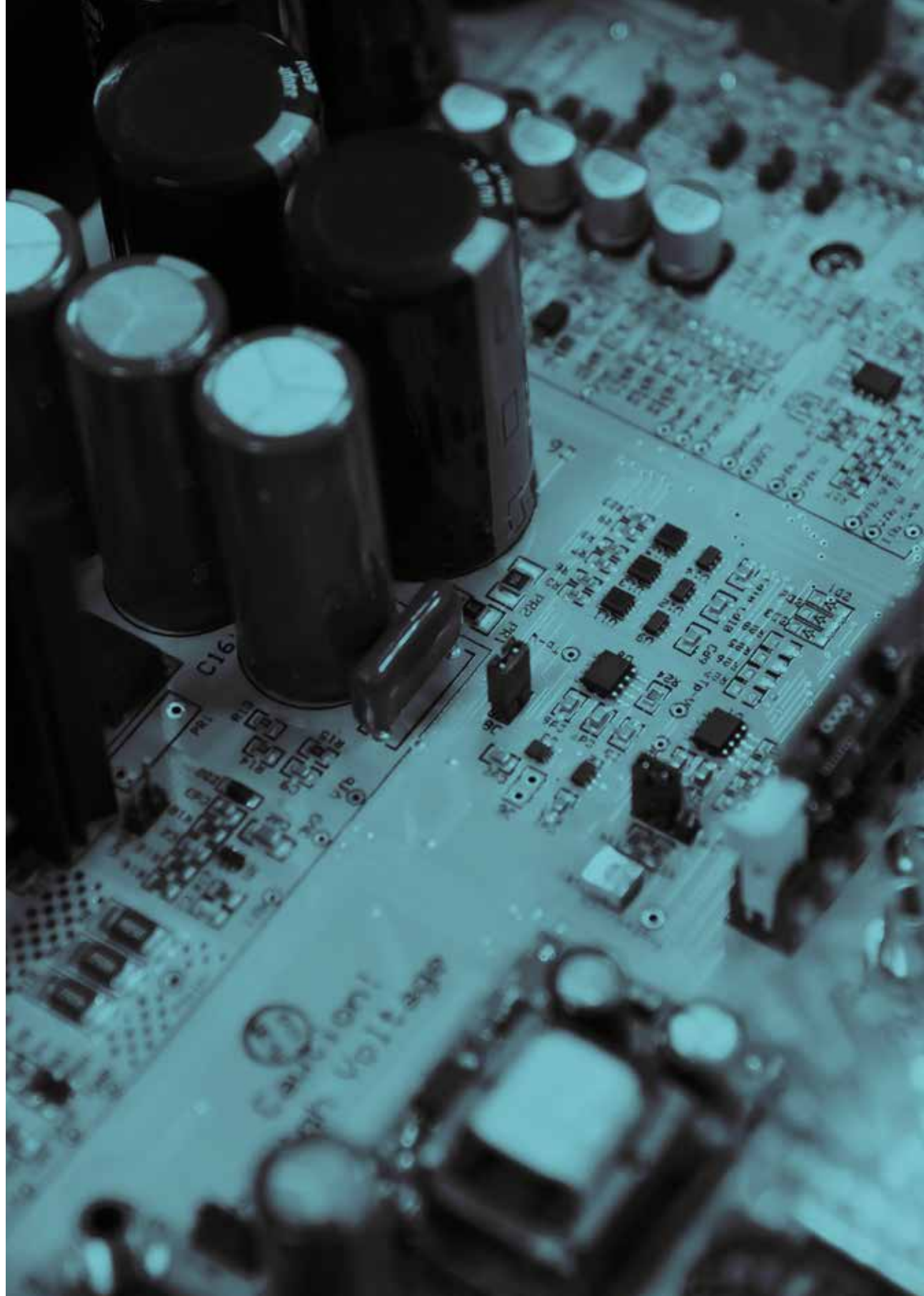

Applied Geomatics Laboratory (AGlab)

Competencies and research activities

Services and research activities (institutional and funded) provided within the lab focus on the following Geomatics themes:

-extraction of 2D/3D geometric primitives from satellite/aerial/UAV VHR data to update Technical/Thematic Cartography.

-multi-temporal (change detection) classification of satellite data acquired by means of optic sensors with medium and high spatial, radiometric and spectral resolution to produce thematic maps (land use/land cover, vegetation, thermal anomalies, archaeological traces, etc.);

Development and customization, through open and proprietary programming languages, of specific algorithms for processing 2D/3D data aimed at improving qualitative and quantitative standards (geometry, accuracy and precision) of results;

Pre/post-processing and structuring of complex 3D cartographic objects, obtained by means of laser technologies for aerial (LIDAR) and Terrestrial LASER Scanning, UAV systems (structure from motion and photogrammetric restitution) aimed generating altimetric models for environmental modelling (DTM, DMS, DEM, etc.);

Development and implementation of WebGIS systems (FLOSS and proprietary software) for interactive analysis, representation and sharing of Big 2D/3D geospatial data according to OGC standard through ad hoc WMS/WFS-T services;

Accuracy testing on geospatial data produced by third parties (technical cartography, LU/LC classification accuracy, specific land cover extraction);

Stability testing of WebGIS systems and services implemented by third parties.

Projects

GreenhouseSat “Object-based horticultural crop under greenhouse identification using stereo imagery of WorldView-3 satellite and Landsat 8 time-series”

STIMARE “STrategie Innovative, Monitoraggio ed Analisi del Rischio Erosione”

CONVENZIONE DI RICERCA SIPAL-DICATECh “Cantiere tecnologico per infrastrutture Civili e Militari”

AIM: Attrazione e Mobilità Internazionale “Definizione di un sistema integrato di monitoraggio per la definizione della influenza dei SOD sui ROD in centri storici”

Sentinel-GH (RTI2018-095403-B-I00; MAPEADO DE INVERNADEROS E IDENTIFICACION DE CULTIVOS HORTICOLAS PROTEGIDOS MEDIANTE ANALISIS DE IMAGEN BASADA EN OBJETOS Y SERIES TEMPORALES DE IMAGENES DE SATELITE) - Spagna

BANDO BRAINS TO SOUTH 2018 “EO4SDG - Earth Observation for Sustainable Development Goals: Big Data analytics for monitoring global land changes phenomena” - Referente scientifico Andrea Nascetti

Softwares

“AssesSeg Tool” (to measure the goodness of a segmentation by means a modification of Euclidean Distance 2 index)

Collaborations with companies and institutions:

Corvallis S.p.A.
Autorità di Bacino della Puglia
SIPAL S.p.A.
ARPA Puglia
University of Almeria (Spagna)
Cyprus University of Technology (Cipro)
Technical University of Lodz (Polonia)
Latvia University of Life Sciences and Technology (Lettonia)
Centre for Advanced Mediterranean Agronomic Studies - CIHEAM
Istituto di Metodologie per l’Analisi Ambientale (IMAA) del Consiglio Nazionale delle Ricerche
University of Warmia and Mazury (Polonia)

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Coastal Engineering Laboratory (LIC)

Competencies and research activities

The Costal Engineering Laboratory (LIC) of the Department of Civil, Environmental, Land, Building Engineering and Chemistry of Politecnico di Bari was designed for advanced research and technical support to the Public Administration in coastal territorial management.

The mission of the laboratory is to provide facilities for researchers, PhD and MSc-students, as well as to perform practical work and demonstrations to support of teaching activities in university. It also has the potential for physical-experimental research in the fields of Maritime and Environmental Hydraulics. The laboratory has a total surface area of 30,000 m2, a laboratory area of 12,000 m2 and an office area of 500 m2.

The major experimental facilities at the LIC are:

Two tanks used for three-dimensional physical models for maritime and costal engineering research. The costal model basin is 100 m long, 50 m wide and 1.2 m deep, while the offshore model basin is 50 m long, 30 m wide and 3 m deep. The costal model facility is equipped with a wave maker.

Two wave channels, which are 2.4 m wide, 50 m long and 1.2 m deep. They are equipped with a wavemaker.

Very large flume for sea currents.

The channel is 15 m long, 4 m wide and 0.4 m deep.Positive and negative buoyant jet systems. The abovementioned channel includes a buoyant jet thermal-hydraulic system with process-computers.

The LIC has many advanced equipment and instrumentation for morphological and hydraulics analysis, such as: bottom propellers, Acoustic Doppler Velocimeter (ADV), Vessel-Mounted Acoustic Doppler Current Profiler (VM-ACP), micro whirls flow meters, pressure gauges, bottom profiler, densimeter, ultrasonic wave height meter, high-precision GPS transceivers, spectrometer, LDV (Laser Doppler Velocimeter) system, laser scanner,

drone. The LIC is also equipped with software and data acquisition systems for the study of the wave climate hindcasting and forecasting, wave propagation, storm and swell activity inside harbors, solid transport, beach evolution, circulation currents and pollutant diffusion.
For the field sea monitoring the LIC has installed a system in the Canale Navigabile of the Mar Piccolo of Taranto (Italy) for the monitoring of sea currents and waves. Another system has been installed in the Mar Grande of Taranto (Italy) for the monitoring of sea currents, waves, water quality and weather. The LIC also hosts equipment of the colleagues of the mechanical engineering department of Politecnico di Bari, such as a wind tunnel and an experimental apparatus to determine the performance of pumps and turbines.
The LIC staff includes many researchers, technicians and students whose work makes the laboratory a reference point in the field of Hydraulics, Maritime and Environmental Hydraulics. The LIC promotes relationships and cooperation with international universities and research institutions.

Collaborations with companies and institutions:

Italian University Ministry with Research Projects of National Interest
European Union for research projects
Co.N.I.S.Ma. – National Inter-University Consortium for Marine Sciences
Basin Authority of Arno
Basin Authority of Apulia
Municipality of Mola di Bari
Municipality of Bari
Apulian Aqueduct
Province of Massa Carrara
The Marche Region
Apulia Region
Port System Authority of the Ionian Sea
Port Authority of Bari
Regional Agency for Environment Prevention and Protection - Apulia
Company Impresub Diving Marine Contractor S.r.l.
Company Price Water House Coopersgm
Company Coastal Protection Systems s.r.l.
Company Edil Impianti S.r.l.
Company Marconsult S.r.l.
Genova
Sviluppo Italia – Roma
National Research Council

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Website

http://www.michelemossa.it/sottopag.php?id=2&id_pag=15AppliedGeomaticsLaboratory(AGlab)
http://www.poliba.it/lic - www.iahrmedialibrary.net

Environmental Technologies Laboratory (ETL)

Competencies and research activities

The “Environmental Technologies Laboratory” (ETL) consists of a (i) chemical section, a (ii) technological section and (iii) a pilot technological platform. The technological platform is located in Taranto wastewater treatment plant over an area of about 500 m2. A variety of research activities are offered by the laboratory in terms of (i) pollutants measurements, (ii) experimental tests at bench and pilot scale as well as (iii) environmental monitoring.
The measurement of pollutants concerns the determination of (i) elemental composition of aqueous solutions by means of ICP-OES, (ii) organic pollutants (PAH, PCB, Total Hydrocarbons) by means of GC-MS, (iii) hydrocarbon (butane, hexane) by means of GC-FID, (iv) pesticides, phenols and PAHs by means of HPLC with UV-VIS and fluorescence detectors, (v) carbon, hydrogen and sulfur content on solid/liquids samples by means of the CHS analyzer, (vi) the heating value of combustion of solid/liquid substances through the Mahler calorimeter bomb, (vii) the TOC (Total Organic Carbon) of aqueous solutions as well as (viii) the biological stability of a biomass with the Respirometric Dynamic Index (RDI) by means of the 3024 Costech International Respirometer.
The experimental tests cover numerous technologies for environmental protection such as (i) tribo-electrostatic separation, (ii) mechano-chemical, (iii) stabilization/solidification, (iv) soil and sediment washing, (v) thermal treatments such as pyrolysis, gasification and incineration as well as (vi) biological treatments by means of the Esedra automated bioreactor.
The environmental monitoring activities concern (i) the measurement of odor emissions by means of an integrated system combining several technologies (already on the market) such as ODOR PREP, ODOR TEL, SENSIGENT MSEM32 and (ii) a real-time monitoring of fine particles through the Optical Particle Counter (OPC) system.
The laboratory also has an impressive experimental platform. For more than twenty years the ETL is involved in research activities with participation in local, national and international projects. The head of the lab is prof. Michele Notarnicola. Furthermore, the experience in environmental impact assessment and decision support system of prof. Sabino De Gisi strengthens the ETL offer in the environmental field.

Collaborations with companies and institutions:

The ETL works in environmental engineering issues of the 09/D1 “Materials Science and Technology” sector, with special reference to (i) solid waste management, (ii) remediation of contaminated sites, (iii) wastewater treatment and (iv) air emissions control. Typically, research activities are conducted at pilot/industrial scale by means of appropriate collaboration with public institutions as well as major industry players. Hereinafter, significant activities are reported:
Three-year cooperation agreement (2015-17) under the article 15 of the Italian Law 241/1990 on “activities preparatory to the remediation, urban and environment

regeneration of the Mar.
Piccolo in Taranto" funded by the Special Commissioner of the Italian Government for urgent measures of remediation and environmental requalification of Taranto area (Souther Italy).
Three-year research agreement (2011-2013) "Scientific and technical support for the preparation of the Municipal Solid Waste Plan of the Apulia Region" funded by the Apulia government, Department of Environmental Quality.
Three-year strategic research project (2007-10) "Integrated strategies for the productive reuse of municipal wastewater in Apulia region (PS 91)" funded by the Apulia Government.
Annual research project (2006-07) "Technical and scientific supervision to the monitoring of diffuse emissions activities produced by the materials handling in the port of Taranto as well as study of the most suitable mitigation devices", funded by Italcave SpA (research contract N.09/06 of 22/11/2006).
Two year research project (2002-04) "SE.L.SY. – Sea-Land System: ConcertatedActions for the Coastal Zone Management" funded by the European Commission under EU-LIFE EVIRONMENT programme (contract no. LIFE00 ENV/IT/000090).

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Geotechnical Engineering Laboratory

Competencies and research activities

The Laboratory has more than thirty years of activity and, since its establishment, instruments and experimental techniques, have been subject to continuous evolution and upgrade.
Currently the laboratory has two locations, one in Bari and a newer one, at the Taranto branch of Politecnico di Bari. The laboratory has adequately equipped to perform tests at controlled load path, under axisymmetric deformation condition, with continuous monitoring of stress-strain state, even locally (on-sample). Such mechanical testing may be performed on specimens different sized, consistent with the appropriate representative volume element (REV). The experimentation may be performed at pressures from low to high (10 MPa), so that we can investigate the mechanical behaviour of soils at state from extremely firm up to weakly cemented, or otherwise investigate the evolution of the material behaviour in various stages of its structure development, natural or reconstituted. The "stress-path" devices are also equipped with instrumentation for the measurement of shear stiffness of the soil in the elastic range, associated with very small deformations, statically, by means of local displacement transducers, whereas dynamically, using the technique of bender elements. The equipment enables the investigation of the character of anisotropy of the elasticity of the material, which is intrinsic anisotropy evolutionary. With such

equipment it is also possible the investigation of the soil behaviour in compression and in extension. For the investigation of one-dimensional compressibility of the soil, the laboratory is equipped with numerous standard oedometers (maximum pressure up to 18 MPa).
The laboratory has equipment for performing conventional direct shear test. There are also two apparatus to perform the ring shear test, useful for the measurement of the residual strength. Beside the conventional equipment for the assessment of the parameters of permeability and consolidation of soils, recently instrumentation has been developed for the investigation of the hydraulic retention properties of the soil, with the change of the degree of saturation, throughout drying-wetting cycles.
A special "tank" designed for physical modelling of infiltration processes mono/bidimensional, with assigned boundary conditions, is available: it is equipped by appropriate slots for the insertion of probes (tensiometers, tdr probes, capacitive/resistive soil moisture sensors) along verticals, with the aim of continuous monitoring of such properties, at the water infiltration. In the laboratory facilities are available to allow the experimental studies of mechanical stabilization techniques of marine dredging sediments by means additives. The laboratory was recently equipped, for the classification and the mechanical characterization of contaminated soil.

Collaborations with companies and institutions:

Italian University Ministry with Research Projects of National Interest
National Research Council (CNR).
Commissario Straordinario per gli interventi urgenti di bonifica, ambientalizzazione e riqualificazione di Taranto.
Regional Agency for Environment Prevention and Protection - Apulia.
Apulia Region.
Imperial College London.
City University of London.
Newcastle University.
University Strathclyde Glasgow.
Delft University of Technology.
UPC. Universitat Politecnica de Catalunya.
Université Grenoble-Alpes.
ETH Zurich.
University of Malta.
Friedrich-Alexander-Universität Erlangen-Nürnberg - Institute for Multiscale Simulation.
University of Malta.
City University of Hong Kong - Department of Architecture & Civil Engineering.
Lund University (Sweden)
Italcementi-Heidelberg Group.

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Laboratory of Building Technologies

Competencies and research activities

The Laboratory of Building Technologies is involved in lab and onsite activities concerning performance assessment of construction components, identification of building pathologies, indoor monitoring and energy diagnosis of buildings. Specifically, it offers advanced solutions for maintenance, conservation and refurbishment of the built heritage, with specific focus on the safeguard and enhancement of cultural assets. Main expertise in the fields of:

VR/AR digital models and environments for building refurbishment and cultural heritage promotion.

Investigation of materials, decay, crack and damp patterns, particularly for the built heritage, by means of advanced digital diagnostic techniques;

Assessment of masonry structures and stone elements by integrated systems of diagnostic tests, including sonic and ultrasonic testing, single and double flat-jacks, bore-hole drilling, reconstruction of stratigraphy, water-content measurements, video-endoscopy, qualitative active and passive thermography, high frequency radar scanning for 3D tomography;

Assessment of vaults and slabs by integrated systems of diagnostic tests, including visual inspection, video-endoscopy, radar scanning, magnetometric testing, ultrasonic testing, qualitative active and passive thermography, bore-hole drilling, reconstruction of stratigraphy;

Investigation and assessment of underground structures, foundations and anthropic caves by radar scanning at different frequencies and digital reconstruction of stratigraphy and/or 3D tomography;

Assessment of reinforced concrete structural elements by integrated systems of diagnostic tests, including rebound-hammer testing, ultrasonic testing, SonReb correlation technique for estimating the onsite mechanical resistance, assessment of the concrete carbonation, measurements of the corrosion potential in the rebars, magnetometric testing;

Assessment of timber elements by integrated systems of diagnostic tests, including resistograph techniques, ultrasonic testing, high frequency radar scanning, visual inspection;

Analysis of energy performances of building components, including thermographic radiometric mapping, onsite thermal transmittance measurement, advanced modelling for dynamic simulations;

Indoor microclimate monitoring by measurement of relevant environmental parameters, including air temperature, relative humidity, radiant temperature and velocity, as well as heat flux, surface temperature and lightening;

Measurement, monitoring and analysis of deformations, cracks and vibrations by multi-sensors reading units, including strain gauges, electric extensometers, LVDT, seismic accelerometers, advanced modelling for dynamic simulations.

Further funded research projects:

“3D-IMP-ACT - Virtual reality and 3D experiences to IMProve territorial Attractiveness, Cultural heritage smart management and Touristic development” (Interreg Italy-Albania-Montenegro 2018);

“VERBuM - Virtual Enhanced Reality for Building Modelling” (Apulia Region INNONETWORK 2018)

“BeS2ECURe- Built Environment Safer in Slow and Emergency Conditions through behavioUral assessed/designed Resilient solutions” (PRIN 2017)

“Contactless diagnostic system by augmented reality for buildings with high cultural value and low accessibility” (MIUR “Start Up” 2014);

“Methodological framework for assessment of energy behavior of historic towns in Mediterranean climate” (Fondazione Cassa di Risparmio di Puglia 2013);

“Assessment of the state of conservation of traditional architectures by innovative approaches for ‘knowledge’ management” (Poliba FRA 2012);

“Innovative solutions for energy efficiency and micro-generation of the existing building stock. The case of Mediterranean historic towns” (PRIN 2009);

“HPWALLS. High Performance Wall System” (Apulia Region FESR 2007-2013);

“Innovative laser techniques for the restoration of the cultural heritage. The case of Apulia Region” (Apulia Region APQ “Ricerca Scientifica”).

Collaborations with companies and institutions:

Agenzia Regionale per la Casa e l’Abitare - Regione Puglia
BOVIAR srl
B.Re.D. - Building Refurbishment and Diagnostics srl
Comune di Bari
Comune di Putignano
Comune di Toritto
Ferramati srl
Fondazione Cassa di Risparmio di Puglia
GaribaldiFragasso srl
Institute of Cultural Monuments “Gani Strazimiri” - Albania
L.A.Ser.Inn. Scarl
Museum Centre of Puglia
Polishape3D srl
Politecnico di Milano
Polytechnic University of Tirana
Regione Puglia
University of Montenegro
Università degli Studi dell’Aquila
Università degli studi di Bari Aldo Moro
Università degli Studi della Basilicata
Università degli Studi di Catania
Università Federico II di Napoli

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Laboratory of Chemistry

Competencies and research activities

The Laboratory of Chemistry (LC) consists of 2 large labs for chemical manipulations; a NMR lab equipped with the NMR Bruker Avance 400 spectrometer; 3 labs equipped with the following main instruments: a GC-MS and two GC-FIDs, a high-resolution mass spectrometer (HRMS) with ESI and APCI interfaces, two HPLC; a FT-IR spectrometer with ATR module; a UV-Vis-NIR spectrometer, a fluorescence spectrometer, a CHNS elemental analyzer; a microwave mineralizer, an AAS spectrometer; two thermogravimetric analyzers (TGA); a differential scanning calorimetry analyzer (DSC); a polarized optical microscope (POM). The research activities in LC cover several fields of basic chemistry and its related sciences and its main research topics can be summarized in the following points:

Innovative syntheses in inorganic chemistry
New recyclable heterogenous catalysts for fine chemical syntheses
Molecular nanotechnologies for controlled drug delivery
Advanced organic materials for electronics, opto-electronics and photonics
Food traceability by Nuclear Magnetic Resonance (NMR)
Decision Support Systems (DSSs) for food quality and food origin assessment

Collaborations with companies and institutions:

Università degli studi di Bari Aldo Moro
Università di Modena e Reggio Emilia
National Research Council (CNR)
Istituto Poligrafico e Zecca dello Stato-SpA (IPZS)
Mediterranean Agronomic Institute of Bari (IAMB)
University of Zaragoza
LCC CNRS, Laboratoire de Chimie de Coordination, Toulouse
Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan
Universidad de La Rioja
Linköping University, Norrköping, Sweden
Johannes Kepler University, Linz, Austria
Joanneum Research Forschungsgesellschaft mbH, Weiz, Austria

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Laboratory of Cognition and Spatial Planning

Competencies and research activities

The Laboratory of Cognition and spatial planning is a strong reference framework for activities related to the disciplines of spatial planning, urban planning and land engineering, toward study and academic research, as well as consultancy and “third mission”.

It is concerned with analysis, forecasting, evaluation, layout modelling, environmental, territorial, urban relationships and transformations, as well as with assisted planning, supported both by multiagent models of spatial cognition and analysis and GIS oriented techniques, and by the use of sensors to monitor environmental and social phenomena. They are activities that allow the construction of possible visions and future scenarios, that are fundamental to support decisions in a perspective of sustainable development and protection of environment and of territorialized relationships.

The skills acquired in recent years, even in the use of techniques and advanced technology, made it possible to support several National and European research projects (such as “PRINs”, “Strategic” and “Exploratory” Projects with Apulia Region), as well as numerous agreements with public and private institutions, municipalities, Apulia Region, park authorities, etc.).

Collaborations with companies and institutions:

Apulia Region
Municipalities
Park Authorities

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Laboratory of Environmental Geoengineering

Competencies and research activities

The scientific activity concerns the following topics:

Physical modeling of flow, mass and heat transport in porous and fractured media.

Prototyping engineering in order to set up new technologies in environment and energy sectors, providing the activities of design, numerical modeling, prototype manufacturing.

Validation and measuring the performance of innovative geothermal technologies. Collaborations with companies and institutions:

Department of Physics & Earth Sciences, University of Ferrara (Italy).
New Energies and Environment Company (NEA), Ferrara (Italy).
Geo Environmental Energy Technologies Company (GEET), Bari (Italy).
School of Civil Engineering, University of Queensland, Brisbane (Australia).
Institut für Geologie, Mineralogie und Geophysik Arbeitsgruppe Hydrogeologie Ruhr-Universität Bochum (Germania).
CEIGRAM, Universitad Politécnica de Madrid - iudad Universitaria Madrid (Spain).
dPELNoT, ERCOFTAC, Instituto Pluridisciplinar, Madrid (Spain).
Dept. Fisica Aplicada, Univ. Politecnica de Cataluña, Barcelona (Spain).

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Transportation Planning and Mobility

Competencies and research activities

The TRAMP lab research activity is devoted to the optimization of passengers and freight mobility. It is located in Bari at the Dicatech and in Taranto at the "Magna Grecia" Center. Advanced methods and models for the solution of traffic, transportation and logistics are developed. These activities are carried out for both pure research and commissioned studies. The main activities concern with analysis, studies and forecasts on travel demand, evaluation of the effect due to new projects or plans on the transportation system and on the territory, specification of traffic simulation models and transport-land use interaction models, specification of decision support systems in transportation planning, public transport network design, pedestrians evacuation planning, studies on efficiency and quality of transport service, parking studies. Another expertise of the Lab is about the planning, design, and management of bike-sharing systems and shared mobility in general. In this field the lab staff has developed advanced real-time model for the simulation of bike-sharing systems. In the field of urban logistics, the research is devoted to the optimization of waste collecting systems and pick-up and delivery problems as well as sustainable and equitable transport planning. The lab is able to carry out surveys on users' choice and traffic counts surveys using both video and microwaves based systems as well as supporting local government in the transport planning process.

Collaborations with companies and institutions:

MerMec SpA
AMAT Taranto
Poste Italiane
ENI
Comune di Bari
Comune di Brindisi
Comune di Palagiano (TA)
Multitel (Belgio)
University of Belgrade
University of Novi Sad (Serbia)
University of Cantabria (Spain)

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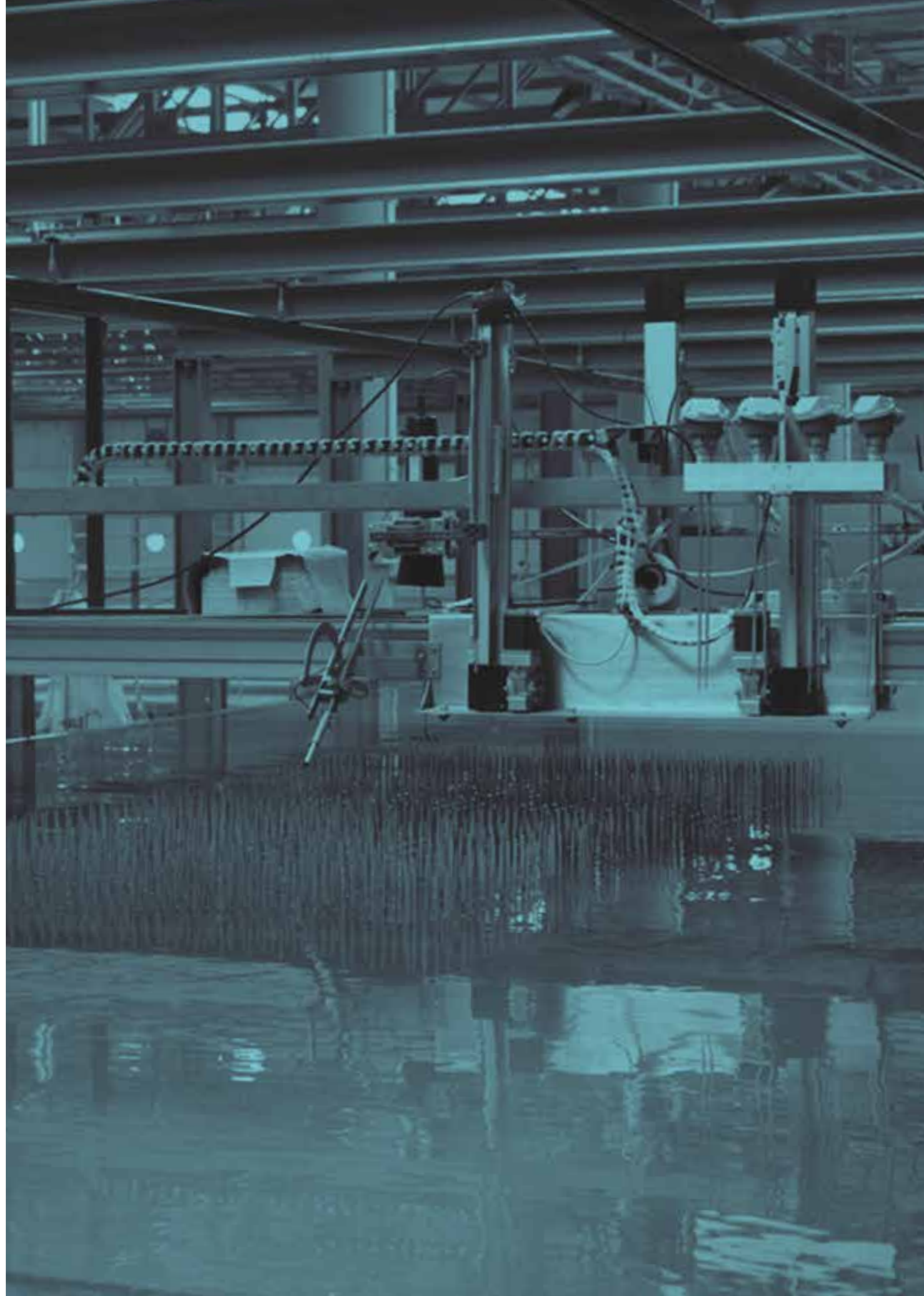

ALICE - Laboratory for ultra-thin silicon detectors

Competencies and research activities

R&D, production and testing of ultra-thin silicon detector for particle physics. The laboratory is equipped with a clean-room (class 10000), a Mitutoyo Crysta APEX 9166 coordinate measuring machine, including an optical system ("optical head") to measure three spatial coordinates, aluminium wedge bonder machines, probe stations with micrometric pass, system for automatic assembly of detector modules, laser machine for micro-bonding.

Collaborations with companies and institutions

INFN - Istituto Nazionale di Fisica Nucleare (main partner)
CERN - The European Organization for Nuclear Research
IN2P3 - CNRS Centre national de la recherche scientifique
Institute of Particle Physics, Central China Normal University (CCNU)
STFC Daresbury Laboratory
Rutherford Appleton Laboratory
LBNL, Lawrence Berkeley National Laboratory
Ukrainian Academy of Sciences, KIPT-KFTI
Institute of Physics, St. Petersburg State University
KISTI Korea Institute of Science and Technology Information
Yonsei University (South Korea)
Department of Physics - Pusan National University (South Korea)

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Gaseous Detector Lab

Competencies and research activities

The lab is involved in R&D and production of advanced gaseous detectors using MPDG-GEM and RPC technologies for particle physics experiments at CERN (CMS, SHiP) and for medical (beam monitoring of proton and ion beams at hadron therapy and fast timing detectors for TOF-PET diagnostics) and homeland security applications (environmental radiation monitoring, fire detection and muon radiography). The Lab is currently involved in a large production of triple GEM detectors for the upgrade of the CMS experiment, in the design and prototyping of RPC systems with large-area gas gaps for the SHiP experiment and in R&D of new environmental friendly gas mixtures for RPC detectors. Furthermore, we are pursuing the development of innovative MPGD and RPC detectors for fast time resolution and high rate capability. The lab is equipped with:
Class 10,000 clean room, class 1000 areas for detector assembly, Mitutoyo for precise coordinate measurement, Gas box to dry polyimide foils and high-resolution power supply;
Test laboratories equipped with multiple gas lines (Ar:CO2 mix, Ar, CO2, N2…), HV and LV, gas leak stand;
X-ray gun in shielding box for testing large size detectors (~1 square meter) with analog readout up to 4000 readout channels;
Optical table in dark box with UV laser for testing small size prototypes;
Cosmic ray telescope for RPC test up to 12 tracking detectors;
Preamplifiers and NIM and VME electronics for signal processing;
Pico- and femto- amperometers for precise current and charge measurements.

Collaborations with companies and institutions

In partnership with Istituto Nazionale di Fisica Nucleare
High Energy Physics experiments at CERN: CMS, SHiP, TOTEM
R&D collaboration "RD-51" at CERN for the development of Micro-Pattern Gaseous Detectors, with guaranteed access to CERN Micro Pattern Technologies (MPT) and PCB workshops
International collaborations with Florida Institute of Technology (FIT, USA), RWT Aachen (DE), UGent (BE), Roma Tor Vergata (IT), LNF Frascati (IT), CERN (CH), State Key Laboratory of Solid Lubrification at LICP (CN), State Key Laboratory of Particle Detection and Electronics at USTC (CN), Korea Detector Lab (KODEL) of the University of Korea (KR)
Collaborations with PCB and Technology-Transfer companies such as ELTOS, SITAEL, TECHTRA, ITEL, MICROLABEN, CAEN.

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High Energy photosensors and electronics for space-born and ground-based experiments Laboratory

Competencies and research activities

Development and charaterization of innovative sensors for high energy physics, in particular ground-based or space born experiments.The laboratory is equipped with lasers (from NUV to FIR), very precice timing, DAQ systems, using Silicon photomultiplier and PMTs. We developt the characterizaztion of different sensors and electronic solutions for frontend and readout .

Collaborations with companies and institutions

Istituto Nazionale di Fisica Nucleare
Fondazione Bruno Kessler (FBK)
CAEN
SITAEL

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Laboratory for ultra-thin silicon detectors

Competencies and research activities

R&D, production and testing of ultra-thin silicon detector for particle physics and medical physics. Most recent research lines: micro-vertex detector for ALICE at the LHC, detector for radio-guided surgery, large area monolithic active pixel sensor in bended geometry. The laboratory is equipped with a clean-room (class 10000), a Mitutoyo Crysta APEX 9166 coordinate measuring machine, including an optical system ("optical head") to measure three spatial coordinates, aluminium wedge bonder machines, probe stations with micrometric pass, system for automatic assembly of detector modules, laser machine for micro-bonding.

Collaborations with companies and institutions

INFN - Istituto Nazionale di Fisica Nucleare (main partner)
CERN - The European Organization for Nuclear Research
IN2P3 - CNRS Centre national de la recherche scientifique
Institute of Particle Physics, Central China Normal University (CCNU)
STFC Daresbury Laboratory
Rutherford Appleton Laboratory
LBNL, Lawrence Berkeley National Laboratory
Ukrainian Academy of Sciences, KIPT-KFTI
Institute of Physics, St. Petersburg State University
KISTI Korea Institute of Science and Technology Information
Yonsei University (South Korea)

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Mechanical Workshop

Competencies and research activities

The Mechanical Workshop provides design consultation, precision machining, and fitting and assembly, all on both prototypes and custom-designed parts. We work with a broad range of polymer and metal materials and state-of-the-art machine tools.
This facility supports the teaching and research activities of the Department providing access to a variety of manufacturing equipment to assist in the development of their designs and research projects. Currently, there are 5 technicians on-site with extensive knowledge and experience in manufacture, assembly and commissioning.
The workshop is equipped with some up-to-date tools for high precision milling and turning:
Hurco CNC 3-axis and 5-axis Machining Centres
Hurco CNC mill turn lathe
Conventional milling machines and lathes
Surface grinding
Welding facilities
GUILLOTINE SHEAR
Press brake
Bandsaws
drill presses

Collaborations with companies and institutions

In partnership with Istituto Nazionale di Fisica Nucleare
Thorlabs

Contact person

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ReCaS-Bari

Competencies and research activities

ReCaS-Bari (www.recas-bari.it) is a middle size data center set up in 2015 at the Inter-university Physics Department by the Bari University and the National Institute for Nuclear Physics (INFN) using a budget coming from the PON project ReCaS (MIUR, PON Research and Competitiveness 2007-2013, Notice 254 / Ric).
It provides services for HEP data analysis and simulation; satellite images analysis for Hearth Observation; medical images and medical signals analysis; weather forecast; AI (artificial intelligence) applications; studies of genomes sequenced by Next Generation Sequencing (NGS) facilities; phylogenetic analysis; biochemical system simulations; data acquisition from sensors, analysis and storage; support for Docker containers and microservices architectures; set up of collaborative test-bed (for software development) and demonstrator set up in European, national and regional projects.
The list of the services provided, include:
An High Throughput Computing Farm with more than 7000 CPU cores.
An High Performance Computing cluster with graphic accelerators (20 NVIDIA K40 GPUs) and InfiniBand network connections for parallel computing.
Disk storage with more than 4000 TB of usable storage, of which 190 TB in replica two.
Tape storage for back-ups and data preservation with a capacity of 3900 TB of data.
Hosting of IT resources.
Cloud@ReCaS-Bari, a private cloud infrastructure based on OpenStack with more than 1900 CPU cores, 7.4 TB of RAM and 370 TB of (raw) storage in replica three which provides the following services:
IaaS-Infrastructure as a service: provision of Virtual machines;
PaaS-Platform As A Services (using Heat, Tosca and Mesos technologies) for instantiation of database, web services, development platforms and deployments for artificial intelligence calculation;
Galaxy cluster on-demand;

RStudio Server on-demand;
Jupyterhub on-demand (notebook-based IDE for developing Python/R/Octave/ Ruby software/applications);
ShareLaTeX on-demand (web-based LaTeX environment for production scientific typesetting);
GitLab on-demand (web-based remote software version control server)
OwnCloud personal storage (Dropbox-like service);
Desktop as a Service (web-based access to virtual desktops);
WordPress on-demand (Content Management System to deploy web sites);
Moodle on-demand (eLearning platform)

Collaborations with companies and institutions

ARPA Puglia Agenzia Regionale per la Prevenzione e la Protezione dell'Ambiente
CNR-IBIOM (Institute of biomembrane and bioenergetics
CNR-IIA (Institute of Atmospheric pollution Research)
CNR-IREA (Institute for electromagnetic sensing of the environment)
Comune di Bari
Concept Reply S.p.A.
Department of Physical sciences, Earth and environment (University of Siena)
EGI (European GRID Infrastructure)
ELIXIR (ESFRI Infrastructure)
INGV (National Institute of Geophysics and Volcanology)
Lifewatch (ERIC ESFRI infrastructure)
MIUR (Ministry of Education, University and Research)
Planetek Italia Srl
Servizi Locali S.p.A.
WLCG (Worldwide LHC Computing Grid)

Contact person

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Nicola De Filippis - nicola.defilippis@poliba.it

Remote Sensing Lab

Competencies and research activities

The Remote Sensing Group is active in the field of Earth Observation (EO).
The main areas of expertise are:
Geohazard assessment and Infrastructure Instability Monitoring Design and implementation of Multi-Temporal SAR (Synthetic Aperture Radar) and Interferometric techniques for topographic mapping and for ground/ infrastructure instabilities detection and monitoring. Calibration of SAR images with Artificial Reflectors and Active Transponders. Assessment of EO-based methodologies to produce landslide early-warning maps. Thematic mapping and change detection techniques applied both to SAR and Optical images for the generation of flood maps, land use maps, deforestation maps, fire maps, coastline extraction and evolution, etc.
Environmental Monitoring Study of the pollution of the sea coastal waters, using Optical and Infrared satellite spectrometers, through the estimation of the concentration of biophysical indicators and pollutants (chlorophyll-a, suspended sediments, yellow substances, turbidity, colored dissolved organic carbon, water leaving reflectance and sea surface temperature). Study of indirect methods for mapping Potential Fishing Zones and exploring fishery resources from satellite VIS/NIR data. Oil spill and oil slick detection using SAR and TIR data.
Meteorological Weather Forecasting. Development and exploitation of prognostic high-resolution Numerical Weather Models (NWM). Analysis and forecasting of weather conditions associated with various types of environmental hazards, particularly in air pollutants diffusion, hydro-geological risk conditions forecasting (flood risk), fire ignition and spread risk forecasting, sea conditions forecasting. Meteorological and climate data processing. Wind reanalysis.

Collaborations with companies and Institutions

Space Agencies (ASI, ESA, NASA).
Geophysical Applications Processing s.r.l., Planetek Italia s.r.l., SITAEL S.p.A., TECNOGAMMA S.p.A.
ENEA, CNR, Civil Protection Department.
European Commission, Apulia Region, ARPA Puglia, Municipalities.
Space Agencies (ASI, ESA, NASA).
Geophysical Applications Processing s.r.l., Planetek Italia s.r.l., SITAEL S.p.A., TECNOGAMMA S.p.A.
ENEA, CNR, Civil Protection Department.
European Commission, Apulia Region, ARPA Puglia, Municipalities.

Contact person:

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Silicon Detectors Laboratory for High Luminosity Colliders

Competencies and research activities

The LAB has a consolidated experience in the development and manufacture of silicon sensors. It has been actively involved in the construction and commissioning of the tracking detectors of the ALEPH and CMS experiments at CERN. It can perform irradiation campaigns and radiation damage studies on silicon detectors, providing electrical and functional characterization of
the devices, both before and after irradiation.
The LAB has the capability to build and test miscrostrip and pixel modules and can provide both mechanical CAD design and production of jigs for testing purposes.
Facilities and equipment:

Clean room: 90 m2 class 10000 + 10 m2 class 1000;
Manual probe station Karl Suss PA150
Automatic probe station Karl Suss PA200 (temperature controlled chuck: -40 +150 °C)
Modular DC source monitor HP4142B
LCR meter HP4284A
1053 nm Laser + Sr90 Radioactive Source
Automatic Wire Bonder Delvotec 6400
Mitutoyo BHN506 - XYZ micrometric measurement
x-Ray Inspection Nikon XTV160
Amptek Mini-X
Gantry for automatic module assembly

Collaborations with companies and institutions:

INFN - Istituto Nazionale di Fisica Nucleare (main partner)
CERN - The European Organization for Nuclear Research
FBK - Fondazione Bruno Kessler (Trento)

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Advanced Forming & Manufacturing

Competencies and research activities

The AF&M-lab is part of the network of laboratories of the research group on Materials and Innovative Technology ("SMATIgroup") whose members operate in the scientific area of Manufacturing Systems and Technologies (ING-IND/16).
The above-mentioned network of laboratories is composed by the laboratory of: Physical Simulation of Manufacturing processes (PhySiMaP-Lab), Optimization of Manufacturing Processes by Numerical Simulations (ManOnSim), Metallography and Microscopy (OMM) and Thermo-Physical Characterization of Post-Formed Polymers. All the laboratories are located in Viale Japigia 182 – Bari – Italy (DMMM).
The AF&M-lab is equipped with suitable facilities for the investigation of conventional and innovative sheet metal forming processes, like:
Electro Hydraulic combo press machine (4000 kN) for warm Hydroforming (max pressure: 350bar; max temperature: 300°C) and Superplastic Forming (max pressure: 30bar; max temperature: 1000°C)
Electro Discharge Machine Agie Charmilles (plunge type) for die manufacturing
Nabertherm Furnace for thermal treatments using inert gas (max temperature: 1280°C)
Micrograph facilities for specimen preparation
Microscopes multi-zoom Nikon AZ100M equipped with an image acquisition and data analysis system (Camera Nikon DS-Fi1 with software NIKON ELEMENTS D)
Inverted Metallurgical Microscope Nikon MA200 equipped with an image acquisition and data analysis system (Camera Nikon DS-Fi1 with software NIKON ELEMENTS D)
Micro Harness tester HighWood (Vickers/Knoop)
Roughness tester Mitutoyo SJ 401
Multi processors workstations (2 x equipped with an image acquisition and data analysis system (Camera Nikon DS-Fi1 with software NIKON ELEMENTS D)16cores) for FE simulations
In the AF&M-lab, innovative manufacturing processes characterized by the use (even combined) of laser sources, flexible media (pressurized gas or oil) and warm/hot working conditions can be investigated by using a numerical-experimental approach based on the mechanical and deformative behaviour (using the facilities in PhySiMaP-Lab and OMM-lab) and on the Finite Element simulations (using the facilities in ManOnSim).
For example:
Sheet Hydroforming, in cold (SHF) and warm (WHF) condition;
HydroMechanical Deep Drawing (HMDD);
SuperPlastic Forming (SPF);
Warm Deep Drawing (WDD);
Single Point Incremental Forming (SPIF).
The investigated materials are: deep drawing steels (HMDD), aluminium alloys (SHF, WHF, WDD, SPF), Magnesium alloys (WDD, SPF), Titanium alloys (SPIF, SPF).
Currently, in the AF&M-lab, research activities financed by the Italian Ministry of Education, Universities and Research Government and by private companies are conducted aiming at investigating: (i) the SPF process for producing highly customized biomedical Titanium prostheses; (ii) the warm forming process for producing parts for railways applications; (iii) the adoption of tailor heat treated blanks for stamping complex shaped aluminium components at room temperature.

Collaborations with companies and institutions

Fontana Group
Omer spa
Master / MasterLab
Centro Sviluppo Materiali, Roma
Gigant, Bologna
Nuovo Pignone - Bari
Enginsoft, Mesagne (Brindisi)
Calabrodental / Tecnologica, Crotone
Ceramed, Loures (Portugal)
Università degli studi della Basilicata
Politecnico di Milano
Università della Calabria
Università di Bologna
CNR-IFN UOS Bari
University of Mugla, Turkey
Institute for Metal Research, Chinese Academy of Science
University West, Sweden
University Medical Center, Utrecht (The Netherlands)

Contact person

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Advanced Optical Methods and Structural Optimization

Competencies and research activities

Interferometric techniques (speckle, moiré and holography) are applied to stress/strain analysis of electronic components, biological specimens and industrial components, reconstruction of 3-D shape of objects, evaluation of thermal distortions and residual stresses, identification of constitutive behavior of materials with high nonlinearities (e.g. biological membranes).
Nanosciences: nanolography, roughness measurement with nonconventional illumination (e.g. evanescent fields), measurement of strains of crystalline arrays (at dislocation level).
Gradient-based (SLP, SQP and modified feasible directions) and metaheuristic optimization algorithms (simulated annealing, harmony search, big bang-big crunch, firefly algorithm, heat transfer search) have been developed for sizing and layout optimization of large-scale skeletal structures, preliminary design of liquid hydrogen tank, and hybrid methodologies for mechanical characterization of

materials (composites, biotissues, cells).
Collaborations with companies and institutions
2001-2009: Department of Mechanical, Materials and Aerospace Engineering, Illinois Institute of Technology (USA) (Prof. Cesar A. Sciammarella)
2011-2012: Department of Engineering Science and Mechanics, Pennsylvania State University (University Park, USA) (Prof. Aklesh Lakhtakia)
2010-2013: School of Engineering, University of Warwick (Coventry, UK) (Prof. K.K. Liu)
2009 to present: Department of Mechanical Engineering, Northern Illinois University (Dekalb, USA), (Profs. Cesar A. Sciammarella and Federico M. Sciammarella
2009 to present: Istituto di Fisica, Università Cattolica del Sacro Cuore, Roma (Profs. M. De Spirito and M. Papi;
2009 to present: Dipartimento di Scienze Ginecologiche Ostetriche e Scienze Urologiche, "Università La Sapienza" (Prof. R. Brunelli)
2009 to present: Istituto di Farmacologia Traslazionale, Italian National Research Council, Roma (Dr. T. Parasassi)
2010 to present: Department of Chemistry and Physics - University of Southeastern Louisiana (Hammond, USA) (Prof. S. Yoshida)
2011 to present: Department of Civil Engineering, Dicle University, Diyarbakir (Turkey) (Prof. S.0. Degertekin)
2015 to present: Dipartimento di Tecnica e Gestione dei Sistemi Industriali, Università degli Studi di Padova - Department of Engineering Design and Materials, Norwegian University of Science and Technology, Trondheim (Norway) - Department of Mechanical Engineering, Aalto University, Helsinki (Finland) (Prof. F. Berto and Dr. P. Gallo)
Leonardo Finmeccanica (formerly Alenia Aeronautica)
Centro Ricerche Fiat
Magneti Marelli
Contact person
Luciano Lamberti - luciano.lamberto@poliba.it

Business Planning

Competencies and research activities
The Laboratory of Business Planning carries out research activities, training and technology transfer in the area of management and business development, with particular focus on entrepreneurship and strategic management of innovation processes.
In particular, regarding the research activities in the context of entrepreneurship, the laboratory is focused on the topic of start-up creation and financing, with particular attention to the theme of crowdfunding.
Concerning, instead, the strategic management of innovation processes, the laboratory has

62DMMMfocused its activities mainly on the themes of open innovation and technology analysis. The main methodological tools used to carry out these activities are statistical and econometric models and analysis of case studies.
The laboratory is also used for the training sessions of the course of business planning, in the second year of the master degree in Management Engineering, and for activities of thesis and internship.Main research areas are:
Project financing
Start-up creation
Crowdfunding
Open innovation
Technology assessment
The most recent thesis, carried out in the laboratory, are related to the followingtopics:
Government policies and eco-innovations.
Analysis of the
technological impact of mature technologies in the aerospace sector.
Innovation and green economy: study on the marketing of green technologies in the energy s ec tor.
Success factors in the creative industries: the case of industry of Hollywood cinema.
Study on Innovative Services for knowledge management: business intelligence and analysis.
Apulian patents: analysis of the current situation and identification of success factors.
Development of a panel of indicators to evaluate the process of technology entrepreneurship within the technological districts.
Collaborations with companies and institutions:
Biovegetal, Fincons Group, Farmalabor, Pezzol, Amaro Lucano, Serveco, Banca Popolare di Bari, Nuova Fiera del Levante, Green Blu, Sudsistemi, Open Work, Exprivia, Master, Ariete, Lucente, Auriga
Contact person:
Claudio Garavelli - claudio.garavelli@poliba.it

Demanufacturing Lab

Competencies and research activities
Demanufacturing is a neologism that represents a promising economic activity and is being developed all over the world for the potential of significant reduction in the consumption of non-renewable resources. It focuses on a new concept: the reversibility of manufacturing production processes.
Demanufacturing concentrates on those processes that can return (with different degree of reversibility) a product to its ex-ante state, i.e. before the production or assembly phase.
The research activity in the lab is mainly concentrated on the transition from

the laboratory to a real settings. Main focus is therefore industrial research projects focused on recycling, reusing, reducing resources, recovering, redesign, remanufacturing.
Competencies are related to technologies, processes, and systems the can perform several demaufacturing actions depending on different products to assure a complete and actual circular economy paradigm.
Also several training classes are given for spreading the culture of 6R: recycle, reduce, reuse, recover, remanufacture, redesign.

Collaborations with companies and institutions:

Main company involved is Globeco S.r.l. On the basis of the knowledge of the research group and of registered international patents) as well as of the available facilities (research laboratories), a pilot plant for demanufacturing PV panels is available as a demonstrator. (TRL = 7).
DASSISTI M. (2013) "Cryogenic thermal-mechanical delamination process controlled for the complete recovery of mono or poly-crystalline or amorphous materials coated with plastic materials (DE-CRYO)" (Patent: R-BR-I-309/13/020 Int. Bureau of WIPO)
https://iris.poliba.it/handle/11589/24598

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Rector's Delegate for Sustainability

E-business

Competencies and research activities

The e-business laboratory research activities include four main streams: (1) design of Recommender Systems models, (2) Customer Experience analysis, (3) models of Customer Analytics, (4) Social TV consumer behavior analysis.
Recommender Systems (RS) are information systems that predict customers' preferences based on data pertaining their behavior and transactions, and suggest a list of products with the highest preference score. One of the most important research activities is the measurement of the business performance related to the behavior of customers interacting with these systems. Among several RS models, context-aware models and profit-maximizing models have been experimented. Several scientific papers on prominent international journals and conferences have been published. The activities involve both PhD and undergraduate students.
The activities in the area of Customer Experience have developed multi-item marketing scales for measuring the quality of customers' experience.
The perceptions of customers' samples are gathered through surveys. Surveys are designed after a set of interviews.
The goal of the analyses is to investigate the relationships between perceptions and marketing results through statistical models. Most of the analyses have been conducted in retail banking and grocery. The activities involve both PhD and undergraduate students. The results have been published on international scientific papers.
Customer Analytics include the definition of customer behavior metrics and the application of statistical and other mathematical models with the goal of defining appropriate marketing actions.
The activities carried out in the fashion and grocery industries, mainly involving undergraduate students.
Social TV is the phenomenon involving TV audiences who use a second screen (typically smartphone or tablet) while watching the TV screen.
They use the second screen to interact with broadcaster, brands placed in shows and, above all, other users. This phenomenon occurs mainly in Twitter. It has raised huge interest both on the business and the research side because it lets companies and researchers observe and investigate users' behavior and defining well targeted, effective, real-time marketing actions.
The first research activities were aimed at identifying the drivers of "online engagement", i.e., the reasons and factors that make people interact on the second screen during a show.
The engagement is measured by the number of tweet (of different types). Relationships and correlations among online engagement and a show contents, including commercial breaks and Twitter recalls, have been studied through statistical models.
The research involves mainly PhD students but also undergraduate students.

Collaborations with companies and institutions

-Recommender System:
New York University (New York, USA)
The Wharton School - University of Pennsylvania (Philadelphia, USA)
Unilever
Panini Spa
Conquist Srl
- Customer Experience:
ESCE International Business School (Paris, France)
Banca Popolare di Bari
-Customer Analytics:
Megamark Srl
Mafrat Spa
-Social TV:
The Wharton School - University of Pennsylvania (Philadelphia, USA)
Borough of Manhattan Community College - City University of New York, NY (USA)
Telecom Italia Spa

Contact person

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LAB. EMILIA (EXPERIMENTAL MECHANICS INTEGRATED LABORATORY IN AEROSPACE)

Competencies and research activities

EMILIA is a team of people and a laboratory which are the reference for the aeronautical industries of Regione Puglia (but not only) with advanced expertise and facilities for research, testing and design of aerospace structures.

The Integrated Laboratory of Experimental Mechanics for Aerospace (EMILIA) integrates cutting-edge skills and facilities from the point of view of research, testing and design of innovative materials and structures.

Lab. EMILIA, with its offices at the Polytechnic of Bari and the Univ. of Salento, has the aim of satisfying all the basic and applied research needs coming from the aeronautical, mechanical and more generally manufacturing industries not only at local but also national and international level.

The prof. Katia Casavola, Full Professor of Mechanical and Experimental Mechanical Design of the Polytechnic of Bari, coordinates a team made up of highly trained researchers who can boast numerous collaborations with important companies in the aeronautical and non-aeronautical sector (i.e. Leonardo, Agusta, Avio, Boeing, Magneti Marelli , Bombardier, Airbus, Fiat Research Center).

The lab. was financed by the PO Puglia FESR 2007-13 at the Polytechnic of Bari as a recognition of the excellence of the existing experimental mechanics lab in the field of the mechanical and aeronautical sectors.

Main research activities are:

-Characterization of materials and structures

Static, fatigue and impact damage tests of metallic materials (steel, aluminum, titanium, sintered), composites, metallic and polymer foams, plastic and biodegradable materials and aeronautical components using calibrated systems and releasing reports and certificates.

-Residual stress

Measurement of residual stresses on different materials, in the laboratory and in situ, according to standard or ad hoc procedures.

-Numerical analysis of structures

Implementation of numerical models in the elastic field and in the elasto-plastic field through the use of commercial or specially developed calculation software. Analysis of the non-linear behavior of aeronautical structures. Numerical characterization at nano, micro and macro structural level of innovative materials and aeronautical super alloys. Experimental validation of the developed models.

-Optical techniques

Development of innovative diagnostic methods for experimental analysis and damage assessment based on optical techniques: digital correlation of images, speckle interferometry and holo-shearographic systems. Applications on electronic boards and scaled components for industrial and aeronautical uses.

Contact person

Prof. Katia Casavola – katia.casavola@poliba.it

Estensimetria (Strain Gauge Testing Lab)

Competencies and research activities

Experimental stress analysis is based on the principle of strain measurement. Initially, bulky mechanical devices were used for measuring strain that displayed strain using a lever ratio of one thousand or more. These devices were the only available type for performing measurements so essential for stress analysis.

Normally, the strains determined with strain gauges are very small. The change in resistance is also minimal and direct measurement is not possible.

The strain gage must be included in a measurement system where accurate determination of the strain gage's change of resistance is possible.

The components include a strain gauge, which converts mechanical strain into a change in electrical resistance and a measuring circuit that is shown as the Wheatstone bridge having the strain gage as one arm. Both the measuring circuit and the strain gauge are passive components.

When the strain gage's resistance changes, due to a strain, the bridge circuit loses its symmetry and its balance. A bridge output voltage proportional to the bridge's unbalance is obtained.

The measuring system includes an amplifier as the third component which amplifies the bridge output voltage to a suitable level for indicating instruments.

In some cases, amplifiers are designed to give a current proportional output to the bridge output voltage, but some models can provide either voltage or current outputs.

The fourth component in the measuring system is the display. Here the output signal of the amplifier is converted into a form which can be understood by the user.

We provide strain gauge testing of mechanical components and structures. Strain gauges are devices used to determine material strain due to static and dynamic loads coming from internal and external sources such as mechanical, thermal and pressure.

During a given test, a gauge is attached to the specimen by an adhesive bond. As the specimen is deformed by loading, the foil within the gauge is deformed, thus causing the electrical resistance to change. Measurement of the gauge electrical resistance is performed using a Wheatstone bridge circuit and a computerized data logger.

We can bond strain gauges to the test surface, perform data acquisition and provide test data to assist in identifying the stress, mechanical failure or fatigue to verify design, uncover weak points, and/or validate your FEA. We have the experience to assist in increasing every component reliability.

Contact person

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Flow Simulation and modelling of energy systems

Competencies and research activities

Modelling and simulation of flows in complex configurations; simulation of the performance of fluid machines and energy systems.

The research activity concerns in particular:
combustion modelling in laminar and turbulent flow regimes;
combustion in the presence of electric fields;
supersonic and hypersonic flows;
stability of flows and transition to turbulent regime;
fluid-structure interaction and biomedical applications;
turbomachinery
simulation of cell transport;
microfluidic systems;
immersed-boundary/iso-geometric fluid-structure interaction

Collaborations with companies and institutions

Stanford University
George Washington University
IIT
CIRA
Ecole Nationale Supérieure d'Arts et Métiers - ParisTech
Baker Hughes a GE Company
GE Avio Aero
Karalit
Roma Tor Vergata
CNR Nanotech - PLASMiLAb
Imperial College
École Polytechnique fédérale de Lausanne
von Karman Institute for Fluid Dynamics
University of Pavia
Politecnico di Milano
Politecnico di Torino
Norwegian University of Science and Technology

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Geomatics laboratory

Competencies and research activities

The Geomatics Laboratory was established in 2004. Since that year, numerous research and educational activities have been developed, including:
surveys using topographic instrumentation and GNSS satellite systems for cartographic applications, design, monitoring and engineering testing;
three-dimensional surveys of the topography of places and photogrammetric surveys of archaeological excavations
geomatic survey methodologies applied to cultural heritage (buildings of high historical and architectural value, monuments, etc.) by means of close-range photogrammetry and terrestrial laser scanners;
aerial photogrammetric surveys using UAV platforms;
ntegrated surveys and modelling of areas subject to hydrogeological instability;
surveys of the state of the places and structural monitoring of areas subject to forensic investigations;
management and maintenance of permanent GNSS stations within the national geodetic network;
high precision surveys of planimetric and levelling networks;
survey and 3D modelling of industrial plants;
georeferencing of images (remote sensing, maps and historical iconographies) and processing of remote sensing images;
research and development of point cloud processing algorithms.

Collaborations with companies and institutions:

Superintendence of archaeology, arts and landscape
Municipal, Provincial and Regional Administrations,
Public administrations,
Private clients
Research centres

Contact person:

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Ing. Pepe Massimiliano - Technical Director - massimiliano.pepe@poliba.it
Ing. Capolupo Alessandra
Ing. Alfio Vincenzo

Hybrid welding

Competencies and research activities

The hybrid welding laboratory of Politecnico di Bari is a hightech laboratory devoted to the joining and powderless additive processes of metals and metal alloys.
The laboratory is equipped with 3 different welding techniques which are High Power Ytterbium Laser (HPYL), Friction Stri Welding FSR), and Arc Welding (AW).
Those technologies are combined for hybrid welding by coupling two techniques at any time. Single plus coupled techniques account for six different options for solving welding problems.
The team of HWL supplies on demand studies and consulting on enhancing productivity, lower cost, speed up throughput.
The solution can reduce distortion, post-weld rework, and enhance weld quality. Stronger, lighter, better end-products and new products can be designed using the power for fusion and solid-state welding and fabrication technique.
The fabrication of dissimilar metals welded structure is one of the major success of the laboratory.
The services includes also metallurgical, mechanical characterisations and

numerical simulation.
Collaborations with companies and institutions
Dublin City University,Dublin, (EIRE)
École normale supérieure d'arts et métiers, Paris (France)
Université de Cergy-Pontoise, Cergy Pontoise (France)
Free University of Bozan, Bozan (Italy)
Malayer University, Malayer (Iran)
General Motors Collaborative Research Laboratory in Advanced Vehicle Manufacturing, University of Michigan, Ann Arbor (USA)
Getrag, plant of Bari Italy
Bosch, plant of Bari italy
Cefival, Persan (France)
Contact person
Giuseppe Casalino - giuseppe.casalino@poliba.it

Interdisciplinary Additive Manufacturing Lab (I AM Lab)

Competencies and research activities
Current research interests are focused on:
-3D printing of composite materials
-3D Printing of low cost microfluidic devices
-3D Printing of fluidic actuators for biomimetics
-Optimizazion of process parameters for 3D printing of non-conventional materials, such as conductive, flexible materials and technopolymers.
5) 3D Scanning
Collaborations with companies and institutions:
Leonardo Aerostrutture
Masmec Biomed
Scuola Sant'Anna Pisa
Universidad Politecnica de Valencia
University of Linkoping
Contact person:
Gianluca Percoco - gianluca.percoco@poliba.it

Knowledge Management Laboratory (KMLab)

Competencies and research activities
The Knowledge Management Laboratory (KMLab) operates in the field of knowledge management with specific focus on innovation and technology management. Its main goal is to favor local and regional development by combining advanced perspectives developed through scientific research and practical industry experience. Accordingly, KMLab conducts cutting-edge research to develop new approaches and methodologies for managing business, organizational, and technological knowledge. In turn, this research is used to provide firms and public organizations with the necessary support to successfully improve their operational and innovation capacity.
In detail, the research activities of KMLab mainly cover the following topics:
Environmental sustainability. It delves into the definition of strategies for developing and commercializing green technologies, products, and processes and the implementation of the most suitable practices (e.g., life-cycle assessment, industrial symbiosis, and energy system analysis) for supporting the greening of business at the corporate, local, and national level. Methodologies and techniques to involve the stakeholders' view in the definition of the above-mentioned strategies are also investigated.
Open innovation. This research stream evaluates the weakness, strengths, and opportunities of web-based markets and crowdsourcing strategies for buying and selling technologies and ideas between organizations (i.e., market for ideas) and how this external knowledge can be integrated within the organizations' processes.
Technology scouting and forecasting. The third topic attempts to provide tools and techniques to keep pace with the most recent technological knowledge and forecast future technological paradigms, so making companies in a better position to react to compete in a turbulent market environment.
Supply chain management. This theme aims at developing a better comprehension of the most effective practices for coordinating manufacturing processes and logistic flows both within and between organizations, by adopting the support of IT tools, simulation modelling of productive and organizational systems, and process management.
Network analysis. Given the increasing relevance of collaborations to improve performance and overall economic and social growth, the last topic analyses and proposes best practices, solutions, and models that may help policymakers and firms to gain advantage from networking strategies, as the case of industrial clusters, M&A, and alliances. These research activities allow the KMLab to provide relevant services, as consulting, education, intelligence, and networking. First, consulting offers support to companies and public organizations that wish to improve their performance and achieve sustainable competitive advantage. As a consequence, they are helped to identify and implement opportunities for business process reengineering or innovative ideas. Second, KMLab also provides companies and public organizations with dedicated education and training programs enabling them to develop new skills and problem solving and operational techniques, and to build new strategic and organizational orientations. Third, intelligence refers to activities devoted to perform customized studies specifically designed for the needs of the diverse organizations aiming at comprehending the best practices in given industries, scanning for the evolution of technologies and markets, and benchmarking with competitors. Finally, KMLab can act as broker between multiple

organizations, hence allowing them to meet each other and access experts in business, markets, technologies, and policies.
KMLab also hosts the activities of the Competence Center on Business Process Management. Born from a strategical partnership between Politecnico di Bari and Openwork s.r.l, an independent software vendor specialized in the development of enterprise solutions based on business process management, such Center carries out research, technological transfer and third mission activities on Business Process Management (BPM). The Center is particularly interested in innovating and supporting the digital transformation of healthcare, public administration and production processes, with a focus on the industries more relevant to the regional economy, e.g. textile, wood furniture, auto component and mechanical industries. All the research activities are performed by leveraging on Industry 4.0 enabling technologies and green/sustainable business process management methods and techniques. KMLab also operates a branch located at Centro Interdipartimentale Magna Grecia in Taranto.

Collaborations with companies and institutions

Research activities of KMLab are currently estimated at about 1 million of Euros, counting on about 20 professors, researchers, and PhD students. KMLab established (since its launch) many collaborations with external academic organizations and R&D departments of both local, national, and international companies.
Among the international academic partners, there are:
New York University (Stern Business School)
University of Navarra (IESE Business School)
Israel Institute of Technology (Technion)
McMaster University (De Groote Business School)
University of Sussex (Science and Policy Research Unit)
University College London
Cass Business School
WHU-Otto Beisheim School of Management
Hasselt University
ESADE Business School
Skema Business School
Lancaster University
Birmingham Business School
Paris School of Business
Beijing Normal University
MIT Sloan School of Management
University of California (Anderson School of Management)
Among the industrial partners there are:
Cézanne Software
IBM
Getronics
Allaxia
Natuzzi
Alenia Marconi Systems
Sudsistemi
Openwork
Fincons Group
Exprivia
Banca Popolare di Bari
ICAM
Cantele
TIM
Geopharma
SAP
Fater Group
Green Blue
Tersan
Master Italy
Lucente SpA
Coop. Ariete
Clementoni
Unilever
Eni Group
Farmalabor
IRCSS Casa Sollievo della Sofferenza
IRCSS Giovanni Paolo II

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Laboratory for the thermo-physical characterization of manufactured polymers

Competencies and research activities

The main topics of basic and applied research are related to the technological characterization of polymeric materials, numerical simulation of injection molding processes and the experimental study of tensions induced crystallization. The available instruments in the laboratory are a Differential Scanning Calorimetry (Neztsch Pegasus 404 F3), Dilatometer (Netzsch DIL 402C), Rotational Rheometer (HAAKE MARS III) and two workstations for heavy duty computation.

Collaborations with companies and institutions:

The research carried out in the laboratory is very large, with several national and international collaborations with companies and research institutes.
There is close cooperation with the IKV Institute of RWTH Aachen University,

highlighted by spontaneous exchanges had in recent years, through the DAAD programs, Erasmus and DFG.
The added values of cooperation are to be able to propose projects promoting innovation and technology transfer, thanks to the skills which were scanned, to local (Italian and German) and international companies.
The Laboratory allows to make joint research with several companies through projects funded by Italian Minister of Research and University (MIUR) and Apulia Region such as:
BOSCH CVIT,
GE Oil & Gas,
Soffigen srl.

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Laboratory of Computer Numerical Control Machine Tools

Competencies and research activities

The Computer numerical control machines laboratory was founded in 1999. It is part of the scientific area of Manufacturing Systems and Technologies ING-IND/16.
The laboratory is located in Viale Japigia 182 – Bari – Italy (DMMM) and it presents several CNC machines as well as an hydraulic press for moulding of thermoplastic materials. In particular there are:
- Alfa Engineering MM 430, CNC Machine Centre , for vertical milling and reaming, 4 controlled axis, Numerical Control SIEMENS 802D sl, ISO Spindle 40 pot. 7 kW, max velocity 10000 g/min, automatic tool change, working volume 900x460x390 mm3.
- PENTAMAC srl QUICLY'T 1000, CNC Lathe. Distance between centres 1000 mm, max turning diameter 460 mm. Max spindle velocity 2000 RPM. Electrical turret with 6 positions.
- FCN 500, CNC 4 axis milling machine, ISO spindle 30 -pot. 1 kW, vel. 100-3000 g/min, with Ethernet Motion Controller 7761M, working volume 500x140x215 mm3.
- DEMAG-ERGOTECH, Hydraulic press (maximum load: 80 ton) equipped for moulding of thermoplastic materials.
The laboratory equipment has been adopted for research activities supporting the more innovative technologies, through the realization of prototypes and tools. Specimens for calibration procedure of measuring instruments, samples for material characterization and specifically designed tooling systems have been realized on CNC Machines. Moreover, different polymeric materials have been tested through the hydraulic press with different moulds.
The laboratory was funded by Piano Triennale MURST (D.M. 21/06/99) and, then, further potentiated through the explorative project POR.

Collaborations with companies and Institutions

-Università Cattolica del Sacro Cuore Roma, Università di Napoli Federico II, Università di Bologna – Policlinico S. Orsola-Malpighi, Università di Bari - Medicina legale, Università di Bari- Dipartimento Interateneo di Fisica "Michelangelo Merlin", Università del Salento – Lecce, Politecnico di Milano – Milano, Università Kore di Enna – Enna;
- Technical University of Denmark, Copenhagen, Università di Kragujevac – Faculty of Engineering (Serbia), Università Politecnica di Tirana (Albania), Università di Poddorica (Montenegro)
- CNR Istituto di Fotonica e Nanotecnologie, CNR – ITIA (Istituto di Tecnologie Industriali e Automazione) – Bari, Milano, ENEA – Brindisi
- GE AVIO Srl, GE Oil and Gas, Enginsoft SpA, HB Technology Srl –Taranto (TA), ELFIM srl – Gravina in Puglia (BA), Novotech srl – Avetrana (TA), Umbra Group Cuscinetti S.p.A, Ingenia Srl, Leone Spa, Bosch TDI, ICAM srl, Roboze srl, Simitecno srl, Adler Ortho srl. COFRA, Pezzol, Base Protection, Saint-Gobain, UTG Lavorazioni, Polishape 3D srl, BreD srl.

Contact person:

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Prof.Fulvio Lavecchia (fulvio.lavecchia@poliba.it)

Laboratory of Experimental Stress Analysis

Competencies and research activities

The research group working in the Experimental Stress Analysis laboratory, in the field of Experimental Mechanics, has developed wide experience for both in lab and in situ inspections, related to the stress/strain analysis on materials, components, structures in aeronautical and aerospace field, naval, biomedical, automotive, mechatronics.
Many techniques and applications have been developed to study Experimental data acquired from real components or stereolithographic model during working conditions:
STRAIN GAGE, BRAGG'S FIBER, WIFI sensors
PHOTOELASTICITY:
-Trasmission photoelasticity (2D)
-Photoelasticity coating technique: stress analysis of real components
-with birefringent coatings;
-Integrate photoelasticity: stress analysis of axialsymmetric components
-Frozen stress photoelasticity: stress analysis of 3D models (rapid prototipe models, etc.)
OPTICAL METHODS (allow displacements and strain measurements on real components; accuracy: tens of nm; data analysis can be done in real time):
-Moiré
-Speckle
-Holographic interferometry

-Integrated Holo-Shearing system

Collaborations with companies and institutions

Many collaborations have been established with industry (i.e. Alenia Aeronautica (Leonardo) – Agusta - Sitael Aerospace - Bosch - Mer Mec - Centro Ricerche Fiat, Enginsoft – MBL Solutions – Inglass, etc.), university and research centre (i.e. Univ. of Nottingham; Univ. of Manchester; University of Washington, Seattle; University of California, San Diego; Illinois Institute of Technology, Chicago; Institute of Micromechanics and Photonics, Warsaw University of Technology; Dep. de Ingeniería Mecánica, Univ. de Zaragoza; Dublin City University; Trinity College; McGill University, Canada; ENEA, CALEF, CETMA, Centro Laser, etc.).

Contact person

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Laboratory of Industrial Systems Engineering (LISE)

Competencies and research activities

Actually, the staff of Laboratory of Industrial System Engineering (LISE) is composed of: 1 full professor, 2 associate professors, 3 researchers, 1 PhD Candidate.The LISE is organized in two sections:

- Systems and Operations Management (SOM);
- Health, Safety & Environment (HSE).

Research areas investigated in the SOM section are:

production systems design and optimization,

operations and service management,

supply chain and logistics management.

Research areas investigated in the HSE section are:

industrial and work safety,

ergonomics and human factors,

industrial and logistics sustainability,

environmental management.

In these areas, scientific consultancies and research activities financially supported by “EU”, “Italian Ministry of Education, University and Research”, “Apulia Region”, national, international companies, and public institutions are offered.

Examples from the past activity of the laboratory are: System design and optimization.

Collaborations with companies and institutions

Automotive

Bosch S.p.A.

CNH Fiat Industrial S.p.A.

Bridgestone S.p.A.

Isringhausen S.p.A.

Public utilities

AQP S.p.A.

AMIU Puglia S.p.A.

AMGAS S.p.A.

Public Services

Ferrotramviaria S.p.A.

Healthcare

Merck Serono S.p.A.

Sanofi Aventis S.p.A.

ITEM Oxygen S.r.l.

IRCCS “Casa Sollievo della Sofferenza”

Ospedale Consorziale Policlinico di Bari

Food

Heineken Italia S.p.A.

Peroni SAB Miller S.p.A.

Contact person

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Laboratory of Intelligent Computation for Manufacturing and Production Systems

Competencies and research activities

Simulation models and mathematical programming techniques can deal with manufacturing systems which call for complex decisions concerning daily issues as well as middle and long horizon strategies (e.g. the introduction of new machines, new products, etc.).

Among the most recent computing algorithms, artificial and swarm intelligences have demonstrated their capability of solving scheduling, programming, and maintenance problems in manufacturing complex systems.

The team of Laboratory of “Intelligent Computation for Manufacturing and Manufacturing Systems” has matured a considerable experience in resolving optimization problems for advanced technologies like welding and additive fabrication ones, and modelling the overall manufacturing system.

The same approach can be potentially applied to a variety of processes that involve low resources availability and necessity of a high degree of efficiency, like processes in the health care systems.

The team can design a screening experiment and explore the process to be simulated by enquire its actors. The information is structured as an input to the process and several solutions are found by means of commercial software and customer programming. Then, the team will discuss until the better solution, if not the best, is selected.

The capability of the team embraces also the use of Statistical Process Control (SPC) with the aid of Design of Experiment technique (DoE).

Collaborations with companies and institutions

Dublin City University, Dublin (EIRE)
Istituto Italiano delle Saldature, Genova (Italy)
University of West of Scotland, Paisley, (Scotland, UK)
Università di Napoli, Federico II, Napoli, (Italy)
ISI Italia, Grugliasco (To), (Italy)
Contact person
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Laboratory of Manufacturing Processes by Laser Technologies

Competencies and research activities

Since 2007, the Laboratory of Manufacturing processes by Laser Technologies (LLT) of Politecnico di Bari has been working on Laser Additive Manufacturing processes of metals and on laser micro-machining.
The laboratory currently houses a Selective Laser Melting (SLM) and a Laser Metal Deposition machine, able to process metal powders. Both techniques are solid freeform fabrication processes where 3D parts can be fabricated layer by layer by fusing metal powders with a high energy laser beam.
SLM machine is equipped with a nanosecond Nd:YAG laser source with a maximum power of 100 W and a scanning head with deflecting mirrors to direct the laser beam over the powder platform. The laser can operate in both continuous and pulse mode. In continuous mode, it allows the selective laser sintering and selective laser melting of metal powders; in pulsed mode, it is able to fabricate micro-components by laser ablation, with a pulse width in the nanosecond range and a repetition rate between 0 and 65kHz. Materials that can be processed by selective laser melting are mainly steels. On the other hand, it is possible to treat different materials (steels, titanium alloys, aluminum alloys, ceramics, glass, etc) by means of laser micro-machining.
LMD machine is characterized by a 5-axis movement system and by an inert chamber that allows processing several materials including reactive metals such us titanium and aluminum alloys. LMD is used for solid freeform fabrication and for laser cladding.
The main research topics carried out in the laboratory are:
Study and characterization of materials obtained by Selective Laser Melting and Selective Laser Sintering
Manufacturing of hybrid structures and porous structures with controlled density by Selective Laser Melting
Thermal treatments of sintered materials
Laser surface processing of metals and glass
Repair of aeronautic components by Laser Metal Deposition
Freeform fabrication of complex geometries by Selective Laser Melting and Laser Metal Deposition

Laser Metal Deposition of WC by Functionally Graded Materials technique
Development of numerical and analytical models for process optimization
Collaborations with companies and institutions
Ge Avio
Elfim srl
Università di Salerno
Contact person
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Laboratory for hydraulic pumps and turbines

Competencies and research activities

The lab is constituted by a closed-loop rig for experimental tests and studies on hydraulic pumps, turbines and PAT (Pumps As Turbines). Due to the possibility to test pumps both in direct and reverse mode, two hydraulic circuits can be set by acting ON/OFF valves.
The turbo machinery under investigation is installed in the test section where it is directly coupled with a DC motor controlled by a four-quadrant converter. The electric machine works as motor during “pump test” and generator during “turbine test”.
The test section is provided by a special platform with a rail system, allowing the investigation of turbomachinery of different size.
During “turbine tests”, a booster pump, driven by another DC motor, supplies the hydraulic energy through pipelines to the turbine. In this case, the motor that drives the booster pump is partially powered by the turbine. The operating range of the test rig is defined by H-Q characteristics of the booster pump and the constant power line corresponding to the maximum capacity of the loading generator.
Turbine tests:
Max test head equal to 280 mH2O.
Max discharge equal to 650 m3/h.
Max rotational speed of the testing machine: 2400 RPM
Max power equal to 480 kW
Pump tests:
Max test head equal to 270 mH2O.
Max discharge equal to 350 m3/h.
Max rotational speed of the testing machine: 2400 RPM
Max power equal to 480 kW
The test rig is equipped with a surge tank with a capacity of 8 m3 and an air pressure control system that can increase the absolute pressure up to 11 bar(abs). In the case of cavitation tests, a vacuum pump can reduce the absolute tank pressure to 0.2 bar(abs).
During machine characterization, a closed loop cooling system controls the water temperature in the test rig (25 ± 0,1 °C); The test rig is equipped by a control and

the data logging system, installed in a control room.
Another open-loop hydraulic circuit is used to study and test turbines for low head hydropower applications.

Collaborations with companies and institutions

Nuovo Pignone Bari

Contact person

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Laboratory for wave energy conversion devices and Wells turbines

Competencies and research activities

This laboratory is devoted to the performance analysis of Wells turbines to be included in systems OWC systems (Oscillating Water Column) for wave energy harvesting.
For these studies a test bench (specifically designed), is used, which reproduces the conditions of the air flow generated by the wave motion.
The entire system is remotely controlled via software, determining the operating conditions.
The test rig consists of: a suction centrifugal fan controlled by a Variable-Frequency Drive (VFD); a straight pipe where a diaphragm is housed for flow measurement; a plenum chamber; a second straight duct in which is located the AC Brushless Servo Systems connected to the torque transducer (for torque measurement) and to the Wells turbine.

Collaborations with companies and institutions

Università Mediterranea di Reggio Calabria

Contact person

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Laboratory for Internal Combustion Engines (MACI)

Competencies and research activities

In the area named Ex-Officine Scianatico, thanks to funding from the PrInCE project, Politecnico di Bari transferred the soundproof chamber inside of which two test benches housing internal combustion engines are already available.
Moreover, a methane pipe has been added, which allows to carry out studies of small CHP units based on internal combustion engines of automotive derivation.
The first test bench is equipped with a single 500 cm3 cylinder research engine, 4-stroke, spark ignition (with both bore and stroke equal to 86 mm), model 5401 produced by AVL. The engine compression ratio is 10.5:1.
The engine has 4 valves, and a Bosch injector that injects, at closed valves, in the intake duct.
The dynamometer consists of an eddy current brake with oscillating cradle and load cell, model System One Alpha 160, rather sophisticated. This implements: oil and water cooling systems (heat exchangers with SIEMENS automated valves); Electric starter (3.2 kW); throttle actuator (stepping motor); Cabinet for cabling of additional acquisition data (Automation Unit); basic data acquisition system (pressure sensors and PT100 thermocouples; pressure transducers and flow switches); internal system for cooling the water of the brake refrigeration system; open access Engine Control Unit (ECU) with maps for early injection and spark ignition and injection, which can be changed in real-time; acquisition system of the indicated cycle; gravimetric balance.
The second test bench is as follows: an eddy AVL Alpha 240 (maximum output current: 240kW, maximum speed: n = 10000rpm); HBM U2A load cell for detecting the torque; feeder LSE AVL 435 for the excitation of the dynamometer; loop detection; detecting the composition of exhaust gas; fuel system. The engine currently under investigation is an Alfa Romeo 2.4 JTD 10V, 5-cylinder, one head camshaft (motor code AR32501; 2387cm3; 90.4mm stroke; 82mm bore; compression ratio 18.5:1; maximum power 100kW @ 4200rpm, maximum torque 304Nm @ 2000rpm; Bosch's direct fuel injection system with an electronic "Common Rail" controller, EDC-15C.

Collaborations with companies and institutions

Bosch
ETAS

Contact person

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Laboratory MICROTRONIC - micro-machining and 3D micro-measures for mechanical components

Competencies and research activities

The Microtronic laboratory, operating in the scientific area of Manufacturing systems and technologies (ING-IND/16), is part of the Microtronic network of laboratories. It is aimed to mechatronic sectors which are characterized by an ever higher request for micro-components realized in a large variety of materials.
The team is composed by people with multidisciplinary competences ranging from manufacturing to measuring processes in order to continuously improve the capability of the manufacturing process, such as micro-milling, micro drilling and 3D surface realization, at micro level.
The laboratory located at Polytechnic of Bari in Viale Japigia 182- Bari- Italy (DMMM), is equipped with a wide range of measuring instruments suitable for small and micro-range, as well as, machines for precision subtractive and additive manufacturing processes.

A complete list of the equipment is reported:
- KUGLER Microgantry micro, 5 axis micro-milling machine, 1kW power spindle and 60000 RPM of maximum velocity, positioning accuracy comprised between 0,5 e 1,0 micrometers for Cartesian axis and ±1 arcsec for rotary axis.
- Hirox RH-2000 microscope, able to ensure several magnification levels (up to 10000x) wit rotary head and tilting table.
- Taylor Hobson CCI-MP HS, optical profilometer based on interferometric principle equipped for a minimum x-y resolution equal to1µm.
- WASP DELTA 4070, 3D printer for Poly(lactic acid) polymeric material. The maximum printing volume is 400x400x700 mm3.
- Zortax M-200, 3D printer optimized for ABS material and printing volume equal to 200x200x150 mm3.
- M-One MAKEX, additive manufacturing machine based on liquid resins photo polymerization and characterized by a xy resolution ranging from 60 to 75µm.

The research activities are focused on the combination of micro-milling and additive manufacturing technologies for the realization of 3D complex parts at micro-scale level. Microscope and profilometer for surface analysis are used for performance verification of the micro-machining processes.
The machines and measuring instruments present in the laboratory are well suited for feasibility studies and services aimed at local companies comprised in the mechatronic district and operating in the fields of precision mechanic, tool design and automotive and machine components.
The laboratory was funded by Regione Puglia and it is composed by three operating unites: Dipartimento Interateneo di Fisica dell'Università degli Studi di Bari, Politecnico di Bari - Dipartimento di Meccanica Matematica e Management (DMMM), CNR Istituto di Fotonica e Nanotecnologia.
Recent funded research projects:
- Apulia Development Center for Additive Repair" laboratory done by the GE Avio and the Politecnico di Bari, research activity on "Reverse Engineering of aeronautical components aimed at their repair by means laser deposition (DL) and cold spray (CS) processes" (2016- now).
- PON MIUR ARS01_00806 "Innovative solutions for quality and sustainability of ADDitive manufacturing processes (SIADD)" that involves 14 partners among Industries, Research Centers and Universities (2019-2022).

Collaborations with companies and institutions:
- Università Cattolica del Sacro Cuore Roma, Università di Napoli Federico II, Università di Bologna – Policlinico S. Orsola-Malpighi, Università di Bari - Medicina legale, Università di Bari- Dipartimento Interateneo di Fisica "Michelangelo Merlin", Università del Salento – Lecce, Politecnico di Milano – Milano, Università Kore di Enna – Enna;
-Technical University of Denmark, Copenhagen, Università di Kragujevac – Faculty of Engineering (Serbia), Università Politecnica di Tirana (Albania), Università di Poddorica (Montenegro)
- CNR Istituto di Fotonica e Nanotecnologie, CNR – ITIA (Istituto di Tecnologie Industriali e Automazione) – Bari, Milano, ENEA – Brindisi
-GE AVIO Srl, GE Oil and Gas, Enginsoft SpA, HB Technology Srl –Taranto (TA), ELFIM srl – Gravina in Puglia (BA), Novotech srl – Avetrana (TA), Umbra Group Cuscinetti S.p.A, Ingenia Srl, Leone Spa, Bosch TDI, ICAM srl, Roboze srl, Simitecno srl, Adler Ortho srl. COFRA, Pezzol, Base Protection, Saint-Gobain, UTG Lavorazioni, Polishape 3D srl, BreD srl.

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Laboratory for Rapid Prototyping and Reverse Engineering

Competencies and research activities

TThe rapid prototyping and reverse engineering (RE) was founded in 1999 and it has been constantly updated with the newest technologies of the field.
The laboratory located in Viale Japigia 182 - Bari –Italy (DMMM) presents a wide range of RE instruments and Rapid Prototyping machines. It is composed by a multidisciplinary team, with competencies in additive manufacturing processes, polymeric materials as well as, in reverse engineering, both for contact and non-contact instruments. The scientific area is Manufacturing Systems and Technologies ING-IND/16.
The laboratory is equipped with several instruments for additive manufacturing and RE:
- Stratasys FDM 3000 using ABS material with layer height equal to 0.1 mm. Maximum working volume 254x254x406 mm3.
- WASP DELTA 4070, 3D printer for Poly(lactic acid) polymeric material. The maximum printing volume is 400x400x700 mm3.
- Zortax M-200, 3D printer optimized for ABS material and printing volume equal to 200x200x150 mm3.
- M-One MAKEX, additive manufacturing machine based on liquid resins photopolymerization and characterized by a xy resolution ranging from 60 to 75µm.
- Konica Minolta Vivid 910i, 3D automatic Laser Scanner: working volume ranging from 111*83*40 mm3 to 1196*897*750 mm3, accuracy X: ±0.22mm, Y: ±0.16mm, Z: ±0.10mm, scanning time comprised between 0.3 and 2.5 sec.
- Roland PIX 250, desktop 3D rotary laser scanner.
- CMM – Coordinate Measuring machine DeMeet 400, equipped with both contact and optical sensors. Measuring volume 400x250x200 mm3, resolution of 0.5 µm.
- Measuring arm GARDA, with Renishaw probe, spherical working volume of 2.5 m of diameter, accuracy of 0.05 mm.
- Line Laser Scanner Kreon, 16000 points per second of scanning speed, accuracy of 0.05 mm.

- Micro Z-Scan, Photogrammetric 3D scanning instrument.
- Optimet QC Scanner type 1 ROHS, holographic 3D scanner.
- Optimet ConoScan 3000, compact and non-contact conoscopic holography 3D measuring instrument, for 120x120 mm2 sized parts.
- ConoProbe HD (High Definition) - Mark 3.0, sensor for high precision 3D measurements (micrometric resolution) based on conoscopic holography principle.
- Optimet NanoConoprobe, conoscopic holography sensor for transparent and reflective surfaces and thickness evaluation comprised between 1-10 µm.
- Microplan, 5 axis conoscopic holography scanning system for axial-symmetrical 2D and 3D profiles.

The research activities are oriented to the analysis and the study of new methodologies for AM and RE implementation. In AM field, new chemical treatments for surface finishing have been developed. Moreover, process parameters have been optimized in order to improve mechanical properties, reduce production time and surface roughness.

In RE, new 3D scanning methodologies have been developed based on photogrammetry, for different applications, from mechatronic to biomedical and forensic field. Calibration procedures have been improved for several optical configurations even at micro-scale level.

The laboratory was firstly funded by Piano Triennale MURST (D.M. 21/6/99). Thanks to some industrial research projects of “Distretto Tecnologico delle Meccatronica Pugliese, Regione Puglia, CIPE 20/04, cod. DM01” and POR it has been constantly updated.

Recent funded research projects:

- European project ADRIATInn - An Adriatic Network for Advancing Research Development and Innovation towards the Creation of new Policies for Sustainable Competiveness and Technological Capacity of SMEs, Consortium with di 20 European partners (2013-2016).
- 2018-2020 Project Leader of the INTERREG IPA CBC ITALY–ALBANIA–MONTENEGRO PROGRAMME 3D-IMP-ACT (Virtual reality and 3D experiences to IMProve territorial Attractiveness, Cultural heritage, smart management and Touristic development), that involves 5 partners from Italia, Albania and Montenegro.
- Apulia Development Center for Additive Repair” laboratory done by the GE Avio and the Politecnico di Bari, research activity on “Reverse Engineering of aeronautical components aimed at their repair by means laser deposition (DL) and cold spray (CS) processes” (2016- now).
- PON MIUR ARS01_00806 “Innovative solutions for quality and sustainability of ADDitive manufacturing processes (SIADD)” that involves 14 partners among Industries, Research Centers and Universities (2019-2022).

Collaborations with companies and institutions:

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- Technical University of Denmark, Copenhagen, Università di Kragujevac – Faculty of Engineering (Serbia), Università Politecnica di Tirana (Albania), Università di Poddorica (Montenegro)
- CNR Istituto di Fotonica e Nanotecnologie, CNR – ITIA (Istituto di Tecnologie Industriali e Automazione) – Bari, Milano, ENEA – Brindisi
- GE AVIO Srl, GE Oil and Gas, Enginsoft SpA, HB Technology Srl –Taranto (TA), ELFIM srl – Gravina in Puglia (BA), Novotech srl – Avetrana (TA), Umbra Group Cuscinetti S.p.A, Ingenia Srl, Leone Spa, Bosch TDI, ICAM srl, Roboze srl, Simitecno srl, Adler Ortho srl. COFRA, Pezzol, Base Protection, Saint-Gobain, UTG Lavorazioni, Polishape 3D srl, BreD srl.

Contact person:

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Laboratory for steady state conventional and MILD combustion (LACO)

Competencies and research activities

The MILD (Moderate or Intense Low-oxygen Dilution) combustion laboratory is one of the laboratories of the Department of Mechanics, Mathematics and Management (DMMM). The test rig can be conducted either under conventional combustion conditions, with air as oxidizing gas, or using an air-flue gas mixture with varying levels of exhaust gas and different temperature levels, in such a way as to obtain a MILD combustion. The rig is equipped with automatic control systems capable of varying the mass flow rates, the dilution factors, as well as the thermal power.

The system consists of:

A balanced draft test rig for the execution of experimental campaigns aimed to the observation of both conventional and MILD combustion processes;

Two burners: an experimental burner with an 80 kWt load capacity and a 200 kWt auxiliary fueled by natural gas. The experimental burner can be fuelled by liquid diesel oil or gaseous natural gas and is able to operate under both conventional or MILD combustion regimes;

Two fans (a blower and discharge fan), both regulated by a Variable-Frequency Drive (VFD), capable of controlling the air mass flow rate and the flue gas recirculation together with the pressure inside the combustion chamber;

The exhaust gas cooling system based on a shall and tube heat exchanger.

A facility of the MILD combustion lab is represented by the transesterification plant for the production of bio-diesel from vegetable oils to be used as fuel in the experimental burner.

Collaborations with companies and institutions
CCA
Ansaldo Boilers
Itea
ICMEA
Contact person
Marco Torresi - marco.torresi@poliba.it

Laboratory of testing on innovative materials and structures

Competencies and research activities
The research group working in this laboratory, in the field of Experimental Mechanics, has developed wide experience for the stress-strain measurement on innovative materials and real components, also for in situ inspection.
Mechanical Characterization of Materials is a very important topic in the analysis of materials.
Data coming from experimental tests are necessary to a proper design and to an accurate formulation of numerical simulations. To fully characterize the material response to external loads, many types of tests can be performed, requiring specific equipment and tools for the analysis of the results.
Some tests are ruled by technical standard, while ad hoc experiments have to be planned in order to characterize innovative materials. In this lab. we can perform:
-Classical Mechanical Characterization (standard test – ad hoc test)
-Hybrid Mechanical Characterization (numerical+experimental)
The main activities of the laboratory concern with the application and the improvement of the most widespread experimental techniques for the measurement of displacements, strains and stresses (i.e. strain gage methods coupled with static and dynamic acquisition systems, acoustic emissions, thermography, digital image correlation-DIC, photoelasticity on models and reflection photoelasticity on real structures, moiré interferometry, digital holography, speckle interferometry, structured light projection system. All techniques are fully automated by means of computers and software for data elaboration and analysis.
The Lab. is fully equipped for the mechanical characterization of materials and structures (static, fatigue, impact tests) in different environmental conditions (temperature and humidity controlled), utilizing experimental techniques for the real time monitoring of stress conditions.
In the laboratory are present 7 loading machines for static, dynamic and low velocity impact tests (load capacity from 500 N to 500 kN; load frequency up to 150 Hz). Moreover, a vertical load frame (5 m x 5 m) for 1:1 mechanical test on real component with two MTS hydraulics actuators (250 kN) is available.
Furnace and climatic chambers are also available for tests at low/high temperature (in the range -165°C to 1400°C).

Equipment for metallographic analysis and fracture inspections have been recently updated (i.e. durometers, several microscopes including a Scanning Electron Microscope, Zeiss Coordinate Machine Measurement). A corrosion chamber is also available to produce accelerated aging of materials and components in order to study how mechanical performances are modified.
Lab. is equipped with modern instrumentations for displacement/strain/stress measurements (strain gage, Bragg's fibres, wi-fi sensors), optical set up (moiré and speckle interferometry, holo-shearography, DIC), acoustic emission, thermograpy, 3D reconstructions by means of structured light projection system.
Finally, a computer cluster is present for the numerical analysis of stresses and structural optimization.
Collaborations with companies and institutions
Many collaborations have been established in the recent years with industry (i.e. Alenia Aeronautica (Leonardo) – Boeing – Agusta - Avio – Airbus - Sitael Aerospace - Magneti Marelli – Bosch - Mer Mec - Centro Ricerche Fiat - SRB Costruzioni - Ansaldo, etc.) and university/research centre (i.e. Univ. of Nottingham; Univ. of Liverpool; Univ. of Manchester; Laboratoire de Fiabilité Mecanique, Université de Metz; Univ. of Lille 1; Univ. Of Chalon en Champagne; University of Washington, Seattle; University of California, San Diego; Illinois Institute of Technology, Chicago; Institut Fraunhofer LBF, Darmstadt; Institute of Micromechanics and Photonics, Warsaw University of Technology; Dep. de Ingeniería Mecánica, Univ. de Zaragoza; Dublin City University; Trinity College; McGill University, Canada; ENEA, CALEF, CETMA, etc.).
Contact person:
Prof. Katia Casavola – katia.casavola@poliba.it

Levantine Lab for Sustainable technologies (SESTANTE)

Competencies and research activities
The strong commitment of Politecnico di Bari towards manufacturing sustainability deploys into the proactive promotion of social involvement of its students into the sustainability topics. The long experience on-the-field led to build up a multidisciplinary laboratory for the promotion and development of manufacturing sustainability both in research and teaching.
The services offered are directed toward students and/or teachers as well as outside Politecnico (research and third mission) toward manufacturing companies.
The main services are: analysis for optimisation of manufacturing processes and sustainability improvement in manufacturing and production systems.
Labs are oriented to let the student gain critical skills on recognising, measuring and applying sustainable solutions to different manufacturing processes.
Strong competences are available on the analysis of complex real production systems, on the use of advanced methodologies and non-conventional tools for

designing and implementing continuous process actions.

Collaborations with companies and institutions

ILVA s.p.a. (Taranto)
Bosch T.D.It (Bari)
Masmec (Bari)
Mermec (Monopoli)
Getrag (Bari)
Fantini (Lucera e Terlizzi)
Buzzi Unicem (Barletta)
IVECO (Foggia)
ALENIA (Foggia)
Natuzzi (Santeramo)
Cofra (Barletta)
FIAT Iveco (Foggia)
Om-Pimespo (Bari)
Magneti Marelli (Bari)
Procter&Gamble (Campobasso)
GEDI Costruzioni S.r.l. (Altamura)
Intini Legnami (Noci)
Tubinsud (Bari)
SIEMENS (Pisa)
Tecnomec Enginnerign s.r.l (Altamura)
Mobilturi (Bari)
Bawer (Santeramo)
Master Italy (Conversano)
TERA (conversano)
VANPLAST (trani)
COFRA (Barletta)
Globeco (Molfetta)
Apulia Strech (Martina)
Brovedani (Modugno)
Gruppo Turi (Modugno)

Contact person

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MATH-LAB

Competencies and research activities

Math-Lab is a laboratory dedicated to didactics, students' guidance, research and experimentation. In particular, activities in the field of didactics and experimentation are developed in collaboration with the world of secondary school by promoting students' orientation, teachers' formation and experimentation of non-traditional forms of teaching.

In the spirit of "alternanza scuola lavoro" (work-linked training) which is one of the most relevant innovations of the Italian educational system (law 107/2015 the Good School "La buona scuola"), and in line with the open school principles, students of secondary school can attend didactical modules in the Math-Lab laboratory.

Students, thanks to an interactive board, will be allowed to use manipulative software such as GeoGebra in a more attractive way, they will be supported on Opedia platform (on-line learning) and by Teachnet didactical LAN, and will be led to reinforce their 3D visualization by digitalizing, manipulating and printing 3D objects.

Summer courses are being organized in order to promote Science, Technology, Engineering and Mathematics (STEM learning) with respect also to the parity of genders.

The laboratory is used in the validation processes, i.e. in the proof of convergence of numerical schemes, of the various models developed in the research activities.

The main applied research is the development of robust numerical methods, which are able to simulate traffic on road networks, salt fingering phenomena, and the dynamical (discontinuous) behaviour of thin elastic 1D and 2D bodies with an adhesive interaction with the environment.

The scientific director has been:

Classroom Trainer and online tutor for the following ministerial projects of renovation of the teaching staff of SSMMSS developed by the National Agency for the Development and Autonomy Scholastic (ANSAS former INDIRE) or the National Assessment of Educational System Education and Training (INValSI) in the following courses:

National teachers training project area Informatics ex D.L.vo n. 59/2004
National training teachers project FORTIC C1 (second edition) s.y. 2005/06, national project Digiscuola s.y. 2006/07 and 2007/08
National training teachers project PON "technologies for teaching (course 2)" Annuity 2008-Code project- E-2-FSE-2008-172
National training teachers project PON "technologies for teaching (course 2)" Annuity 2009-Code project- E-2-FSE-2009-140
National project "PON M@t.abel+" for training teachers for mathematics annuity 2009/2010 Code project--E-2-FSE-2009-161
National project "PON M@t.abel+" for training teachers for mathematics annuity 2010/2011 Code project--E-2-FSE-2010-88
Expert plan National Dissemination digital whiteboard annuities 2010.
National plan for dissemination digital whiteboard annuities 2011.
National Plan of "Training and Information on the survey PISA" Structural Funds Programming 2007/2013-PON "Skills Development" AXIS I - Human Capital Action B.3 "Interventions of training on evaluation in the learning process."

Collaborations with companies and institutions

The laboratory, completed toward the end of 2016, now constantly interfaces with the Promotion Orientations Placement project especially in the LAB action "Stage in the

laboratories of search" offered by Politecnico di Bari to secondary schools.
The following secondary schools are collaborating:
Liceo Scientifico "E. Fermi" in Bari for "alternanza scuola lavoro" stages.
Liceo Scientifico "Federico II di Svevia" in Altamura for "summer STEM courses".

Contact person

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Mechanical and Thermal Measurements Laboratory

Competencies and research activities

Skills and research activities

The laboratory of Mechanical and Thermal Measurements is arranged to perform mainly experimental activity typical of the field of research: basic metrology, calibration of sensors, design and manufacture of instrumentation for environmental applications, analysis of the signals, the temperature and pressure measurements, vibration measurements, acoustic measurements, fluid dynamic measurements, monitoring and control of machinery and plants.

Major Facilities and Instrumentation

Wind-Tunnels
LDA 2D Dantec
LDA 3D Dantec
LDV 100 Polytec
PIV 2D Dantec
Wire Anemometer CTA
Piezo accelerometers
Electro-Magnetic flowmeters
Digital Electronic Instruments

Part of the equipment available also allows its use for educational activities, mainly addressed to laboratory internships, where students can simulate and / or manage the operation tools through LabView or Matlab/Simulink platforms on opportune test benchs.

Collaborations with companies and institutions:

Centro Ricerche ANSALDO Caldaie - Gioia del Colle
Centro IRCCS Medea – Brindisi
Centro LAT SITEC – Molfetta
Loccioni S.p.A - Ancona
AQP S.P.A. – Bari
BOSH – Modugno (BA)
C.M.C. S.r.l. - Carovigno (BR)
Consorzio CETMA - Brindisi
TU/e (University of Technology) – Eindhoven, Germany
Vrije University - Belgium
VKI Insitute - Belgium
Università Politecnica delle Marche
Politecnico di Milano
Università del Salento
Università di Reggio Calabria
Università di Perugia

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Metallography and Microscopy (M&M-Lab)

Competencies and research activities

The M&M-Lab is part of the network of laboratories of the research group on Materials and Innovative Technology (SMATI group), which work in the scientific Area of Manufacturing Systems and Technologies. The network includes the laboratories of Advanced Forming & Manufacturing, Physical Simulation of Manufacturing processes, Optimization of Manufacturing Processes by Numerical Simulations, and Thermo-Physical Characterization of Post-Formats Polymers. The laboratories of the network are located in the DMMM, Viale Japigia 182 – Bari - Italy.

Aim:The M&M-Lab performs teaching, research and service activities on the analysis of metals and alloys microstructure in relation to the physical and technological process involved in the production of an industrial part. Using Metallography for the specimens preparation (sectioning, mounting, course grinding, fine grinding, mechanical and electrochemical polishing, chemical and electrochemical etching) and Optical Microscopy for the microstructure evaluation, the procedures implemented in the lab allow to determine whether an alloy was correctly manufactured, observing the amount and morphology of microstructures or defects such as voids, cracks or impurities.

Skills:Supporting the SMATI group research activities, in the M&M-Lab skills on the metallographic analysis of steels and light alloys (titanium, magnesium and titanium) have been developed, when processed with different manufacturing processes, such as heat treatments, laser beam welding, laser beam hardening, laser-MIG welding, MIG and Cold Metal Transfer welding, explosion welding of dissimilar aluminium-steel, superplastic forming, sheet metal forming (in cold, warm and hot condition).

Current research activity:Currently, the M&M-Lab is involved in research activities financed by the Ministry of Education and by private industry, aimed to the (i) experimental validation of the process analysis of new assembly technologies for the lightening of vehicle structures (Single-Side Resistance Spot welding, Friction Stir Spot Welding, Friction Element Welding, fiber laser welding), (ii) hot stamping of advanced high strength steel.

Collaborations with companies and institutions:

Centro Ricerche Fiat - TO
Fontana Group - LC
Omer -PA

Getrag S.p.A. - Bari
Borsh - Centro Studi Componenti per Veicoli S.p.A. - Bari
Nuovo Pignone - Bari
Master - Conversano (BA)
MasterLab - Conversano (BA)
Contact person
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Noise and Vibration Laboratory (NVLab)

Competencies and research activities

Mission of the NVLab at DMMM, PoliBA is the theoretical and experimental analysis of Noise and mechanical Vibrations having the aim of their control. Main sectors of application are macro- and micro-devices, machines, plants and facilities, manufacturing processes, transportations, environment.
Main activities are in the fields of theoretical (Multibody/FEM/BEM) and experimental analysis (classical and innovative modal testing, acoustics mapping, environmental testing, and NVH analysis for road/rail vehicles) of the dynamical behaviour of mechanical systems and devices. Experimental activities can be carried out either in lab or in loco. Specifically, tests that the lab is able to perform are:
A) structural identification by Experimental Modal Analysis (Input-Output Modal Analysis of linear and nonlinear systems), Operational Modal Analysis (Output-only Modal Analysis), Vibro-Acoustic Modal Analysis tests, Transmissibility-based Operational Modal Analysis, Operational Modal Analysis of vehicle systems;
B) vibration measurements by accelerometers, Laser Doppler Vibrometer, and u (μ-flown) probes;
C) acoustics measurements, i.e. sound power measurements by p-p and p-u (μ-flown) sound intensity probes, acoustic impedance measurements by p-u (μ-flown) probes, acoustic fields' mapping and source localization by acoustic holography, Transfer Path Analysis (TPA, OPA);
D) vibration (environmental) testing of mechanical, mechatronic systems and devices on electro-dynamic shakers of large size (up to 20 kN), under close loop controlled base excitation (linear, log swept sine deterministic, white, pink stochastic).
The facilities for technical computing are:
Server comprising 2 cluster nodes, each equipped with 2 XEON processors E5-2680 v3, for a total of 96 cores, 448 GB RAM, and 16 TB of disk space.
The facilities for experimental testing are:
Mobile PC based multichannel analyzer platform for noise and vibration analysis equipped with the needed software applications, having real-time capability, able to perform signal processing (FFT, 1/n-octave (CPB) and overall analyses simultaneously on the same or different channels/signals), signal generation, modal parameter estimation.

Electrodynamic shakers (2 N, 200 N, 450 N, 2000 N, 20000 N) equipped with the needed power amplifiers.
Impact hammer.
Piezoelectric and piezoresistive accelerometers of different classes with the needed calibrators and cables.
Impedance heads.
Laser Doppler Vibrometer and all the needed measure chain components.
Sound Intensity probe kit equipped with the needed calibrator.
Sound level meters.
Microphones of different classes equipped with the needed calibrators and cables.
Micro-flown transducers.

Collaborations with companies and institutions:

The NVLab at DMMM, PoliBA is and has been involved in several national and international cooperation activities with research groups belonging to other universities:
New York University - USA,
University of Liege - Belgium,
Aalborg University - Denmark,
Kiel University - Germany,
RWTH AAchen University - Germany,
Università Politecnica delle Marche - Italy),
and industrial partners:
SISW – Belgium,
MERMEC – Italy, MASMEC – Italy,
ISOTTA FRASCHINI MOTORI - Italy.
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Optimization of Manufacturing Processes by Numerical Simulations (ManOnSim)

Competencies and research activities

The lab ManOnSim is part of the network of laboratories of the research group on Materials and Innovative Technology ("SMATIgroup") whose members operate in the scientific area of Manufacturing Systems and Technologies (ING-IND/16).
The above mentioned network of laboratories is composed by the laboratory of: Advanced Forming & Manufacturing (AF&M-lab), Physical Simulation of Manufacturing processes (PhySiMaP-Lab), Metallography and Microscopy (OMM) and Thermo-Physical Characterization of Post-Formed Polymers.
All the laboratories are located in Viale Japigia 182 – Bari – Italy (DMMM).
The lab ManOnSim is equipped with suitable facilities for the numerical simulation of industrial processes, like:

Sheet Metal Forming in warm and hot conditions;
Casting (sand and high pressure);
Surface treatment (laser hardening, laser remelting);
Heat treatment on steels and aluminum alloys;
Multiphysics processes (induction heating, electro magnetic forming, electric heating);
Residual stresses.A numerical-experimental approach, based on the mechanical and deformative behavior (using the facilities in PhySiMaP-Lab and OMM-lab) and on the following experimental validation (using the facilities in the AF&M-lab), is adopted.
Both the model tuning and the optimal process conditions are obtained using multi objective optimization techniques based on genetic algorithms and the Response Surface Methodology.
Currently in the lab ManOnSim research activities financed by the Italian Ministry of Education, Universities and Research Government and by private companies are conducted aimed at simulating: (i) the SPF process for producing highly customized biomedical Titanium prostheses; (ii) the warm forming process for producing parts for railways applications; (iii) both the local heat treatment and the stamping process of aluminum heat treated blanks.

Collaborations with companies and institutions:
Fontana Group (Accordo Quadro dal 2015);
Omer spa (Accordo Quadro dal 2016 ed una convenzione di dottorato);
Master / MasterLab (Accordo Quadro dal 2016);
Enginsoft, Mesagne (Brindisi);
Centro Ricerche Fiat;
Università degli studi della Basilicata;
Politecnico di Milano;
Università della Calabria;
CNR-IFN UOS Bari;
Institute for Metal Research, Chinese Academy of Science;
University of Mugla, Turkey.

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Physical Simulation of Manufacturing processes (PhySiMaP-Lab)

Competencies and research activities
The PhySiMaP-Lab is part of the network of laboratories of the research group on Materials and Innovative Technology (SMATIgroup), which works in the scientific Area of Manufacturing Systems and Technologies. The network includes the laboratories of Advanced Forming & Manufacturing, Metallography and Microscopy, Optimization of Manufacturing Processes by Numerical Simulations, and Thermo-Physical Characterization of Post-Formats Polymers. The laboratories of the network are located di the DMMM, Viale Japigia 182 – Bari - Italy.
Aim:The PhySiMaP-Lab performs teaching, research and service activities based on the reproduction in a laboratory scale of a real-world manufacturing process or of the end use of a material. Thermal and mechanical cycles are imposed on small samples of the investigated material, using a commercial physical simulator (3185 Gleeble System) or in home designed equipment. The latter are designed integrating and controlling a Universal testing Machine (200kN - INSTRON 4485), a Digital Image Correlation software (Aramis), a gas pressure system and heating devices based on induction heating or electrical resistance heating. Knowledge acquired through this approach has be used in applications concerning process simulation, testing and basic material studies on steels and light alloys (titanium, aluminium and magnesium).
Skills:Supporting the SMATI group research activities, in the M&M-Lab skills on some process simulation applications, like heat treatments, hot deformation, gas forming, post weld heat treatment have been developed. Testing applications concern the determination of stress vs. Strain curves in cold, warm and hot condition, Creep/ Stress Rupture evaluation, superplastic characterization, weld heat affected zone simulation for weldability assessment, determination of drawability, bendability, stretch-bendability and formability (by Marciniak and Nakazima test) in cold and warm condition (until 300°C). Application in basic materials studies concern work hardening, precipitation hardening and annealing.
Current research activities:
Currently, the PhySiMaP-Lab is involved in research activities financed by the Italian Ministry of Education, Universities and Research Government and by private industry, aimed to the (i) experimental validation an the process analysis of new assembly technologies for the lightening of vehicle structures (Single-Side Resistance Spot welding, Friction Stir Spot Welding, Friction Element Welding, fiber laser welding). (ii) hot stamping of advanced high strength steel.

Collaborations with companies and institutions
Centro Ricerche Fiat -TO
Fontana Group - LC
Omer -PA
Masinara Spa - Monteveglio (BO)
AZ Perazsole Srl - Carinario (CE)
Getrag S.p.A. - Bari
Borsh - Centro Studi Componenti per Veicoli S.p.A. - Bari
Nuovo Pignone - Bari
Master - Conversano (BA)
MasterLab - Conversano (BA)

Contact person
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Polimare Lab

Competencies and research activities

The Polimare Project is a multidisciplinary laboratory of educational activities and research for the development of systems related to the sea, boating and sailing boats.
The main objective is to investigate and develop new systems and devices for boating, in particular developing the following areas:
Advanced sustainable manufacturing technologies
Augmented Reality for easy sailing
Automatic and manual mechanical devices for driving the vehicle
Biomaterials for boating
Green design and production for boating
Fluid dynamics for innovative boat and propulsion
Sport ergonomic and efficiency
Yacht design and interior nautical design
The Polimare is equipped with virtual calculation and design systems, mechanical equipment for the first prototyping and works in a public-private agreement with a nautical production companies with hi-tech composite construction devices.

Collaboration with companies and institutions:

Secondary Education Institute “Archimede” (Taranto)
Neo Yacht & Composite, Bitonto (BA)
Centro Universitario Sportivo Bari

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Michele Fiorentino – michele.fiorentino@poliba.it
Rossana Carullo - rossana.carullo@poliba.it
Giuseppe Pascazio – giuseppe.pascazio@poliba.it

RESIDUAL STRESS LAB

Competencies and research activities

The research group working in the RS lab. has developed wide experience for the measurement of RS by means of different experimental techniques (i.e. HDM with strain gage rosette, HDM with optical methods, X-ray diffractometer, Barkhausen noise). Moreover, the analysis or RS generation and evolution under dynamic load has been implemented also by numerical methods.
The RS lab. is accounted as Italian reference residual stress laboratory for measurement on on-flight component in the aviation industry.
In the past years the Residual Stress laboratory (RS Lab.) reach great experience on the use of the Hole Drilling Method (HDM) for the measure of residual stress on innovative materials (e.g. itanium, sintered materials, composites).

Welded components made by steel, aluminium or titanium alloys were investigated to relate the welding parameter to the mechanical response of the joints, in particular to the fatigue strength.
To estimate sign and magnitude of residual stresses to account properly for their effect in a numerical model is indeed a very difficult task. RS related to different welding techniques can be studied (laser welding, FSW, LAFSW, electron beam, etc.).
Selective laser melting (SLM) is used in rapid prototyping processes because of the possibility of building complex three-dimensional metal parts. However, the SLM process introduces some modifications in the material due to the thermal cycle produced layer by layer on the component by the laser beam, including alterations of microstructure and residual stresses. The emphasis on the study of these residual stresses is justified by the strong influence that macro stresses have on the mechanical behavior of the analyzed components.
HDM technique allow a good evaluation of the stress-strain condition in a small area of a structure, but it is a semi-destructive test and does not allow a full-field measurement of the stress condition. So, in order to overcome some limitation related with the HDM, alternative techniques has been developed: in particular, X-ray diffractometer (steel, aluminum, titanium alloys) with chemical etching for in-depth measurements, HDM with optical method (for full field and non-contact measurements), Barkhausen noise and a new methods developed at Politecnico di Bari.

Collaboration with companies and institutions:

Many collaborations have been established in the recent years with industry (i.e. Avio GE - Alenia Aeronautica (Leonardo) – Airbus – Boeing – Sitael Aerospace - Magneti Marelli – Bosch, etc.) and university/research centre (i.e. Univ. of Nottingham; Univ. of Sheffield; Laboratoire de Fiabilité Mecanique, Université de Metz; Univ. Of Lille 1; Univ. Of Chalon en Champagne; University of Washington, Seattle; University of California, San Diego; Institut Fraunhofer LBF, Darmstadt; Institute of Micromechanics and Photonics, Warsaw University of Technology; McGill University, Canada; etc.).

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Robot mechanics Lab

Competencies and research activities

The Lab is a laboratory of educational activities and research for the development of robotic solutions and mechanisms for automatic systems. The researchers of the lab collaborate with other teams in all mechatronics field to integrate mechanical capability with electronic and electrical innovative devices.
The main objective is to investigate and develop new systems and devices for

automatic machine, dealing with the following areas:
Agriculture automation
Optimized mechanisms for automation
Robotic and automatic vehicles
Prosthesis mechanism and exoskeleton
Machinery to improve sport efficiency
The robot mechanics lab is equipped with mechanical calculation and design software, measurement equipment, mechanical equipment for the first prototyping.

Collaboration with institutions and companies:
New York University (USA)
Delft University of Technology (NL)
ANTY S.R.L., Modugno (BA)
Osa Demolition Equipment, Molfetta (BA)

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Structural Diagnostic and Thermal Methods for Experimental Mechanics

Competencies and research activities
The Lab carries out research activities mainly on the following topics:
Structural Diagnostic: traditional applications, new applications and development of new non destructive techniques (Thermal methods –IRT; Ultrasound – UT; magnetic particles – MT; Penetrant – PT; Strain Gauges – SG; Eddy Current - EC; Xrays – only interpretation)
Rapid characterization of fatigue behavior of materials/components with InfraRed techniques
Monitoring of manufacturing (Automated Fiber Placement and technological processes (Friction Stir Welding) and analysis of the process for mechanical behavior of components
Coatings analysis: thickness evaluation, quality of adhesion, non destructive evaluation, tribological characterization (in cooperation with tribolab)
Stress analysis with Thermoelastic Stress Analysis (TSA)
Damage monitoring (Acoustic Emission; Thermography, TSA etc)
Fracture Mechanics
The lab is equipped with all needed and up to date instruments for non destructive testing (3 UT systems with possibility of c-scan, MT, PT, 5 Thermocameras in all possible ranges and performances, Eddy current system with single and differential probes, Strain gauges, hole drilling rosette for residual stresses, etc).
In particular the possibility to use 100kN MTS Hydraulic loading machine with thermal cameras allows the fast analysis of fatigue behavior of various materials (tested for aluminum alloys, titanium alloys, traditional and innovative steels, composites) with fatigue limit evaluation in about 3 days instead of 6-8 weeks needed for standard testing. Research carried out in the lab showed the possibility to obtain the entire fatigue curve. Research also focuses on the study of Fracture Mechanics behavior of materials in order to localize the crack tip position and to assess the crack propagation law.
The strong point of the adopted approach is the applicability on operating real and complex shaped components (i.e. FSW welded joints).
The research group was awarded of:
AEA Technology award during 1998 International Conference of Experimental Mechanics
Innovation Award of ALENIA AERMACCHI 2014 for development of thermographic innovative technique for resin pocket characterization
Innovation Award of FINMECCANICA 2014 for development of a system for quantitative measurements of resin pockets.
AIAS award 2015 for best paper presented in 2014 conference of Italian Association for Stress Analysis
Best Student Paper at 2017 SPIE Conference “Thermosense”
The vision of the lab is that all engineering lab activities have to be properly used in the territory. The effort is always to consider, in the development of new application or new technologies, the possibility for a proper implementation of the results of the research in the production line or the product development. The lab cooperates strictly with the spinoff company DES - Diagnostic Engineering Solutions.
All activities carried out in the lab are and can be industrialized and customized in proper in line control.
The scientific coordinator registered 4 patents: 2 European related to new instruments for Non Destructive Testing based on thermography and 2 national patents (one for thermography application and one for monitoring blood pressure with a wearable device).
The lab is involved actively in a number of industrial and research projects such as PON, regional, and private collaborations.

Collaborations with companies and institutions
In recent years Lab of Structural Dagnostic was involved in many funded projects and international collaboration. The following list is not comprehensive of all activities but is a good example of collaborations and technological tranfert.
Université Montpellier II – Laboratorie de Mécanique et Genie Civil.
France Instituto Tecnológico de Aeronáutica
Sao José dos Campos-SP-Brazil Departamento de fisica aplicada I
Escuela de Ingeniería de Bilbao-Spain
Universitè Livree de Brussels (Be)
University of Sheffield (UK)
University of Manchester (UK)
Dublin City University (IR)

University of West Scotland (UK)
Onerà (FR)
CIRA (IT)
CETMA (IT)
ENEA (IT)
CNR - ISSIA (IT)
CNR - ITIA (IT)
Università di Palermo (IT)
Università del Salento (IT)
Industrial research and collaborations
Bosch
Leonardo
CALEF
FIAT Research Centre
Isotta Fraschini
Centro Laser
Master
Analysa
Jonica Impianti
Mermec
Sitec
RFP
ELFIM
ITRIB (ES)
Fraunhofer Institute
General Electric (Nuovo Pignone)
Avio

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Tribology Laboratory (TriboLab)

Competencies and research activities

The TriboLAB belongs to the net of research labs TRASFORMA, recently established at Politecnico di Bari thanks to the financial support of the Government of Apulia Region. The mission of the TriboLAB is to investigate phenomena taking place at the interface of contacting bodies, such as rough contact mechanics, friction, hydrorepellence, lubrication, crack propagation.

Collaborations with companies and institutions

The Tribolab has been funded by several Industries, Academic Departments and local Governments. The research collaborations are:

“LASER4FUN” (European Project “Marie Sklodowska-Curie”).
Scientific Coordinators Antonio Ancona and Giuseppe Carbone
The funding assigned to the Bari research unit of CNR-Politecnico di Bari–Università, is 252k€.
“INNOVHEAD “ PON Ricerca e Competitività 2007-2013
Research Unit Scientific Coordinator G. Carbone.
The funding assigned at the research unit: 193k€
“Elettronica di controllo, sistema d’iniezione, strategie di combustione, sensoristica avanzata e tecnologie di processo innovativi per motori diesel a basse emissioni inquinanti”- PON Ricerca e Competitività 2007-2013.
Research Unit Scientific Coordinator G. Carbone.
The funding assigned at the research unit: 93k€
“Modelli Innovativi per Sistemi Meccatronici”, APQ Ricerca III Atto Integrativo della Regione Puglia.
Research Unit Scientific Coordinator G. Carbone.
The research unit has been funded with 130k €.
“Tecniche di Ricerca Avanzate per lo Studio e l’implementazione della FORMAtura con mezzi flessibili di Leghe Leggere tramite l’utilizzo di superfici ad attrito controllato e lamiere saldate di differente spessore (TRASFORMA)”
Research Unit Scientific Coordinator G. Carbone.
The project has been funded by Apulia Region (Bollettino Ufficiale della Regione Puglia -12/02/2008).
The research unit has been granted with a budget of 500 k€.
“An Integrated Framework for Engineering Bio-Mimetic Adhesive Interfaces (EBioAdI)”
Scientific Coordinators G. Carbone and P. Decuzzi
The project was funded for the period 2008-2011 by the European Science Foundation.
“Metal chain CVT efficiency and traction performances”
Scientific Coordinator G. Carbone
The project was funded by the dutch company Gear Chain Industrial B.V. Neunen The Netherlands for a total amount of 66k€. The project involved also JTEKT – Corporation Japan.
“Innovative models for Mechatronic systems”.
Scientific Coordinator of the research unit on Tribology of surfaces: G. Carbone
The total funding under the responsibility of Prof. Carbone was of 130 k€
“Friction and Wear of Ceramic and Composite Materials
Scientific Coordinator G. Carbone
The project was funded by General Electric – Nuovo Pignone – Italy for a total amount of 37k€ + VAT
“International Center for Ocular Physiopathology-Fondazione Banca degli Occhi del Veneto Onlus (FBOV)”
Scientific Coordinator of the research unit on Tribology of surfaces: G. Carbone
The aim is to determine the mechanical properties of human cornea membranes by

means of Atomic Force Microscopy. The project was funded by FBOV.
"Sviluppo di Materiali Avanzati e Tecnologie Innovative per turbomacchine per impiego in condizioni estreme-SMATI"
Scientific Coordinator of the research unit on Tribology of surfaces: G. Carbone
The aim is to design and develop wear and corrosion resistan coatings.
"ARGOTRACTORS"
Scientific Coordinator: G. Carbone
The total funding was 80k€ + VAT
"BOSCH"
Scientific Coordinator: G. Carbone
The total funding was 40k€ +VAT
"ESI"
Scientific Coordinator Tribology of surfaces: G. Carbone
The total funding was 20k€ +VAT

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Virtual Reality and Reality Reconstruction Lab (VR3Lab)

Competencies and research activities

The VR3Lab is a multidisciplinary research facility for the development and testing of innovative tools and methods in engineering and medicine. Its goal is to explore and apply cutting edge technologies in the following areas:
Virtual and Augmented Reality simulation & marketing
Augmented Reality solutions for Industry 4.0
Augmented Reality maintenance
Virtual training
Virtual tours and experiences for cultural heritage
Natural User Interfaces
Industrial advanced interfaces
CAD and PLM consulting
Composite materials modelling
CAD advanced surfacing and style
Reverse engineering and CAD reconstruction
Industrial ergonomics and human-centered design
Bioengineering simulations
Bioengineering devices design and prototyping
The lab is provided with the latest VR & AR technologies in other to test and apply the optimal solution to the specific problem: head mounted displays, led and laser projectors, a virtual theater, software tools and libraries.
Moreover, 3D scanners and 360-pano cameras are available for object and ambient reconstruction, while a 3D printer and a mechatronic-lab allow for prototyping novel devices.

Collaborations with companies and institutions

Idea75 – Bari (BA)
Hevolus – Molfetta (BA)
SER&P – Bari (BA)
InResLab – Monopoli (BA)
ICAM - Putignano (BA)
Master Italy - Conversano (BA)
Simulo - Bari (BA)
HGV - San Severo (FG)
3D Research - Rende (CS)
Tecbus - Modugno (BA)
LORAN - Modugno (BA)

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Wind Tunnel (GAVE)

Competencies and research activities

The subsonic closed loop wind tunnel of the GAVE Lab has a 1 meter squared test section.
The wind tunnel is of rectangular shape, is 30 m long, and has a sufficient length to ensure the uniformity of the flow across the test section.
The wind tunnel can be divided into four different zones.
The first zone (downstream the test section) includes a diverging portion of increasing rectangular section, whose task is to recover part of the kinetic energy; two (90deg) curves follow, guiding the flow toward the inlet of the fan. Upstream the fan, orifices are provided in order to prevent the wind tunnel pressurization due to the air heating during steady state operation.
The second zone is constituted by the axial fan, which is driven by a three-phase AC motor (55kW) mounted on a special cradle inside the cylindrical duct which encloses the impeller.
The possibility to adjust the engine rotation speed by means of a Variable-Frequency Drive (VFD), allows one to obtain variable speed in the test section, and then to recreate different operating conditions.
The third zone, located downstream the fan, includes other two curves (this time with guide vanes), that allow the curvature of the flow without introducing flow distortions or significant secondary flows.
Finally, a convergent duct (with a contraction ratio equal to 4:1) accelerates the flow up to the rated speed on the input section of the test area (this is subsonic wind tunnel, then air can be considered incompressible). Upstream the convergent there is an "honeycomb", in order to make the flow uniform (elimination of any macro-

turbulence).
The last zone is constituted by the test section composed with side walls made of transparent polycarbonate. This material allows one the use of non-intrusive laser measurements.
Moreover, its structure consists of a Rexroth aluminum frame. In the test section, a three-axis Cartesian robot controls the position of a hot-wire probe for measuring the wind speed. The upper closure panel of the test volume is formed, therefore, by two polycarbonate half-panels, between which is inserted the wind speed probe; the two panels are movable, in order to allow the horizontal displacement of this probe.
The three-axis Cartesian robot is basically composed of the following elements: stepper motors; control and driving boards; profiles and guides (traversing).

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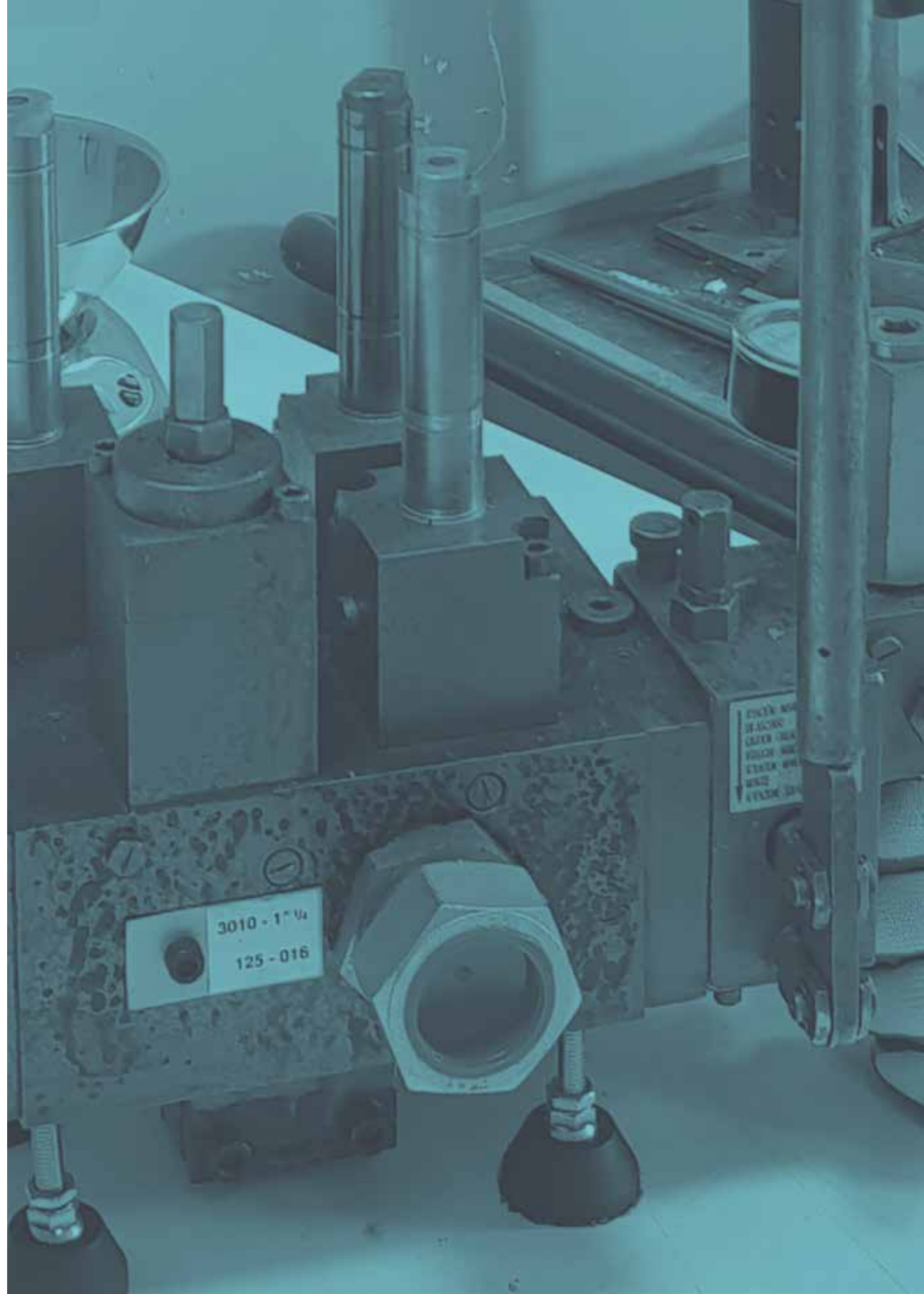


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SPIN-OFF COMPANIES

AESEI - ARCHITECTURAL & ENGINEERING SURVEY OF ENVIRONMENT AND INFRASTRUCTUES S.R.L.

www.aesei.it

Competencies

Integrated survey, Environmental and Structural monitoring, Intelligent points cloud viewer, Remote sensing, GIS and Database.

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AP-IS - APULIA-INTELLIGENT SYSTEM S.R.L.

www.spinoffapis.com

Competencies

Intelligent Systems, Industry 4.0, Computer Vision, Diagnostics, Security.

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APULIAN BIOENGINEERING S.R.L.

www.apulianbioengineering.com

Competencies

Decision Support System (DSS) for clinical and industrial applications, Electronic and Information Bioengineering, Human-Machine Interaction, Intelligent Systems, ICT Solutions for Industry 4.0.

Key words

Electronic, Information and Industrial Bioengineering
Intelligent Biomedical Computer-Aided Decision Systems
Human-Machine Interaction
Machine Vision for Industry 4.0
Decision Support Systems for Industrial Applications

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AUTOLOGS - AUTOMATION IN LOGISTICS AND SERVICE SYSTEMS S.R.L.

www.autologs.eu

Competencies

Industry 4.0, Decision Support System (DSS), Logistic, Optimization, Automation.

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BEST - BARI ELECTRONIC SYSTEMS FOR TELECOMMUNICATIONS S.R.L.

www.bestengineering.it

Competencies

Custom integration of TLC systems, HW and SW integrated platforms for biomedical/welfare support, Microwave and mm-wave systems for industrial automation, Wireless multi-sensor networks for environmental monitoring, Custom design and development of electronic systems.

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B.R.E.D. - BUILDING - REFURBISHMENT AND DIAGNOSTICS S.R.L.

www.bred-srl-com

Competencies

Building Diagnostics, Innovation in Building, Building Refurbishment, Cultural Heritage, UAV Surveys.

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DES - DIAGNOSTIC ENGINEERING SOLUTIONS S.R.L.

www.desinnovation.com

Competencies

Performance, Quality, Safety, Integration, Innovation.

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GAP - GEOPHYSICAL APPLICATIONS PROCESSING S.R.L.

www.gapsrl.eu

Competencies

Radar Satellite Remote Sensing, VIS/NIR Satellite Remote Sensing, UAV Technologies, Meteorological Services, Biomedical Applications.

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GEET - GEO ENVIRONMENTAL ENERGY TECHNOLOGIES S.R.L.

Competencies

Energy efficiency, geothermal low enthalpy, biomass valorization, bio-methane, optimization ofthe anaerobic digestion.

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IDEA (INNOVATION, DECISION, ENVIRONMENT, AWARENESS) RESEARCH TRANSFER S.R.L.

www.idea-rt.com

Competencies

Environmental Data Modelling, Water Distribution System Management, Asset Management, Innovation in Civil Engineering, Courses for Innovation in Water Industry.

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INGENIUM S.R.L.

www.ingenium.poliba.it

Competencies

Technology Scouting, Crowdfunding & Crowdsourcing, Recommender systems & Customer experience, Business process management, Logistics & Performance management.

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INNOLAB S.R.L.

www.innolabsrl.it

Competencies

Process optimization, Logistics, Decision support systems, Automation, Energy systems.

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INNOVATIVE SOLUTIONS S.R.L.

www.innovative-solutions.it

Competencies

Agri-food, Traceability, Shelf-life, Precision Support Systems, Magnetic Resonance..

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MICROLABEN S.R.L.

www.microlaben.com

Competencies

Design, prototyping and production engineering of custom electronic systems, Wireless sensor networks and IoT applications, Electronic systems for environmental monitoring, Electronic systems for smart metering, Embedded systems.

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POLIMECH S.R.L.

Competencies

Mechanical design and Structural Optimization, Continuously Variable Transmission (CVT), Thermoelastic and Dynamic Instability in Clutch and Brakes, Composites, Contact Mechanics, Superhydrophobic surfaces, Seals.

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POLISHAPE 3D S.r.l.

www.polishape3d.it

Competencies

Reverse Engineering, Rapid Prototyping, Scanner 3D, Biomedical, Manufacturing.

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QUAVLIVE S.r.l.

www.quavlive.com

Competencies

Video encoding as a Service, Video streaming as a Service, Immersive Video, Mobile video surveillance,
Video conference as a Service.

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T&A - TECNOLOGIE & AMBIENTE S.R.L.

www.tecnologiaeambientesrl.com

Competencies

Water, waste, air, odour treatment, Contaminated soil and aquifer remediation, Environment monitoring and planning, Environmental plant design and operation, Administrative permits and services.

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WIDEVERSE S.R.L.S..

www.wideverse.com

Competencies

Virtual reality, mixed reality, augmented reality, recommender systems, personalized information access, recommendation, personal assistant, artificial intelligence, machine intelligence, cognitive computing.

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ARTIFACT IN CONCRETE WITH A PLASTIC REINFORCEMENT

MISE-UIBM

Patent number 0001420342

Abstract

Concrete component comprising at least one reinforcing element in plastic material of elongated shape having a size greater than the other two, characterized by a length of the reinforcement comparable with the length of the artefact measured in the direction in which the reinforcing element is positioned. The section of the reinforcement is such as to ensure a bending strength sufficient to support its own weight in the process of positioning, and a constant section along the longitudinal direction, so as to allow the manufacturability by extrusion of the reinforcing element.

Keywords

Recycling waste PET, concrete reinforcement, concrete ductility and durability improvement.

Inventors

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COATED WITH PLASTIC MATERIALS

MISE-UIBM

Patent number 0001416552

WIPO

International Publication Number WO/2014/141311

EPO

European Patent Number EP 2973744

CHINA PATENT & TRADEMARK OFFICE

International Publication Number CN 105246604A

Abstract

The purpose of the invention is to provide a process for the recovery of raw materials from multilayer artifact.

The process involves cryogenic conditioning of the materials to be reconverted and exploits the different thermal and elastic behaviour of different layers of different material.

Keywords

De-manufacturing, delamination, cryogenic processes, WEEE, recycle.

Inventors

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MODULAR BUILDING BLOCK, IN PARTICULAR FOR CONSTRUCTION OF DIVIDING STRUCTURES OR FURNISHINGS

MISE-UIBM

Patent number 102017000051977

Abstract

The Netflix block has been designed to solve a wide range of issues related to the division and articulation of interior spaces for residential purposes (temporary housing, highly flexible dwellings, rented houses, ...) and commercial (store, event areas, commercial centers, ...).Its lightness, ease of handling and ease of assembly ensure rapid installation and flexibility of use for living and furniture spaces. The guiding philosophy of the block is to ensure a high degree of flexibility in everyday living spaces, guaranteeing acoustic, structural (self-porting and fixing of furniture, wall hangings, etc.) and techniques properties (possibility to host installations) comparable to a traditional masonry, for the walls and elements of division resulting from it.

The Netflix system provides several important benefits:

Easy assembly and dismantling of partition walls in self-construction and without the support of any kind of construction equipment, with height varying from the floor

Possibility of individual blocks to be anchored to each other by means of specific mechanical hooks that solidify the wall making it uniform and self-supporting

Possibility of the block and the wall to accommodate the plants thanks to the provision of special cavities and trenches

Possibility of disassembling and re-assembling the same walls at a later stage for obtaining distinct spatial and environmental solutions

Possibility of quick assembly and removal of the finishing surfaces of the blocks and walls.

Possibility of inserting doors and windows into the walls thus obtained

Possibility of interchangeability of the finishes or their partial replacement to obtain different decorative effects within a few minutes

Possibility to use the Netflix Block for basic furniture solutions such as kitchen environments, for the construction of recessed furniture and work surfaces or furniture solutions such as open bookcases, cupboards, ...

These features make the product highly appealing to the interior design

market, for designing versatile living spaces and, above all, for commercial, cultural and creative spaces.

Keywords

Modular lock, self-construction, quick assembly and disassembly, spatial configuration change, automatic structural coupling, interchange of finishes, planting and furnishing equipment, lightweight.

Inventors

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OPTICAL ROTATION SENSOR AS WELL AS METHOD OF MANUFACTURING AN OPTICAL ROTATION SENSOR

WIPO

International Pubblication Number WO/2014/161565

EPO

International Pubblication Number EP 2917691A0

US Patent Number 9863771

Abstract

An optical rotation sensor is provided, comprising an optical ring resonator (RR) formed by a one-dimensional photonic crystal (ID PhC) waveguide, and a bus waveguide. A light input section of the bus waveguide is connectable to a light source, and a light output section of the bus waveguide is connectable to a light detector.

The bus waveguide is optically coupled to the ring resonator within a coupling area which is located between the light input section and the light output section of the bus waveguide. The optical rotation sensor is configured to measure a shift of frequency of a resonance area (or a plurality of resonance areas) close to a band edge of a photonic band gap of the ring resonator, wherein the shift of frequency is caused by a rotation of the optical rotation sensor.

Inventors

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OPTICAL SYSTEM FOR THE MEASUREMENT OF THE DISPLACEMENT OF A MOVABLE BODY DROWNED IN A FLUID

MISE-UIBM

Patent number 0001414358

Abstract

The optical system allows the detection of the opening and then the control and diagnostics of injectors of any type, with any type of petrol and supply, as well as other mechanical moving parts drowned in a fluid. This system includes: - a measuring environment with an almost watertight chamber, - a fixed body, such as the body (8) of an injector, having at least two coaxial holes (3) of any geometry, - movable body, such as a control piston (7), having at least one through hole (4) of any geometry, - at least one diode (1) for the emission of an infrared or other light frequency beam placed in one of said coaxial holes (3) drilled on the fixed body, - at least one photoreceiver transistor (2) for receiving said beam, positioned frontally to said diode, and placed in the second of said coaxial holes (3) formed on the fixed body, - an electronic circuit for the transmission and reception of the light signal. The diode (1) emits an infrared or other light frequency beam which, passing through the coaxial holes (3) on the fixed body and the through hole (4) on the movable body, reaches the photoreceiver (2) that produces an indicative voltage derived from the intensity of the received light signal which is due to the displacement of the movable body with respect to the fixed body, said voltage being proportional to the percentage of juxtaposition between said through holes of the fixed body and said through hole of the movable body.

Keywords

Common rail, injector, Diesel engine, optical sensor, displacement measurement.

Inventors

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SEISMIC ISOLATOR

MISE-UIBM

Patent number 0001414213

Abstract

eismic isolator (1) comprising at least a first cradle (11/12) and a second cradle

(12/13), the cradles being positioned one over the other, each cradle housing respectively a first (R1A – R1C) and a second (R2A – R2C) group of rollers, wherein axes of rotation of the rollers of the first group are mutually parallel and lying in a first plane, wherein axes of rotation of the rollers of the second group are mutually parallel and lying in a second plane parallel to the first plane, and wherein the axes of rotation of the rollers of the first group are offset with respect to the axes of rotation of the rollers of the second group.

Keywords

Passive control, base isolation, visco-elastic behavior, rubber–steel contact.

Inventors

Prof.ssa Dora Foti

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THERMO-MECHANICAL CONTROLLED CRYOGENIC DELAMINATION PROCESS FOR THE FULL RECOVERY OF RIGID MONO-POLYCRYSTALLINE OR AMORPHOUS MATERIALS

MISE-UIBM

Patent Number 0001429017

Abstract

Cement-based conglomerate, light-weighted by recycled EPS, which makes the compound lighter and highly insulating. The mixture is featured by the partial replacement of sand parts/fractions with corresponding recycled EPS parts.
The mixture can be used also for construction of structural components, featured by lightness, sustainability and improvement of thermal properties.

Keywords

Cement conglomerate, sustainability, recycling, waste reduction, improvement of properties.

Inventors

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PRECAST COMPONENT WITH HIGH MECHANICAL, THERMAL AND ACOUSTIC PERFORMANCES FOR LOAD-BEARING AND NOT LOAD-BEARING WALLS

MISE-UIBM

Patent Number 0001429016

Abstract

Partially precast system for opaque vertical components, both structural and not, featured by high thermal insulation and reinforced by metallic framework. The system is composed of a disposable formwork made of two conglomerate-based panels, both combined with an additional EPS panel showing high thermal insulation. The panels are connected by horizontal transversal connections, in order to shape a reinforced cavity, where concrete (or equivalent with innovative materials) can be onsite poured. The above-described panels become an integral part of the vertical system: the final onsite grouting also connects adjacent wall modules in both longitudinal and transverse direction, in order to create a single integrated structure. The system is designed to withstand suitably the vertical and horizontal stresses of seismic type and to be equipped by plant engineering systems.

Keywords

Precast concrete walls, high thermal performance, sustainability, construction methods and techniques, Technical and technological performances of pre-cast systems.

Inventors

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PUBLIC-PRIVATE JOINT LABORATORIES

Politecnico di Bari is very active in developing partnerships with the industry, especially in the fields of industrial and technological research. Joint research laboratories have been set up between Politecnico and several private companies to respond to a specific research and development issue compatible with the university mission and scope.
Research activities are carried out in different facilities around the university campus. Currently, there are ten active laboratories specialized in different thematic areas:

EFB - Energy Factory Bari with GE AVIO Srl
I4M - Innovation for Mills Lab with Molino Casillo S.p.A.
MET- More Electric Transportation Lab with Centro Studi Componenti per Veicolo S.p.A. Gruppo Bosch
PolySense Lab with THORLABS GmbH
RDC - Repair Devolopment Center Lab with GE AVIO Srl
F-BARI Lab - Food and Beverage Automation and Robotics Innovation Laboratory
IPZS-POLIBA
HYPER
ETF -Energy Transition to the Future
BPM CC: Business Process Management Competence Center

EFB - Energy Factory Bari

AVIO AERO and Politecnico di Bari, in 2010, realized an integrated multidisciplinary laboratory called “Energy Factory Bari” (EFB), to develop research and development activities in areas of common interest in the fields of aerospace and energy.
The laboratory is located inside the university campus in Bari and it is connected with other laboratories operating in the fields of electrical, information, and mechanical engineering at Politecnico di Bari to develop experimental investigations.
The aim of the laboratory is to coordinate joint research activities, to identify issues for the growth of the Apulian Aerospace Technology District, to monitor the international scientific scene in order to identify the innovative ideas, and to create an area of integrated expertise and human resources in order to rationalize the efforts, according to the interest to both partners.
The research areas involved in the activities of the laboratory also cover:
high-speed electrical machines;
high frequency power converters;
control systems;
fluid mechanics and energy systems;
machine design;

control systems for gas turbine;
aeronautical sensors and motor accessories;
data analysis and software.
Currently, the laboratory enrolls about 40 researchers. Among the main laboratory facilities there is equipment to design test and characterize electrical machines and power electronic devices in the power range up to 200 kW.

I4M - Innovation for Mills

Molino Casillo (world leader in the processing and marketing of wheat) Idea75 (startup company in the engineering sector), and Politecnico di Bari have launched a joint public/private laboratory to develop research projects, product and process innovation within the Industry 4.0 mainframe in the following areas.
Energy efficiency and predictive maintenance of complex industrial processes:
advanced techniques for the efficient design of electric drives for flour milling industry,
innovative algorithms for predictive diagnosis of incipient faults of electric motors and drives.
Automation and Information systems for flour milling industry:
advanced algorithms, data analytics, and optimization to improve energy efficiency,
soft computing techniques for optimal production planning.
Technologies for zero-defect manufacturing:
advanced systems for predictive maintenance and process optimization,
innovative methods to improve the performance of the automation systems for the processing of wheat, production and packaging of flour.

MET - More Electric Transportation

Centro Studi Componenti per Veicoli S.p.A (a Bosch Group company) and Politecnico di Bari in 2016 started an integrated multidisciplinary laboratory called “More Electric Transportation” (MET) to develop a strategic partnership in research projects, technological development and innovation in the following areas:
Automation and Information systems for mobility:
big data analysis;
computer networks, wireless sensor networks;
urban mobility;
optimal control of nonlinear dynamic systems.
Technologies and electrical systems for transportation:
electrical machine design
control of electric drives

components and sensors, device integration;
automated test and measurement systems, diagnostics, SCADA systems.
Powertrain technologies
optimization of powertrain for hybrid applications;
exhaust post-treatment technology in hybrid applications;
innovative fuel supply systems.
Mechanical technologies for automotive applications
additive and unconventional manufacturing processes;
laser surface texturing;
plastics and new materials.

Polysense

Thorlabs, Inc. is a privately held optical equipment company headquartered in Newton, New Jersey. Thorlabs has about 1,500 employees and its production and research offices are located in different American States, Brazil, Canada, China, France, Germany, Japan, Sweden, and the United Kingdom. It sells approximately 20,000 different products with a turnover of 480 M$.
Thorlabs and Politecnico di Bari have established partnership for joint research activities, technological developments and innovations in the area of “Optical Gas sensing” and have launched an integrated multidisciplinary laboratory called “PolySense Lab” located in Physics Deptartment of Politecnico di Bari.
The activities of the joint research lab will be focus on the research and development of innovative optical gas sensing systems.
Main research activities of Polysense Lab are:
Development and implementation of novel techniques for gas sensing;
Highly sensitive trace gas sensors, portable, compact, robust for in situ & real time detection for the following potential applications:
Breath analysis;
Environmental monitoring;
Leaks detection;
Hydrocarbon gases monitoring;
Monitoring of hotspot areas (explosive precursors, narcotics).
To support the newly formed strategic partnership, Thorlabs provide the necessary instrumentation as well as technical staff and funding for both the research and personnel, while the university provide the laboratory and office space as well as conduct the research.

RDC - Repair Devolopment Center

GE Avio is a leader company in the design, production and maintenance of components and systems for civil and military aviation, with recognized excellence

within General Electric in the field of mechanical transmissions, low-pressure turbines, combustors, control systems, additive manufacturing and repair technologies.
In the framework of a long-term agreement between GE AVIO and Politecnico di Bari, the Repair Development Centre (RDC) has been introduced to develop innovative technologies to repair aeronautical components, and transfer the results of the research to actual components in the GE AVIO plants.
The main focuses are research and development of advanced repair systems based on additive manufacturing techniques able to guarantee the high-quality standards required for aeronautical applications.
The attention is focused on repair techniques based on laser deposition and cold-spray using dedicated experimental equipment available in the RDC laboratory.
Research and experiments are based on components with complex geometry made by materials difficult to repair with traditional techniques such as nickel- or cobalt-based super alloys, light alloys, intermetallic materials.

CPS - Cyber Physical Systems - Arol Bari

AROL SpA is globally recognized as a top of mind brand specialized in safety of closing solutions, capable of managing all the capping process from the analysis of the caps/containers till the product integrity after the capping.
AROL and Politecnico di Bari have launched a joint public/private laboratory (“Food and Beverage Automation and Robotics Innovation Laboratory” F-BARI Lab) to develop technologies in the field of industrial automation, electric drives, electric motors, control systems, SW development for HMI systems.
The main topics the R&D activities of the F-BARI Lab are:
Advanced techniques to size and design efficient drives and electric motors for industrial manufacturing applications;
Robotic systems for high speed applications
Innovative algorithms for predictive diagnostics;
High-speed vision systems;
Development of innovative sensors and laser spectrometry;
New collaborative man machine interface models.

Hyper Laboratory

Hyper is a public-private laboratory aimed to develop new technologies for very high-speed transport, including transport within pipes, the TransPod vehicle and hyperloop systems.
The researches include systems and components for railway, automotive, aeronautical and space markets.
The laboratory will develop new generation propulsion and communication technologies that will represent a leap forward compared to the current development

of hyperloop, with particular attention to sustainability, energy saving and ensuring a higher safety level for passengers and products.

Energy Transition to the Future - ETF

In 2018, the Centre for Combustion and Environment (CCA), a company of the Sofinter group (together with Ansaldo Boilers, Macchi, Itea, EuroPower), and Politecnico di Bari realized an integrated multidisciplinary laboratory called "Energy Transition to the Future" (ETF) in order to work together on research and development activities the aim to face the important challenges to make energy needs compatible with the environmental protection.

Energy is one of the 12 areas of specialization identified by the 2015-2020 PNR in line with the National Smart Specialization Strategy. In particular, this Area refers to "... innovative components, technologies and systems for the production, storage and distribution, under a logic of efficient management, of sustainable energy with a low CO2 content…".

In order to actively participate in the transition phase of the energy sector towards greater environmental sustainability, the ETF laboratory is an observatory that monitors the international scientific landscape for the identification of ideas for technological innovation as well as promote joint research and experimentation actions with particular attention to the following topics:

Numerical and experimental study of advanced combustion systems;
Study of thermo-acoustic instability;
Study of systems for the use of alternative and / or renewable fuels;
Processes of energy transformation and storage (gasification; power to gas; etc.);
SCADA systems for integrated process management;
Development of advanced instrumentation and diagnostics;
Power digitalization;
CHP - Combined Heat and Power generation;
Advanced materials for components with high thermal and chemical resistance;
Thermal vectors and PCM, Phase Changing Material.

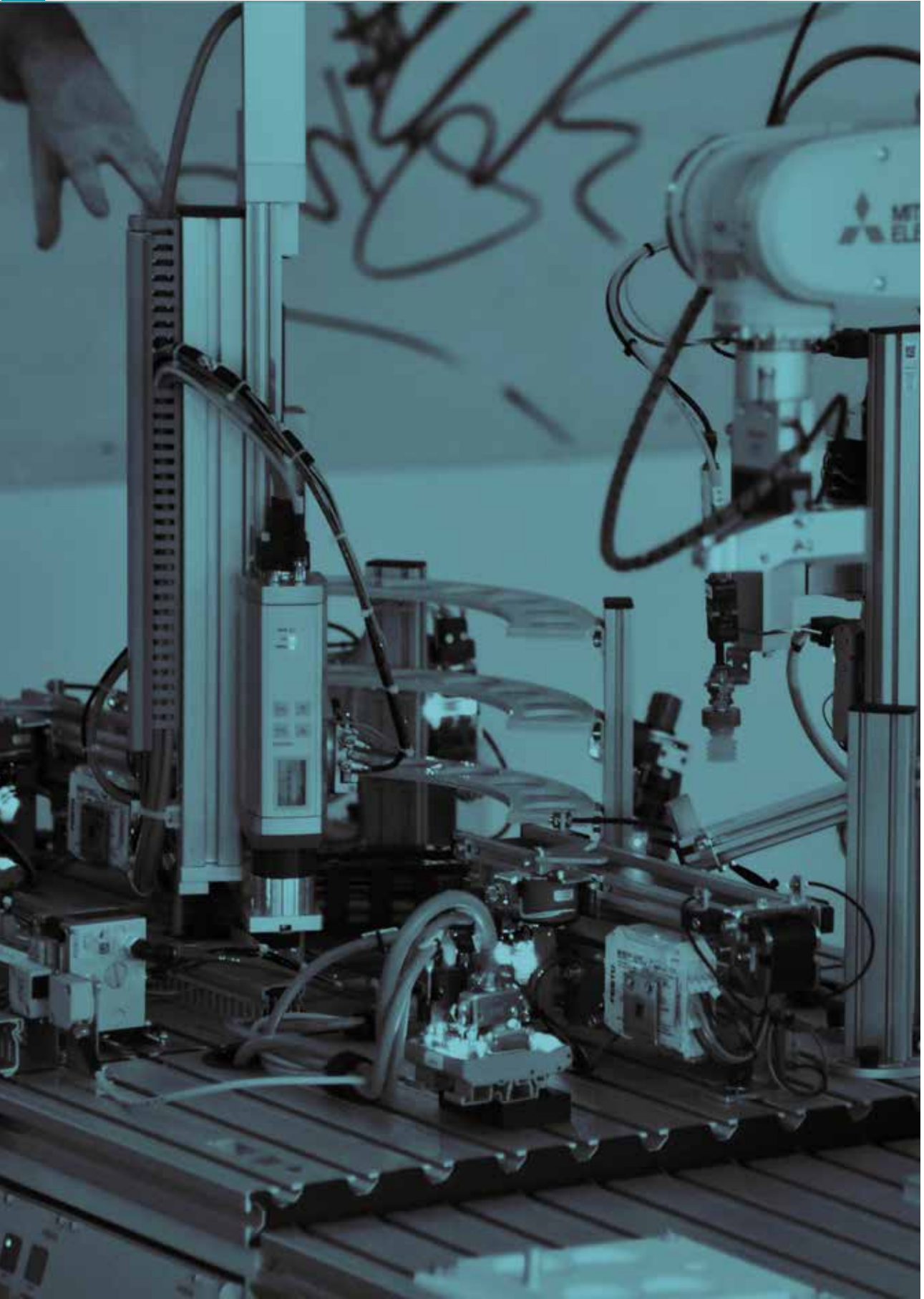
Currently, the laboratory enrolls about 10 researchers. The laboratory is located inside the university campus in Bari and it is connected with the CCA's experimental facilities in Gioia del Colle (BA) where prototypes (designed and numerically validated at the Politecnico di Bari) can be tested.

BPM-CC: Business Process Management Competence Center

Established in 2016 based on a strategical partnership between Politecnico di Bari and Openwork s.r.l, an independent software vendor specialized in the development of enterprise solutions based on business process management, the Business Process Management Competence Center carries out research, technological transfer and third mission activities on Business Process Management (BPM).

The Center is particularly interested in innovating and supporting the digital transformation of healthcare, public administration and production processes, with a focus on the industries more relevant to the regional economy, e.g. textile, wood furniture, auto component and mechanical industries. The Center also carries out research on how to innovate methods and technologies so as to improve the BPM reachness (i.e. ability to support processes that cross several organizations) and richness/ambidexterity (i.e. ability to address process criticalities while also transforming opportunities and visions into new processes). All the research activities are performed by leveraging on Industry 4.0 enabling technologies and green/sustainable business process management methods and techniques.

As to technological transfer and third mission activities, the Center supports companies interested in improving and digitally transform their own business processes. The Center also organizes lifelong learning courses, seminars and workshops on process organizations, business process management and, in general, business administration.



PUBLIC-PRIVATE JOINT LAB

Casillo GROUP

Avio Aero
A GE Aviation Business

exprivia

BOSCH
Tecnologia per la vita

CCA Centro Combustione Ambiente

Politecnico di Bari

AC BOILERS

itea

MACCHI

THORLABS

AROL
closure systems

ETF
LAB – Energy Transition to the Future

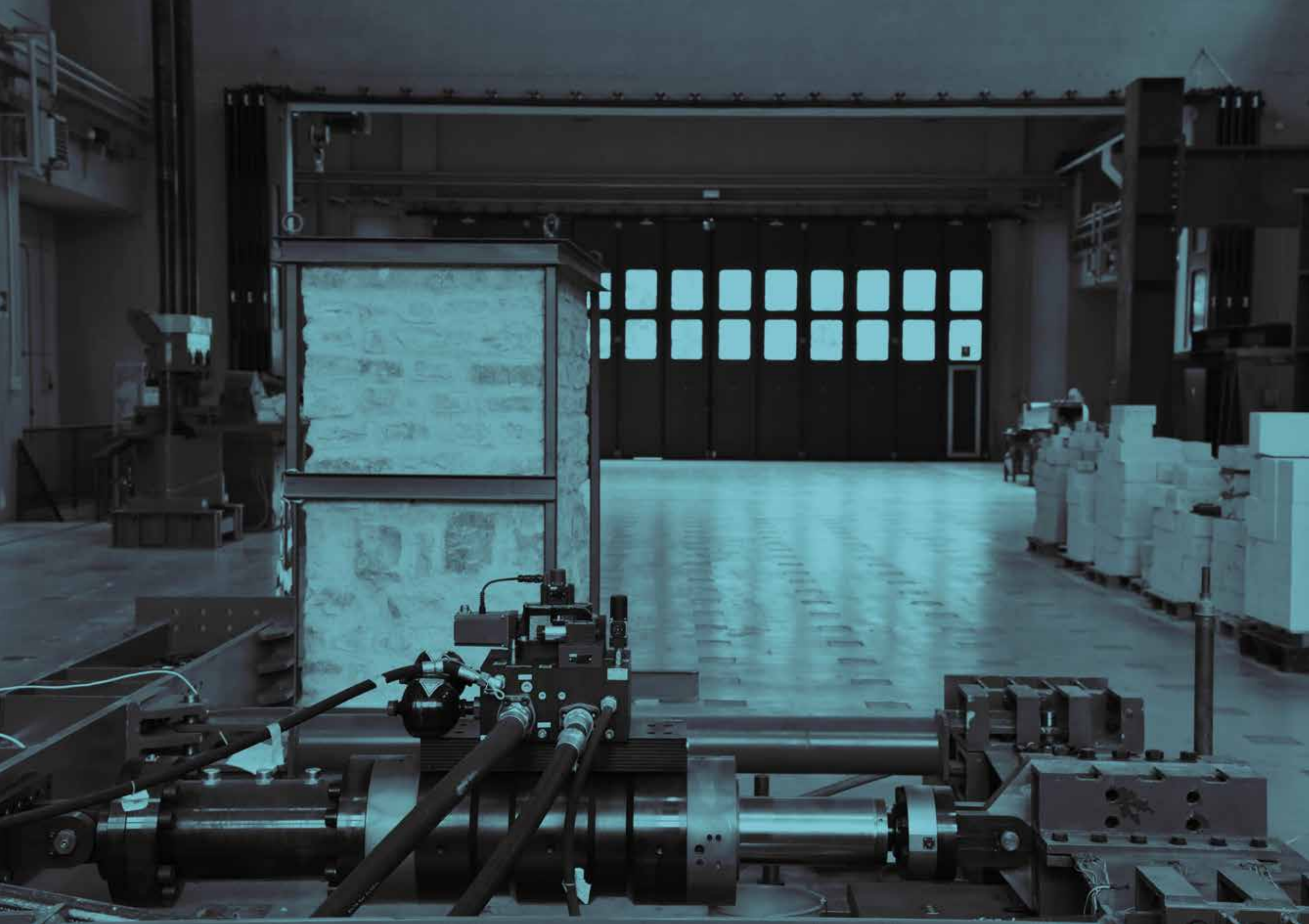
MAIN RESEARCH PROJECTS

Politecnico di Bari has been involved in different European research projects both as lead partner and as project partner. The academic staff has reached up a great experience and good competences in preparing targeting projects proposals as well as in achieving the projects objectives.

In the last three years, Politecnico di Bari has been taking part in more than 15 European projects for a total of three million euros.

Politecnico di Bari has participated in different programmes aiming at supporting and enhancing collaborative and multidisciplinary research and strengthening the collaborations at international level. such as:

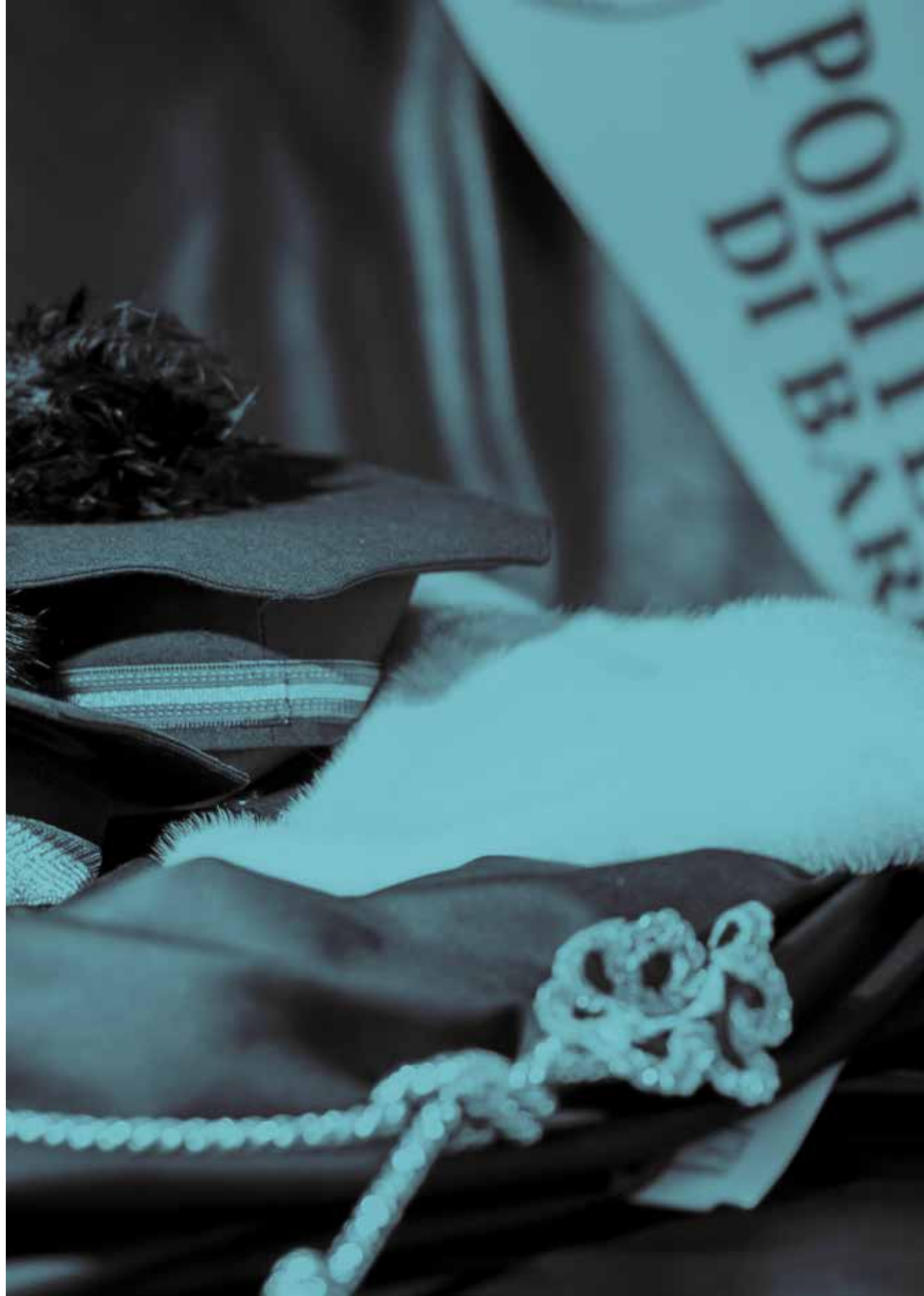
European FP7 framework
Horizon2020
INTERREG
IPA Adriatic Cross-border Cooperation Programme
Trans-European Transport Network Executive Agency
South East Europe
MISE - Ministry of Economic Development
MAECI - Ministry of Foreign Affairs
MIUR - PONRI - Ministry of Research and Universities



CATALOGUE OF RESEARCH

The products of the research of Politecnico di Bari (publications, patents…) are managed, made visible and searchable through the new Catalogue of Research.
The catalogue of research is a system of research integrated data management, purchased by the University in order to ensure maximum visibility and dissemination of its scientific production.
It is an Open File Access that collects and gives access to the bibliographic information and, in accordance with the policies of copyright of the publishers, to the full texts of the scientific products where permitted.
The University has adopted, since December 2015 with decree of the Rector, the policy of Politecnico di Bari on the open access (Open Access) to scientific literature based on the principle for which the results of research financed with public funds must be publicly available.

The products of the research of the University are available at the following link:
https://iris.poliba.it/



POLIBA ALUMNI ASSOCIATION

Poliba Alumni is the association of graduates of the Politecnico di Bari, strongly desired by the University's Governance. The Association, led by a Board of 7 Alumni, essentially aims to create and maintain stable relationships between members, promoting initiatives in their favor, carrying out cultural activities, encouraging meetings and networking experiences among Alumni.
The Alumni Association intends to contribute to the inclusion of graduates of the Politecnico di Bari in the world of work and to provide support, including material support, for university development projects with particular reference to the Educational Offer, to the Students, to the Research. The Association also aims to promote the development of the University, improve and strengthen the information service for students and members; contribute to giving visibility and prestige to the Politecnico di Bari.

"*Much of the value of the Politecnico lies in the value of its Alumni. It is fundamental to put them in contact with each other, to enhance and support them*".

One of the objective of the Association is to create a network to share experiences with an advantage not only for young graduates, but also for professionals who have graduated from Poliba and who intend to continue to build a virtuous network of contacts and knowledge. inside and outside the Polytechnic.

polibalumni association

The advantages reserved for Alumni are:
Free participation in exclusive events organized by the Association;
Concessions for participation in training courses organized by the Association;
Participation in the calls for study awards made available by our supporters and partners;
Concrete help in employment research, through direct contact with companies;
Creation of an international professional network;
Registration and / or renewal registration methods;
To join and support the Poliba Alumni Association it is necessary to register and pay the annual membership fee.

Past president:
Eng. Anna Matteo (2016-2019)
President:
Eng. Mariarita Costanza
Vice President:
Prof. Arch. Loredana Ficarelli
Website:
https://alumni.poliba.it/home
Contacts:
presidentealumni@poliba.it
alumni@poliba.it

INDUSTRIAL LIAISON OFFICE

The Industrial Liaison Office (ILO) of Politecnico di Bari is the organizational structure designed to support the university staff in the exploitation of research outcomes.
The mission of ILO of Politecnico di Bari is to strengthen the interaction and cooperation between research structures, territorial production system and public institutions ensuring the transfer of competences and technologies from the academic structures to the different regional, national and transnational productive contexts.
The ILO of Politecnico di Bari continuously works in the creation of collaborative relationships between university and industrial organizations by gathering the technological innovation instances coming from the market and matching with the University's capacities, skills and technologies.
The ILO provides a range of different services with the specific objective to promote entrepreneurship, transfer of skills from university to firms and create new firms from academic spin-offs.

The ILO provides the following services:
Scouting of technologies, skills, competences and so on: the ILO staff gives assistance and support to researchers in the process of protecting their invention;
Networking: the ILO creates opportunities to facilitate and enhance knowledge transfer from universities to businesses;
Organization of seminars, meetings and events focusing on technological transfer: the ILO supports the dissemination of scientific studies and new technologies by interacting with different stakeholders in the region;
Communication: provision of the necessary tools for creating short advertising spots to promote activities not only of the academic departments but also of the involved companies;
Assistance in the creation of spin-offs companies: the aim is to exploit the results of academic research and to boost competitiveness and economic and social development of the region;
Promotion of spin-off companies: the ILO staff carries on specific activities to promote and create opportunities for spin-off companies.

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