UNIVERSITÀ
POLITECNICA
DELLE MARCHE

DICEA

Department of Construction and Civil Engineering and Architecture

2023

www.dicea.univpm.it

UNIVERSITÀ POLITECNICA DELLE MARCHE

THE NUMBERS OF EXCELLENCE: DICEA in the last 5 years

last 5years of DICEA

ranking

DICEA ranked first among departments of excellence in both 2018 and 2022

quality in scientific research

DICEA improved its excellent results from 2011-14 in the 2015-19 VQR

high-level researcher involvement

Several researchers of recognized international prestige belong to the DICEA, as evidenced by their visibility on international databases and their ranking compared to their Italian colleagues in the same SSD (Scopus H-index).

ability to attract funding

over the past 5 years, DICEA has increased its ability to attract resources, both international (2 EU H2020 projects, 2 USA Institutions funded projects, 2 EU Interreg projects, 1 EU Homeland Security Fund project, 1 EU LIFE project, 3 EU Erasmus+ projects) and high-level national (including 5 EU PRIN projects), totaling more than €5.5 million. In addition to the approximately € 6.5 million from the previous DE.

financed scientific research

In the past 5 years, scientific research funded by agencies and companies has increased, both in number and total amount (870,000 €/year, peaking at about 1 million € in 2020 and 2021), despite the Covid-19 pandemic.

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THE NUMBERS OF EXCELLENCE: DICEA into numbers by 2022

DICEA

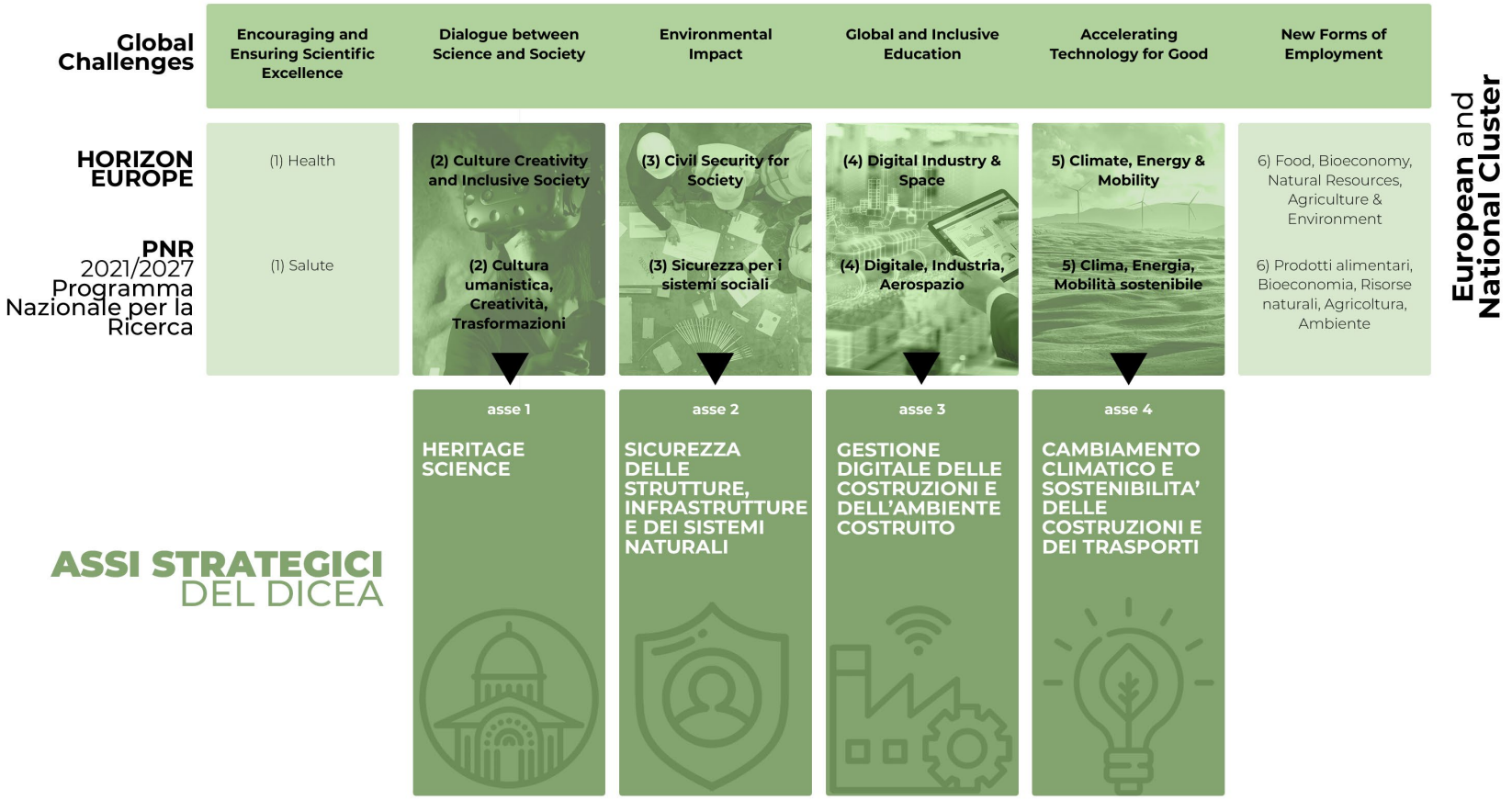
Department of Excellence
for the 2nd consecutive five-year period, consolidating its leading position in university scientific research!

2018-22 | excellence
2023-27 | excellence

The Head of the Department
Professor Enrico Quagliarini

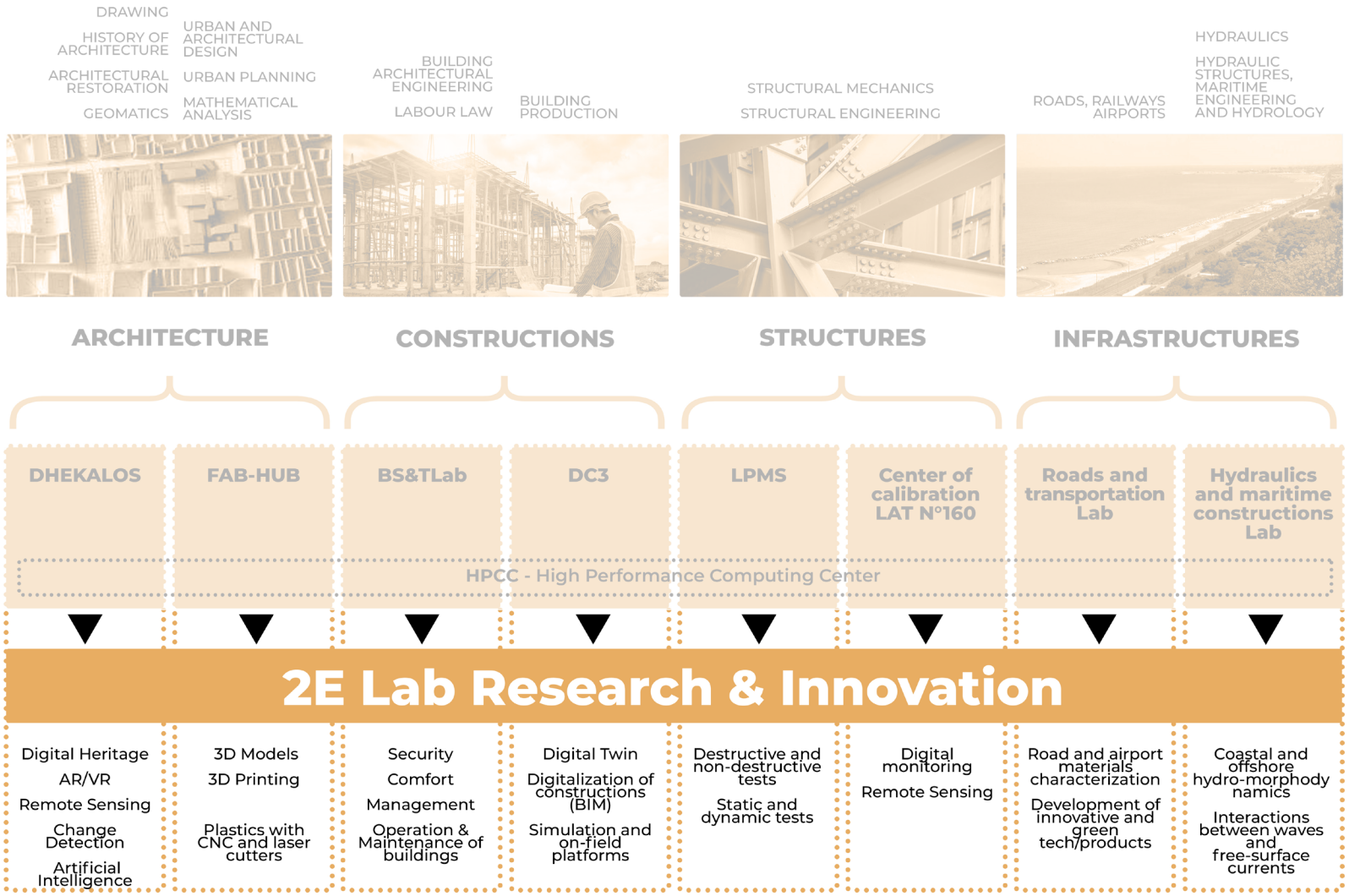
4 strategic axes of research

1 | Heritage Science
2 | Safety of Structures, Infrastructure and Natural Systems
3 | Digital Management of Construction and the Built Environment
4 | Climate Change and Sustainability of Construction and Transportation



2E lab
digital education lab

> a hub for students and professionals education
> it cross-links all of DICEA's labs
> it is intended as an enabling tool for the virtual design and construction of environments, buildings and infrastructure



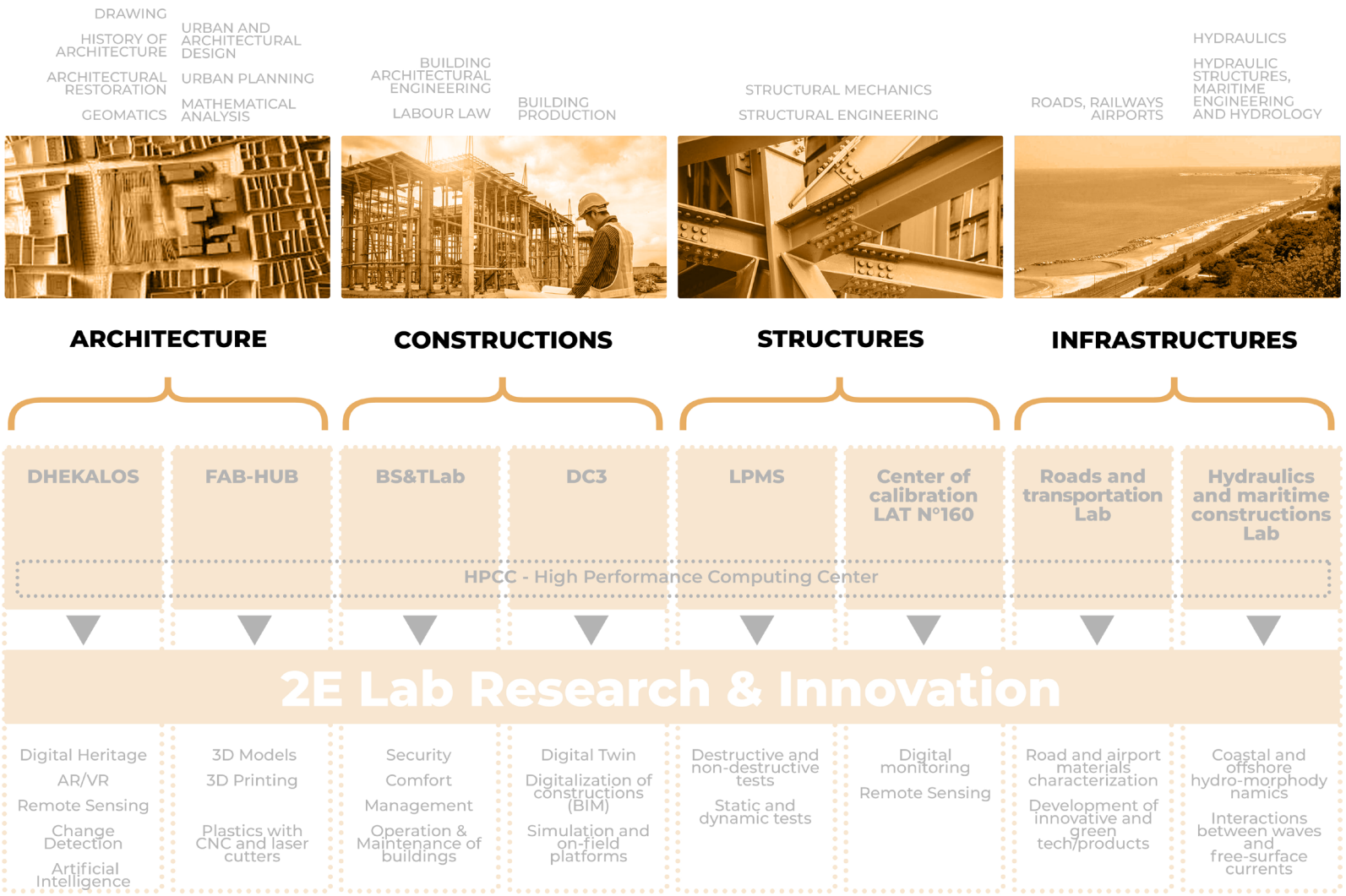
UNIVERSITÀ POLITECNICA DELLE MARCHE

THE STRUCTURE OF THE DEPARTMENT

4 research sections

1 | Architecture
2 | Construction
3 | Structures
4 | Infrastructures

each section combines **2 research areas**



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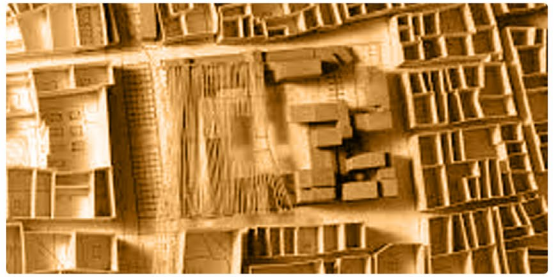
THE STRUCTURE OF THE DEPARTMENT



ARCHITECTURE

- Digital &Heritage
- Hub 4 Heritage &Habitat
- Mathematics

CONSTRUCTIONS

- Building Architectural Engineering
- Digital & Built environment

STRUCTURES

- Structural Mechanics
- Structural Engineering

INFRASTRUCTURES

- Hydraulics
- Transportation Infrastructures

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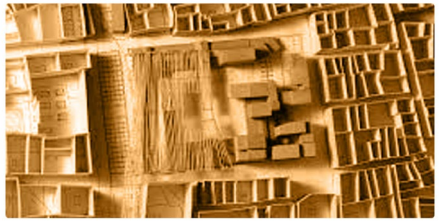
THE STRUCTURE OF THE DEPARTMENT



ARCHITECTURE

SSD
ICAR/06
ICAR/17
ICAR/18
ICAR/19

Digital & Heritage

mission

is committed to study historical, architectural, territorial, and environmental heritage through a dynamic and continuous process that enriches knowledge of history, culture, and diversity in the fields of architecture and landscape/territory. This aims to provide a clearer understanding of historical dynamics, cultural influences, as well as changes that have occurred on the territory over time.

lab: DHEKALOS

is an interdisciplinary lab on Digital Cultural Heritage at DICEA UNIVPM. The laboratory drives a scientific process that spans from knowledge to the conservation and enhancement of cultural heritage, both tangible and intangible. Two closely integrated research groups cover the spectrum of competences of the laboratory: Digital Cultural Heritage (DISTORI), which deals with the digitalization of cultural heritage (photogrammetry, TLS, 3D modeling, HBIM, ICTs, Virtual, Augmented, and Mixed Reality, VR movies and digital transformation of CH as a whole), and Geomatics Applications & Processing (GAP), which focuses on the processing of certified geo-spatial data for environmental monitoring, landscape control, and spatio-temporal dynamics (remote sensing, digital cartography and photogrammetry, GNSS, Lidar, SLAM into data collection for the transition from GIS to CityGML).

people

Prof. Paolo Clini
Prof.ssa Eva Savina Malinverni
Prof. Antonello Alici
Prof.ssa Ramona Quattrini
Dott.ssa Romina Nespeca
Dott. Roberto Pierdicca
Dott.ssa Chiara Mariotti
Anna Paola Pugnaloni
Sagone Luigi

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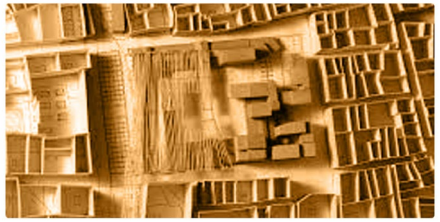

ARCHITECTURE

SSD
ICAR/14
ICAR/21

Hub for Heritage and Habitat

mission

the research focuses on the following areas:
_architectural design, urban planning and reuse, transformation and enhancement of built heritage in historical contexts;
_strategic visions and scenarios for the regeneration of architectures, cities, territories, and landscapes;
_territorial branding and smart cities to foster resilience to climate change and societal challenges;
_recycle and circular economy strategies applied to architecture, city and territory.

lab: FAB-HUB

is a new manufacturing and 3D printing laboratory for the creation of architectural and urban models and small structures in wood, metal and other materials. It supports the research and training activity of DICEA, offering itself as a point of excellence for the creation of innovation and the advancement of development in multiple design scales and fields: from architectural, technological, structural and industrial design to urban design. Innovative projects for a realistic reproduction of buildings, monuments scanned with laser, city skylines, objects and architectural, structural and technological details. Students can benefit from the lab equipment, creating their scale building models with different materials such as polymers, clay, wood, silicone, metal. The available technologies expand the possibilities of investigation and advancement in this research field.

people

Prof. Gianluigi Mondaini
Prof. Paolo Bonvini
Prof.ssa. Maddalena Ferretti
Prof. Francesco Rotondo
Floriano Capponi
Gianni Plescia

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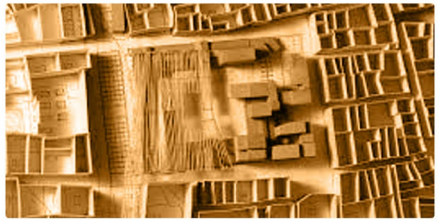
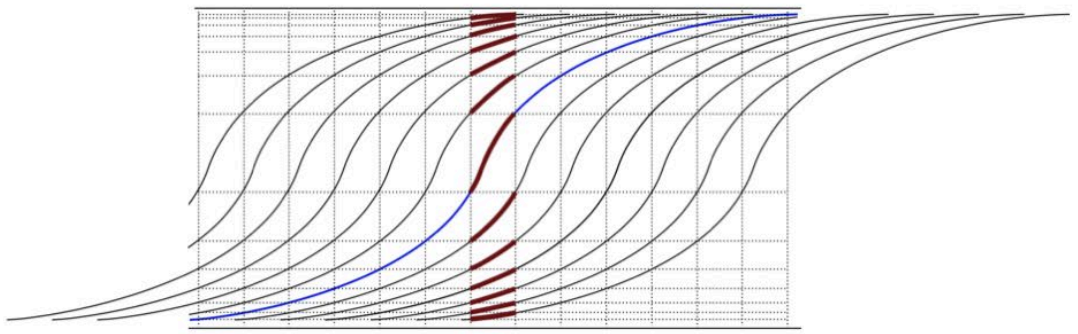
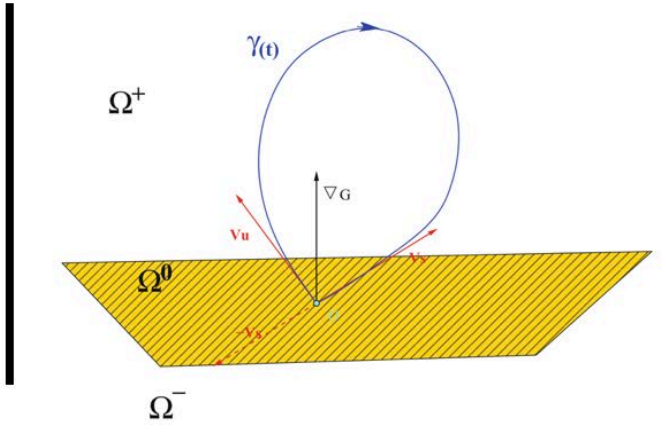


ARCHITECTURE

Mathematics

SSD
MAT/05





mission

the research activity of the group deals with various fields of Mathematical Analysis, in particular focusing on the study of the existence and multiplicity of solutions of ordinary and partial differential equations by variational and topological methods, degree theory, and dynamical systems techniques.

research activities

the main research strands of the group are as follows:

1 | Variational methods for semilinear elliptic equations

2 | Boundary value problems for ordinary and functional differential equations

3 | Topological degree, fixed point index and applications in nonlinear analysis

people

Prof. Alessandro Calamai
Prof. Piero Montecchiari

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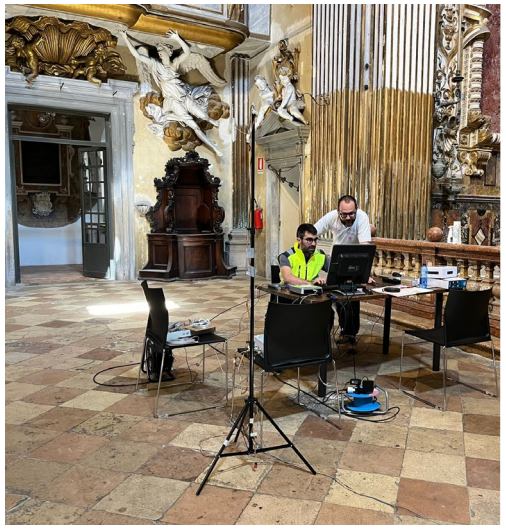
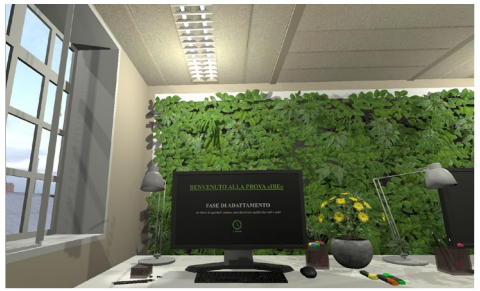
THE STRUCTURE OF THE DEPARTMENT

CONSTRUCTIONS

SSD
ICAR/10
IUS/07






Building Architectural Engineering

mission

the research activity concerns the development of technological solutions, tools and services for the improvement of the built environment from the points of view of safety, comfort, management, use. The Group carries out several European, national and local research projects. It actively collaborates with national and international subjects in the research and production sectors and with numerous Local Bodies. The group is engaged in constant actions of technology transfer and enhancement of knowledge deriving from research.

lab: BS&T

it supports research activities related to the development of innovative building technologies and smart buildings that can adapt and respond to user needs for comfort and safety, considering economic and environmental aspects in the life cycle.

It is divided into 4 macro-areas of activity:
1 | **Materials and building components testing**
2 | **Human interaction analysis**
3 | **Full-scale experimental buildings for long-term in situ measurements**
4 | **Computing center**

people

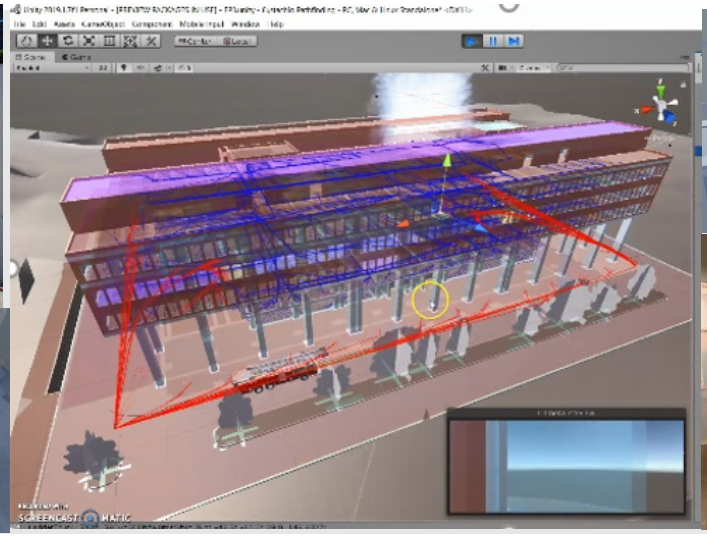
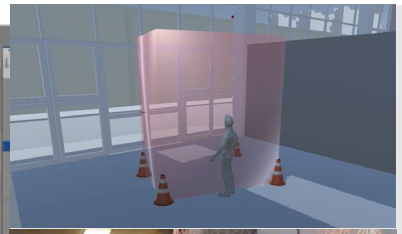
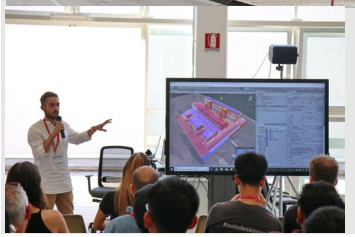
Prof. Placido Munafò
Prof. Marco D'Orazio
Prof. Enrico Quagliarini
Prof. Giovanni Zampini
Prof.ssa Elisa Di Giuseppe
Prof. Gabriele Bernardini
Dott. Francesco Monni
Ing. Andrea Gianangeli

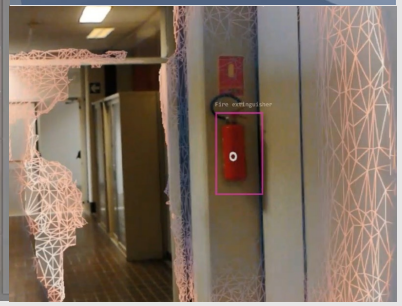
UNIVERSITÀ POLITECNICA DELLE MARCHE

THE STRUCTURE OF THE DEPARTMENT

CONSTRUCTIONS

SSD
ICAR/11



Digital & Built Environment

mission

This research team carries out teaching, research activities and consulting to develop, customize and implement digital technologies and innovative methodologies to control construction processes in **complex domains**. This includes the management of complexity and real-time simulation tools. Preferred applications are the production phase and the management of the built environment, mainly concerning **BIM modelling**, **Digital Twins** and related techniques and challenges, such as information modelling, knowledge management, immersive simulation tools.

lab: DC3 Digital Construction Capability Centre

is a full-scale laboratory and demonstration center ("capability center") of the advanced digital technologies and innovative processes required to attain the topics of the mission of the research team. They include augmented and mixed reality (**AR/MR**), HW and SW architectures to develop and demonstrate **digital twins** in full-scale applications, real-time **tracking and monitoring systems**, **AI-based reasoners** to manage complex scenarios (e.g. **health and safety** in construction sites, **project control**, construction **project management**), **decision-making** tools, platforms for the implementation of **BIM-based** processes. The DC3 hosts **demonstrators** of typical construction process scenarios, to **showcase** at what extent digital technologies and advanced management methods can help **manage the built environment**. Such situations can be reproduced for any of the macro-phases of the construction process.

people

Prof. Berardo Naticchia
Prof. Massimo Lemma
Prof. Alberto Giretti
Prof. Alessandro Carbonari
Dott.ssa Alessandra Corneli
Dott. Leonardo Messi
Dott. Francesco Spegni
Dott. Massimo Vaccarini

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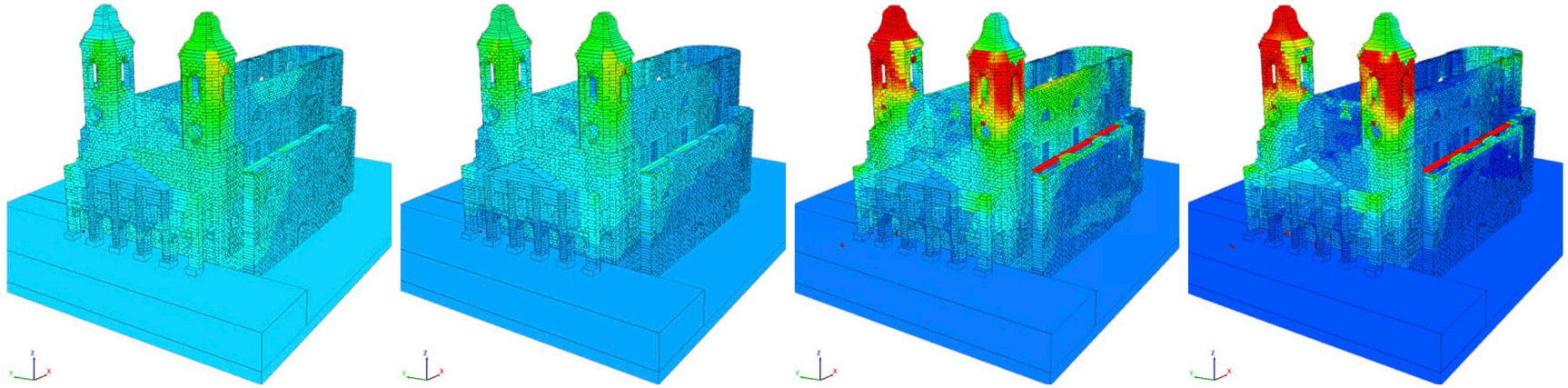
THE STRUCTURE OF THE DEPARTMENT

STRUCTURES

SSD
ICAR/08



Structural Mechanics

mission

the research group develops and disseminates knowledge, tools and innovative techniques for understanding and solving problems in the realm of applied science and engineering. It investigates the static and dynamic behavior of structures. It aims at designing buildings and mechanical parts, and any other component for the benefit of mechanical engineering and architectural design. The group also tackles issues in bio and nano engineering paying attention to advanced materials.

lab: LPMS

the Official Materials and Structures Testing Laboratory "Prof. Giovanni Menditto" (LPMS) is specialized in performing tests for the mechanical characterization of materials, using presses and small electrohydraulic actuators; quasi-static, cyclic and pseudo-dynamic tests on structural components and prototype scale structures, with both vertical and horizontal forcings thanks to major frames and a steel contrast wall, large electrohydraulic actuators and a vibrodyn. The Lab has instruments for conventional in situ investigations and dynamic identification, both for defining the mechanical characteristics of existing buildings (including historic and architecturally valuable buildings) and for operations related to the testing and monitoring of new and existing structures. The Lab operates in both teaching (experimental research theses) and research through collaboration with companies and individuals.

people

Prof. Fabrizio Davì
Prof. Stefano Lenci
Prof. Giovanni Lancioni
Prof. Michele Serpilli
Prof. Francesco Clementi
Dott. Pierpaolo Belardinelli
Dott.ssa. Valeria Settimi

UNIVERSITÀ POLITECNICA DELLE MARCHE

THE STRUCTURE OF THE DEPARTMENT

STRUCTURES

Structural Engineering

SSD
ICAR/09

mission

to explore topics of primary interest in Structural Engineering. The group is among the international leaders in the field of steel-concrete composite bridges, with significant contributions in analytical modelling, long-term effects, and construction techniques. It is also recognized in important research fields of earthquake engineering and structural dynamics, such as soil-foundation-structure interaction, base isolation systems, structural identification and monitoring, and innovative materials for structural reinforcement.

lab: LPMS

the Official Materials and Structures Testing Laboratory "Prof. Giovanni Menditto" (LPMS) is specialized in performing: tests for the mechanical characterization of materials, using presses and small electrohydraulic actuators; quasi-static, cyclic and pseudo-dynamic tests on structural components and prototype scale structures, with both vertical and horizontal forcings thanks to major frames and a steel contrast wall, large electrohydraulic actuators and a vibrodyn. The Lab has instruments for conventional in situ investigations and dynamic identification, both for defining the mechanical characteristics of existing buildings (including historic and architecturally valuable buildings) and for operations related to the testing and monitoring of new and existing structures. The Lab operates in both teaching (experimental research theses) and research through collaboration with companies and individuals.

people

Prof. Roberto Capozucca
Prof. Fabrizio Gara
Prof. Sandro Carbonari
Prof.ssa Laura Ragni
Dott.ssa Erica Magagnini
Andrea Conti
Stefano Bufarini
Carlo Perticarini

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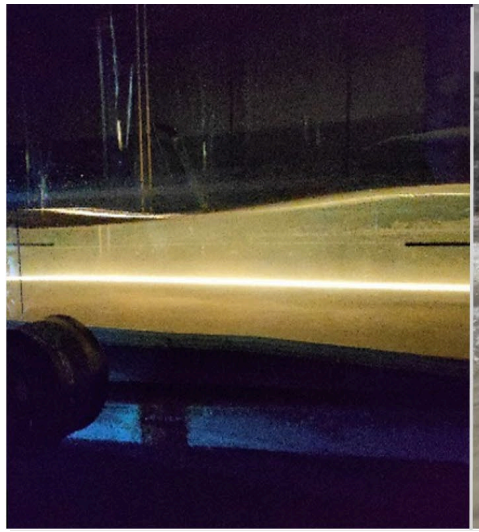
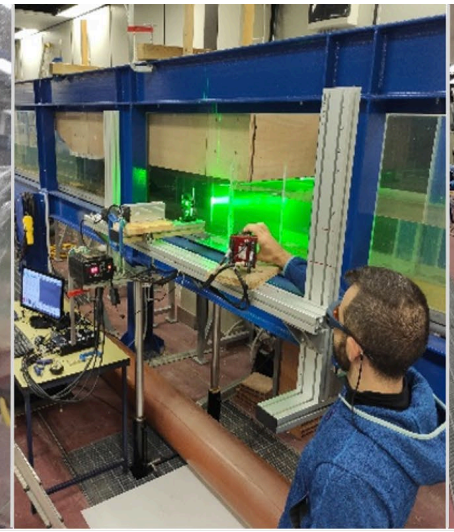
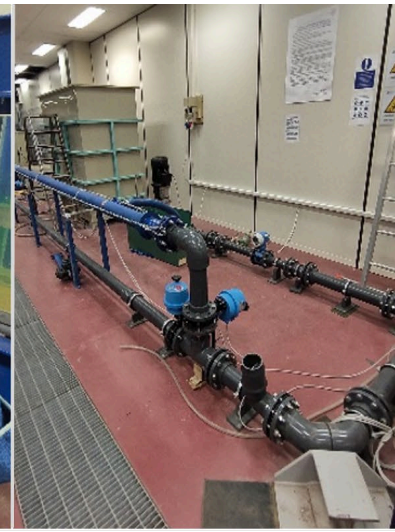
THE STRUCTURE OF THE DEPARTMENT

INFRASTRUCTURES

Hydraulics

SSD
ICAR/01
ICAR/02



mission

teaching, researching and supporting activities and/or collaboration with external organisations and companies operating or with interests in the hydraulics sector. The research group in the Hydraulics area works mainly in Fluid Mechanics, Biofluid Dynamics, Environmental Hydraulics, Hydrology, Hydraulic and Fluvial Constructions, and Maritime, Coastal and Offshore Hydraulics and Engineering.

lab: Hydraulics and Maritime Construction

the Hydraulics group has the Hydraulics and Maritime Construction Laboratory, which houses equipment and instruments useful for studies and simulations of: marine and river dynamics, pressure flows, biological flows.

people

Prof. Maurizio Brocchini
Prof.ssa Sara Corvaro
Dott.ssa Giovanna Darvini
Prof. Carlo Lorenzoni
Prof. Matteo Postacchini
Prof. Luciano Soldini
Dott. Gianluca Zitti
Livio Luccarini
Giacomo Trozzi

UNIVERSITÀ POLITECNICA DELLE MARCHE

THE STRUCTURE OF THE DEPARTMENT

INFRASTRUCTURES

Transportation Infrastructures

SSD
ICAR/04

mission

teaching and research activities focus on design, maintenance, management and material characterisation for road and airport infrastructures. In recent years, the research group is mainly addressed to pursuit innovative solutions for sustainable mobility, circular economy and transition to smart infrastructures.

lab: Roads and Transportation

the research and training activities are developed using a fully equipped laboratory that is set in a facility of about 800 m^2 with some of the most advanced equipment for the mechanical characterization of innovative and sustainable road and airport materials.

The main fields of interest are:
1 | **Laboratory of Rheology of Binders**
2 | **Laboratory of Dynamic Testing of Mixtures**
3 | **MOST (National Center for Sustainable Mobility) Laboratory**
4 | **Laboratory of Transportation Geotechnics**

people

Prof. Francesco Canestrari
Prof. Andrea Graziani
Prof. Amedeo Virgili
Prof. Fabrizio Cardone
Prof. Gilda Ferrotti
Ph.D. Andrea Grilli
Pierluigi Priori