



Anno 2013

Politecnico di MILANO >> Sua-Rd di Struttura: "Ingegneria Civile e Ambientale"

B.1.b Gruppi di Ricerca

1. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Environmental
Descrizione	Scientific and academic activities dedicated to environmental quality assessment, analysis and evaluation of mitigation and reclamation measures and strategies, remediation technologies and resource recycling and reutilisation. Main specific areas of interest and expertise. Advanced treatment technologies (physical, chemical and biological) of urban and industrial wastewater, process monitoring and control systems. Enhanced wastewater treatments for industrial and agricultural reutilization. Surface water quality management and planning, analysis and evaluation of alternative strategies for systems reclamation. Air quality analysis, management and planning, emission inventories. Control technologies for gaseous and particulate atmospheric pollutants. Environmental impact assessment of industrial sites and civil infrastructures. Analysis and evaluation of integrated system options for solid wastes management and treatment. Human health risk assessment of toxic pollutants. Treatment technologies for reclamation of contaminated soils and sediments. Reclamation of contaminated groundwater pollution. Environmental management and certification systems: management systems (ISO 14001, EMAS), life cycle analysis (LCA), ecological labelling (ISO 14020 - Ecolabel); indicators and indexes (ISO 14031). Research lines. Groundwater, soils and sediments remediation. Risk assessment for contaminated sites. Waste prevention and material and energy recovery from waste. Treatments of municipal solid waste and recovery of the residues from treatment of waste. Life Cycle Assessment of waste management and treatment. Air quality and characterization of airborne particulate matter. Characterization of emissions. Emission control technologies. Monitoring and assessment of the environmental quality status. Environmental Impact Assessment. Wastewater and drinking water disinfection. Processes for pollutant removal from wastewater and drinking water. Biogas production from agro-zootecnical waste. Wastewater treatment sludge management.
Sito web	www.dica.polimi.it
Responsabile scientifico/Coordinatore	CERNUSCHI Stefano (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:

LS7_10 - Environment and health risks, occupational medicine

LS9_8 - Environmental biotechnology, bioremediation, biodegradation

PE10_1 - Atmospheric chemistry, atmospheric composition, air pollution

PE10_17 - Hydrology, water and soil pollution

PE10_9 - Biogeochemistry, biogeochemical cycles, environmental chemistry

PE1_14 - Statistics

PE1_20 - Application of mathematics in sciences

PE4_12 - Chemical reactions: mechanisms, dynamics, kinetics and catalytic reactions

PE4_15 - Photochemistry

PE6_12 - Scientific computing, simulation and modelling tools

PE7_3 - Simulation engineering and modelling

PE7_4 - Systems engineering, sensorics, actorics, automation

PE8_10 - Production technology, process engineering

PE8_12 - Sustainable design (for recycling, for environment, eco-design)

PE8_3 - Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment

SH3_1 - Environment, resources and sustainability

SH3_12 - Geo-information and spatial data analysis

SH3_9 - Spatial development and architecture, land use, regional planning

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BIGANZOLI	Laura	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
CANZIANI	Roberto	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/03
CAREGHINI	Alessandro	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
CATENACCI	Arianna	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
CEVIRGEN	Serap	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
DI COSMO	Roberto	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
FICARA	Elena	Ingegneria Civile e Ambientale	Ricercatore	ICAR/03
FALBO	Alida	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
FORTE	Federica	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
GIUGLIANO	Michele	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/03
GROSSO	Mario	Ingegneria Civile e Ambientale	Ricercatore	ICAR/03
LANFREDI	Caterina	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
LONATI	Giovanni	Ingegneria Civile e Ambientale	Ricercatore	ICAR/03
LOVATO	Francesca	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
MALPEI	Francesca	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/03
MARRE' TIRADO	Miguel Levi	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
MASTORGIO	Andrea Filippo	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
NESSI	Simone	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
ANTONELLI	Manuela	Ingegneria Civile e Ambientale	Ricercatore	ICAR/03
PULCINI	Dalila	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
PORQUEDDU	Isabella	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
PIAZZOLI	Andrea	Ingegneria Civile e Ambientale	Assegnista	ING-IND/03
RIGAMONTI	Lucia	Ingegneria Civile e Ambientale	Ric. a tempo determ.	ICAR/03
SCAGLIONE	Davide	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
SIGNORINI	Stefano	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
SAPONARO	Sabrina Francesca	Ingegneria Civile e Ambientale	Ricercatore	ICAR/03
STREITENBERGER	Caterina	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
STERPI	Irene	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
SUTTI	Marco	Ingegneria Civile e Ambientale	Assegnista	ING-IND/09
SEZENNA	Elena	Ingegneria Civile e Ambientale	Ricercatore	ICAR/03
TELI	Aronne	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
TUROLLA	Andrea	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
VISMARA	Renato Francesco	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/03

YUAN	Tugui	Ingegneria Civile e Ambientale	Dottorando	ICAR/03
OZGEN	Mueyyet Senem	Ingegneria Civile e Ambientale	Assegnista	ICAR/03
AZZELLINO	Arianna	Ingegneria Civile e Ambientale	Ricercatore	ICAR/03

2. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Geodesy and Geomatic area
Descrizione	This area is deeply rooted in the history of Politecnico and is characterized as having always been a promoter of advanced research themes, both at the national and international level. Following the developments in the fields of electronics and informatics, the evolution in the topics regarding earth observation and data acquisition through images has led to the establishment of a new frontier for this area, which is nowadays known as Geomatics. The main research lines include subjects such as Physical and Mathematical Geodesy, surveying methodologies based on Global Navigation Satellite System (GNSS), Photogrammetric and Remote Sensing techniques, Digital Cartography and Geographical Information Systems (GIS). Regarding Physical and Mathematical Geodesy, the on-going research projects cover the main themes of these disciplines: Boundary Value Problem (BVP) analysis and Earth gravity field estimate, both at regional and global level; the latter activity is based on the exploitation of satellite gradiometry data, namely from the ESA GOCE mission. Furthermore, these activities are carried on in the frame of the International Service for the Geoid (ISG), formerly IGeS, an official service of the International Association of Geodesy, based at Politecnico di Milano. Research projects regarding GNSS Survey techniques are on-going at both methodological and application level. Also in this field, original approaches have been and are being studied to analyse GNSS data acquired by different operational procedures. Activities in the field of Digital Photogrammetry are mainly focused on studies related to automatic matching techniques and close-range applications. In the area of Digital Cartography and Geographical Information Systems (GIS), research projects are directed at studying problems involving standardization, interoperability and its various aspects, data quality analysis and WebGIS / GIS for Mobile applications. It has to be underlined that all the described activities share a common ground represented by the stochastic modeling of data and by the use of stochastic prediction and inference methods. These fundamental aspects, on which research work is also carried on, represent a basis for all the activities, leading to substantial contributions both in the methodological approach and in numerical applications. Since long time, co-operation with other research areas within Politecnico has been established; in particular there are strong connections with the modeling and simulation area and with the signal analysis and remote sensing area at DEIB (Department of Electronics, Information and Bioengineering). At the Italian national level, long-time partnerships have been established with Italian Space Agency (ASI); National Research Council (CNR); National Institute for Geophysics and Volcanism (INGV); National Institute for Oceanography and Experimental Geophysics (OGS); Military Geographic Institute (IGM). At the international level, the most important co-operations are with: Aristotle University of Thessaloniki, Greece; Niels Bohr Institut - University of Copenhagen, Denmark; University of Calgary, Canada; Universidad de Jaén, Spain; Universidade de Sao Paulo, Brasil; Stuttgart University, Germany; Abdus Salam International Centre for Theoretical Physics (ICTP), based in Italy; European Space Agency (ESA); Joint Research Centre (JRC); National Imagery and Mapping Agency (NIMA). Technology Transfer activities are on-going with ENI, based on gravimetric data analysis for oil exploration, and with a large number of public authorities and private companies. Research lines Physical and mathematical geodesy Global and local gravity field estimation Inverse gravimetric problems Digital Terrain and Surface Models Dynamic Sea Surface determination GNSS techniques Permanent and non-permanent GNSS networks Digital photogrammetry, remote sensing and UAV applications Digital cartography and Geographical Information Systems Multi-dimensional Internet e mobile GIS, Web platforms for geodata sharing Historical cartography and historical geodata Very Long Baseline Interferometry (VLBI) techniques Geomatics applications for forensics
Sito web	www.dica.polimi.it
Responsabile scientifico/Coordinatore	PINTO Livio (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:

PE10_13 - Physical geography
PE10_14 - Earth observations from space/remote sensing
PE10_2 - Meteorology, atmospheric physics and dynamics
PE10_7 - Physics of earths interior, seismology, volcanology
PE10_8 - Oceanography (physical, chemical, biological, geological)
PE1_18 - Scientific computing and data processing
PE1_20 - Application of mathematics in sciences
PE6_10 - Web and information systems, database systems, information retrieval and digital libraries, data fusion
PE6_12 - Scientific computing, simulation and modelling tools
PE7_8 - Networks (communication networks, sensor networks, networks of robots...)
PE9_1 - Solar and interplanetary physics
SH3_11 - Social geography, infrastructure
SH3_12 - Geo-information and spatial data analysis
SH6_4 - Medieval history

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BIAGI	Ludovico Giorgio Aldo	Ingegneria Civile e Ambientale	Ricercatore	ICAR/06
BALLARIN	Martina	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
BORGHİ	Alessandra	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
BROVELLI	Maria Antonia	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/06
BARZAGHI	Riccardo	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/06
BETTI	Barbara	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/06
CARCANO	Laura	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
CARRION	Daniela	Ingegneria Civile e Ambientale	Ricercatore	ICAR/06
CASSINI	Michele	Architettura, Ingegneria delle costruzioni e Ambiente Costruito	Dottorando	ICAR/06
CAZZANIGA	Noemi Emanuela	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
DE GAETANI	Carlo Iapige	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
DEVENDRAN	Aarthı Aishwarya	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
FERMI	Alessandro	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
GILARDONI	Maddalena	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
GINI	Rossana	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
GOTTARDI	Caterina	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
GATTI	Andrea	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
HAMDI HEMIDA MAHMOUD MANSI	Ahmed	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
ALBERTELLA	Alberta	Ingegneria Civile e Ambientale	Ricercatore	ICAR/06
LUCCHESI	Alba	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
MIGLIACCIO	Federica	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/06
MANDELLI	Alessandro	Architettura, Ingegneria delle costruzioni e Ambiente Costruito	Dottorando	ICAR/06
MINGHINI	Marco	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
MININI	Guido	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
NEGRETTI	Marco	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
PAGLIARI	Diana	Ingegneria Civile e Ambientale	Dottorando	ICAR/06

PASSONI	Daniele	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
REGUZZONI	Mirko	Ingegneria Civile e Ambientale	Ricercatore	ICAR/06
ARIAS MUNOZ	Carolina	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
ROSSI	Lorenzo	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
SAIDIAZAR	Ramin	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
SONA	Giovanna	Ingegneria Civile e Ambientale	Ricercatore	ICAR/06
SANSO'	Fernando	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/06
SERRANO	Richard	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
OSEI TUTU	Anthony	Ingegneria Civile e Ambientale	Dottorando	ICAR/06
TRIGLIONE	Damiano	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
VENUTI	Giovanna	Ingegneria Civile e Ambientale	Ricercatore	ICAR/06
VISCONTI	Maria Grazia	Ingegneria Civile e Ambientale	Assegnista	ICAR/06
VATALIS	Antonios	Ingegneria Civile e Ambientale	Dottorando	ICAR/06

3. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Transport Infrastructure and Geosciences
	The section is composed by professors and researchers of different scientific sectors: GEO/05 (Applied Geology), ICAR/04 (Road, Railway and Airport), ICAR/06 (Topography and Cartography) and ICAR/22 (Cadastral surveying). Studies and researches deal with both the infrastructure (materials, constructive technologies, management, sustainability, etc.) and related geological problems, such as landslides, groundwater resources management, and land use modification. Research Area Applied Geology The group mainly deals with subjects concerning technical geologic and hydrogeology. In particular, issues related to natural resources management and geological risk assessment are dealt with. All these researches develop from a common base, that is the geological and hydrogeological conceptual model reconstruction and they often use numerical models (i.e. for slope stability assessment and groundwater flow and transport simulation), useful to understand the geological system dynamic and to validate the conceptual model. The main research lines developed within this area include: • The geological risks related to the implementation of civil engineering works (tunnels, roads, dams, etc.). The research is aimed at identifying methodologies for forecasting the hydrogeological risk linked to both underground excavations (water inflow, water table drawdown, etc.) and landslides. In the first case, the most recent research was aimed to calculate the drained flows and the radii of influence and to evaluate the risk, meant as the probability that the tunnel inflow or the water table drawdown can exceed limit values. The relevant aspect of these studies, as far as their application is concerned, is linked to the possibility of carrying out a probabilistic analysis of the geological risk during the planning of underground construction. This analysis allows to consider the different risky scenarios and to plan all the measures to prevent their occurrence. • The geological risk related to the land-use planning (landslide risk management) In the second case, recent researches were aimed to assess the influence of some hydrogeological parameters (i.e. permeability and heterogeneity coefficient) on slope instability. The study has been carried out through the modeling of groundwater flow coupled with the slope stability process, considering several triggering phenomena. The parametrical approach enabled to connect the slope instability to some hydrogeological parameters that are easy to survey and to monitor (e.g. rainfall, water table level and spring flow rate). These results provided a scale of the landslide susceptibility concerning the hydrogeological setting (hydrogeological susceptibility), that is very important for both hazard mapping and risk analysis. Moreover, some researches have been carried out namely for Civil Protection purposes, in order to prevent disasters due to topples and rockfalls. At this aim, rock slopes have been monitored by suitable instrumentation, as laser-scanner and interferometers, in order to outline falls sources and debris trajectories. Finally, the debris sources, for the evaluation of sediment budget in rivers have also been outlined, to forecast overflows due to flow section shrinking. • The geological risk related to the natural resources management (water, rocks and soils, etc.). The engineering geology group has been involved for several years in the research of sustainable yield definition in groundwater systems. Thanks to a wide groundwater system database built up in the last 20 years, the group has achieved a good knowledge of the conceptual model of the Lombardy hydrogeologic system. The research is also oriented towards water resource localization and sustainable management in order to respect, by means of suitable modeling, the hydrogeological balance even in case of human and natural (e.g. climate) changes. The assessment of this research results is performed by collaborating with main public agencies and by means of some monitoring nets of the groundwater wells, in order to survey groundwater heads and hydrochemical data. The monitoring nets have been planned by means of the detailed hydrogeological structures reconstruction, achieved with geostatistic methods. The border definition

Descrizione

of polluted areas is also fundamental. The research focuses on contaminated site characterization and localization of the pollution sources. For this reason, the method of Integral Pumping Test (IPT) has been tested in 2 real cases to localize the contaminant sources of PCE and MTBE and using the IPT results as a new tool for transport models calibration. This method is more efficient if used with the Isotopic Fingerprinting, enabling the prevention of pollution risk. By means of fingerprinting the contamination has been dated and the hydrogeochemical evolution of the contamination has been reconstructed. The identification of both original products of the pollution and their evolution enables to describe well the history of the pollution and the related risks, representing an important tool for the characterization of the contaminated sites. Moreover, a method for the prevention of pollution formation after the construction of dangerous work (e.g. landfills) has been prepared even in order to control onset the environmental problems. The application of this method on some real cases allows verifying that the use of both statistic techniques and quantitative risk analysis is necessary to describe the spatial-temporal phenomenon distribution. The pollution problems and groundwater resources management are important issues also in coastal aquifers where salt water intrusion occurs, changing the contamination. The movement of the contamination into a coastal aquifer depends on a complex shape of equipotential lines along the contact with salt water. Thus, the research is oriented toward the understanding of all factors playing a role in this phenomenon. The research group is involved in field surveys and modelization with specific computer codes to study the salt-water effects and the contaminant fate near the transition zone. This problem has been studied by validating models with real data collected from a contaminated site along the Adriatic coast. These kinds of investigation also allow predicting the interaction between the salt water and hydraulic barrier wells enabling to choose the best solution regarding the intervention management.

Transport infrastructures and cost estimating engineering

Researches concern the development of models, methods and innovative technologies (including materials) aimed at economic evaluation and construction of transport infrastructures (mainly roads and airports), characterized by high levels of environmental compatibility and sustainability. This because infrastructures have always been one of the main "instruments" that led to anthropized territories and altered the natural balance of the environment in which they are placed.

Therefore, the starting point for research activities is an economic evaluation of project decisions, considering the different stages of the construction process (feasibility study, preliminary design phase, final design phase), and a definition of indicators and Urban Quality indexes. These studies include economic - estimative advice in environmental, urban and construction fields, with reference to special real estate and public property estimation. Research activities of the Group also focus on Life Cycle Analysis and its different stages, in order to control the effects that infrastructures have on territory and environment. For this reason, research activities include planning, design, realization, management and maintenance of a work.

As regards planning and design activities, the research Group is involved in the study of methods, models and technologies that allow to join in the best way mobility requirements to all the territorial constraints. Research programs on hydrogeological (and geological) impact, due to new work construction and existing work renewal, are also developed. In this contest, the researchers are mainly focused on: mitigation of the impact of road infrastructures (visual, noise, pollution, etc.); environmental sustainable pavements (warm and cold mix asphalt, fiber reinforced asphalt concrete, colored pavements and natural stone pavements); multipurpose pavements (photocatalytic, anti-noise, anti-vibration, piezoelectric, heat storage pavements); Reclaimed Asphalt Pavement (RAP) using recycled materials like construction and demolition materials (e.g. recycled airport concrete slabs), wastes of industrial processes (e.g. blast furnace slag) and general waste (e.g. from waste-to-energy plants, rubber from used tires and glass).

Another important research theme regards construction phases. In fact, these represent one of the main critical points in order to achieve the environmental sustainability of infrastructures, since emissions, land and resource consumption (construction site tracks and areas, quarries, transit of construction site vehicles on ordinary roads, etc.), noise emissions and construction site interference (reversible or irreversible) on territory and environment depend on work methods chosen.

The major research issues concerning on-site materials recycling result from this context (on-site material stabilization, use of construction site facilities and mobile technologies, etc.).

Finally, a notable research topic regards infrastructure management and maintenance systems that have fundamental effects on the work service life and on its connections with the territory and the environment.

Dialectic critique of Data Processing

The dialectic critique of Data Processing is located at the crossing point of Geometry, Statistics, Metrology and Epistemology. Indeed Geomatics, which collects and newly interprets all the Survey and Mapping disciplines, recognizes the need to extend its attention from Applied Mathematics and Physics to Human Sciences. Following this path, Linguistics is the starting point, but Philosophy of Science and History of Science and Technique also have to be taken into account to better understand their whole and deep impact. Actually, the most important result shows a "parallelism" not only among stereo-images, 3D models and GIS' geo-database, but also among the geographic descriptive texts of landscapes, human settlements, cultural heritages, etc.

Research lines

Road and Airport innovative pavements
Sustainable Infrastructures
Infrastructure management and monitoring
Bituminous and concrete materials
Groundwater resources research and pollution
Geothermal systems
Groundwater flow in rock masses
Characterisation and re-use of quarries and mines
Landslide hazard
Geological risk in civil engineering works
Dialectic critique of geomatics
Economic evaluation of plans and projects in the holistic view

Sito web

www.dica.polimi.it

Responsabile scientifico/Coordinatore

CRISPINO Maurizio (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:

PE10_17 - Hydrology, water and soil pollution

PE10_5 - Geology, tectonics, volcanology

PE10_9 - Biogeochemistry, biogeochemical cycles, environmental chemistry

PE1_14 - Statistics

PE1_18 - Scientific computing and data processing

PE1_20 - Application of mathematics in sciences

PE8_12 - Sustainable design (for recycling, for environment, eco-design)

PE8_3 - Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment

PE8_6 - Energy systems (production, distribution, application)

PE8_9 - Materials engineering (biomaterials, metals, ceramics, polymers, composites...)

SH3_1 - Environment, resources and sustainability

SH6_10 - History of ideas, intellectual history, history of sciences and techniques

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BONICELLI	Alessandra	Ingegneria Civile e Ambientale	Dottorando	ICAR/04
BRAMBILLA	Davide	Ingegneria Civile e Ambientale	Assegnista	GEO/05
OBERTO	Gabriele	Ingegneria Civile e Ambientale	Assegnista	GEO/05
COLOMBO	Loris	Ingegneria Civile e Ambientale	Assegnista	GEO/05
CANTONE	Martino	Ingegneria Civile e Ambientale	Assegnista	GEO/05
CARUSO DI SPACCAFORNO	Angelo	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/22
DE FINIS	Erika	Ingegneria Civile e Ambientale	Dottorando	GEO/05
FIORI	Federico	Ingegneria Civile e Ambientale	Ricercatore	ICAR/04
GIUDICI	Francesco	Ingegneria Civile e Ambientale	Assegnista	ICAR/04
GIUSTOZZI	Filippo	Ingegneria Civile e Ambientale	Assegnista	ICAR/04
GATTINONI	Paola	Ingegneria Civile e Ambientale	Ricercatore	GEO/05
KAMAL ALAVI	Seyed Vahid	Ingegneria Civile e Ambientale	Dottorando	ICAR/04
ALBERTI	Luca	Ingegneria Civile e Ambientale	Ricercatore	GEO/05
ALBERTI	Susanna	Ingegneria Civile e Ambientale	Dottorando	ICAR/04
LA LICATA	Ivana	Ingegneria Civile e Ambientale	Assegnista	GEO/05
LONGONI	Laura	Ingegneria Civile e Ambientale	Ricercatore	GEO/05
MELILLO	Valentina	Ingegneria Civile e Ambientale	Dottorando	GEO/05
MALVICINI	Sara	Ingegneria Civile e Ambientale	Assegnista	ICAR/04
MARCHESI	Massimo	Ingegneria Civile e Ambientale	Assegnista	GEO/05
MARTINEZ ARGUELLES	Gilberto	Ingegneria Civile e Ambientale	Dottorando	ICAR/04
MUSSIO	Luigi	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/06
ANTELM	Matteo	Ingegneria Civile e Ambientale	Dottorando	GEO/05
PAPINI	Monica	Ingegneria Civile e Ambientale	Prof. Associato	GEO/05
PIETRINI	Ilaria	Ingegneria Civile e Ambientale	Assegnista	GEO/05
SCESI	Laura Teresa Giuseppina	Ingegneria Civile e Ambientale	Prof. Ordinario	GEO/05
TORALDO	Emanuele	Ingegneria Civile e Ambientale	Ricercatore	ICAR/04

4. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Hydraulic Engineering
Descrizione	Major research topics of Hydraulic Engineering include: fluid mechanics; hydro-energy; fluid-structure interactions; hydraulic measurements; river hydraulics; hydraulic risk assessment and management; flow and transport processes in porous systems; hydraulic networks. Experimental, modeling and methodological aspects are integrated in application-oriented research activities. Key research areas include Fluid mechanics Flowing fluids, their interaction with structures and devices and their control and exploitation are the main interests of this field. Research and educational activities comprise analysis and development of advanced methodologies of computational and experimental fluid dynamics (e.g. CFD and image analysis techniques at multiple observational scales), modeling of processes of fluid-structure interactions for environmental, civil and industrial engineering applications. A significant part of the research is based on the study, development and optimization of fluid control devices (valves; resistors) with a focus on specific problems of applicative interest (cavitation, multi-phase flow, fluid-dynamic noise), as well as of production and recovery of energy from fluids (wave energy converters, energy recovery in pipeline systems, energy production in free surface flows). River hydraulics and sediment mechanics The key research topics are associated with optimization of approaches and technologies for process analysis at a wide range of scales, from detailed laboratory experiments to applications for land protection. Research and educational activities include particle mechanics in water-induced sediment transport, hydro-morphologic river modeling, local and general scour processes, hyper-concentrated flows, debris flow, flood scenario analysis and post-event damage estimation, field monitoring with a focus on vulnerability of river bridges. Emphasis is given to field and laboratory experimental activities. Flow and transport processes in porous systems Key research topics include: characterization of hydraulic and soil properties from pore-scale to aquifer systems; geostatistics; well testing; inverse modeling; flow and multicomponent reactive transport process in heterogeneous media under uncertainty; multiphase flows; scaling of hydrogeological quantities; uncertainty quantification; mixing processes in coastal aquifers; enhanced oil recovery; geothermal fluxes at the reservoir and basin scales. A major focus is on the study of theoretical and operational bases for the assessment of hydro-geo-chemical processes governing the distribution and residence time of solutes in the subsurface to provide the building blocks for reliable technologies to mitigate environmental risk and restore polluted aquifer systems. Research lines Groundwater and reservoirs Stochastic methods in engineering, upscaling, characterization Secure subsurface energy River sediment transport: sediment mechanics and morphology Flood risk, monitoring and emergency management Debris flows Granular flows Hydro-Energy Flow Control Devices Fluid-Structure Interaction Hydraulic measurements, tests on hydraulic devices, calibration of flow meters Water networks
Sito web	www.dica.polimi.it ; http://www.dica.polimi.it/sezioni/idraulica/
Responsabile scientifico/Coordinatore	GUADAGNINI Alberto (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:

PE10_17 - Hydrology, water and soil pollution

PE1_20 - Application of mathematics in sciences

PE2_17 - Metrology and measurement

PE3_13 - Structure and dynamics of disordered systems: soft matter (gels, colloids, liquid crystals...), glasses, defects

PE3_14 - Fluid dynamics (physics)

PE4_12 - Chemical reactions: mechanisms, dynamics, kinetics and catalytic reactions

PE4_18 - Environment chemistry

PE8_3 - Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment

PE8_5 - Fluid mechanics, hydraulic-, turbo-, and piston engines

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BALLIO	Francesco	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/01
BIANCHI JANETTI	Emanuela	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
BERZI	Diego	Ingegneria Civile e Ambientale	Ricercatore	ICAR/01
BOSSI	Filippo Carlo	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
COLOMBO	Ivo	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
CAMPAGNOL	Jenny	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
CROTTI	Gianluca	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
DELL'OCA	Aronne	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
FRANZETTI	Silvio	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/01
FERRARESE	Giacomo	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
GUADAGNINI	Laura	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
HOSSEINI SADABADI	Seyed Abbas	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
LARCAN	Enrico	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/01
MOLINARI	Daniela	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
MALAVASI	Stefano	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/01
MAMBRETTI	Stefano	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/01
MANDELLI	Simone	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
MESSA	Gianandrea Vittorio	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
NADJAFZADEH ANVAR	Amir	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
NEGRI	Marco	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
PANZERI	Marco	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
PERULERO SERRANO	Raul	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
PORTA	Giovanni Michele	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
RADICE	Alessio	Ingegneria Civile e Ambientale	Ricercatore	ICAR/01
RANAEE	Ehsan	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
ORSI	Enrico Maria	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/01
ROSSI	Marco Maria Agostino	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
RIVA	Monica	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/01
ESFANDIAR JAHROMI	Bahman	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
SAFAR BEIRANVAND	Mahmoud	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
SHAHVI	Shervin	Ingegneria Civile e Ambientale	Dottorando	ICAR/01
SIENA	Martina	Ingegneria Civile e Ambientale	Assegnista	ICAR/01
VESCOVI	Dalila	Ingegneria Civile e Ambientale	Dottorando	ICAR/01

5. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Mechanics of Materials and Structures
	The research activity of the group is focused on the theoretical and numerical modeling and testing of materials and

Descrizione	structures. Materials modeling concerns not only typical structural engineering materials, such as concrete, steel and composites, but also biological and bio-compatible materials, polycrystals, engineered materials, biomimetic, functionally graded materials, and engineered materials characterized by a specific internal micro-structure. Structural modeling focuses mainly on discretization methods, using classic approaches, such as finite elements, and more advanced methods, such as particle methods, domain decomposition, meshfree and non-local discretization. The activity of the group includes the development and implementation of sequential and concurrent computer codes. In recent years the group has turned his attention to the development of methods and models for the analysis of coupled phenomena, such as electro-mechanical or chemo-mechanical, multi-physics problems, such as fluid-structure interaction, and multi-scale phenomena. An important activity of the group in this line, is the analysis and design of micro electromechanical systems (MEMS), which lead to the deposit of a few patents and to the study of various nonlinear phenomena at the micro-scale. Traditionally, the group has been developing models and numerical methods for the mechanical characterization of materials and structures, in both civil and industrial engineering. Recently, a computerized instrumentation for X-ray micro-tomography has been conceived and developed. Digital Image Correlation (DIC) and nano-indentation techniques are used for the identification of material parameters. A micro-probe testing device for the mechanical characterization of microsystems through on-chip testing (tension force, flexure, fracture, dynamic tests) has been installed. It is used for the mechanical characterization of polysilicon in devices like e.g. accelerometers and gyroscopes. The current research lines, often motivated and driven by the needs of the engineering community, are summarized in the following points. Computational models and methods. Methods for the simulation of nonlinear problems in solid, structural mechanics and fluid-structure interaction. Domain decomposition, Model Order Reduction and multi-scale methods. Stochastic mechanics and dynamics . <i>Implementation and validation of constitutive models for nonlinear behavior of materials: elasto-plasticity and damage, quasi-brittle fracture, ductile fracture, delamination. Formulation and implementation of finite elements for continua, membranes and shells in finite kinematics, and interface finite elements for delamination and fracture. Analysis, development and implementation of alternative methods of discretization: boundary elements, particle methods, meshfree methods, NURBS, multigrid finite element, domain decomposition, model order reduction. Development of advanced experimental equipment and computer codes for Digital Image Correlation apt to process two- and three-dimensional (from X-ray microCT) digital images, oriented to diagnostics and monitoring activities of experiments on materials and structures at different scales, to be combined with mechanical models and parameter identification techniques.</i> Composites, advanced and complex materials. Formulation of constitutive laws for complex material behaviours. Composites and innovative materials for biomechanical, geo-mechanical and structural applications. <i>Development of constitutive models for multi-phase damage induced by chemical and physical phenomena, and of viscoplastic models for the simulation of hot rolling processes. Micro-mechanics of porous fiber reinforced visco-elastic-plastic composites and brittle polycrystals. Development of constitutive models for anisotropic biological materials and complex materials, such as liquid crystals, functionally graded materials, biomimetic materials, electro-active materials.</i> Micromechanics and Microsystems. Mechanical characterization and reliability of microsystems (MEMS and NEMS). Modelling and design of microsystems (MEMS and NEMS). <i>Micro-devices for the experimental mechanical characterization at the micro-scale. Gas fluid-structure interaction at the micro-scale. Analysis of dissipative phenomena (fracture, fatigue, thermo- elasticity) and spontaneous adhesion. Simulation of the effects of accidental impacts. Analysis and design of microsystems and inertial micro-sensors used in the diagnosis of composite structures, of infrastructure and of technological networks.</i> Inverse Analysis, identification and structural optimization. Parameter and model identification. Diagnostic analysis of structural components. Advanced experimental techniques for material characterization. <i>Development of techniques for the characterization of materials with non-traditional tests. Use of DIC for the characterization of cohesive bonds and for the monitoring of delamination. Development of non-destructive diagnostic techniques for structural components using nano-indentation testing. Development of algorithms for the identification of constitutive parameters and of structural damage using the Kalman filters.</i> The group collaborates actively with other Departments of the Politecnico and with national and international scientific and academic institutions. It carries out consulting and research activities with leading companies and industrial research centers, and promotes dissemination and technology transfer activities through advanced continuing education courses.
Sito web	www.dica.polimi.it
Responsabile scientifico/Coordinatore	PEREGO Umberto (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:	
PE1_10 - ODE and dynamical systems	
PE1_12 - Mathematical physics	
PE1_13 - Probability	
PE1_14 - Statistics	
PE1_18 - Scientific computing and data processing	
PE1_20 - Application of mathematics in sciences	

PE2_17 - Metrology and measurement

PE3_15 - Statistical physics: phase transitions, noise and fluctuations, models of complex systems

PE6_11 - Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)

PE6_12 - Scientific computing, simulation and modelling tools

PE7_3 - Simulation engineering and modelling

PE7_7 - Signal processing

PE8_3 - Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment

PE8_4 - Computational engineering

PE8_7 - Micro (system) engineering

PE8_8 - Mechanical and manufacturing engineering (shaping, mounting, joining, separation)

PE8_9 - Materials engineering (biomaterials, metals, ceramics, polymers, composites...)

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BAGHERINIA	Mehrdad	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
BOLZON	Gabriella	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
BARBARA	Salvatore	Ingegneria Civile e Ambientale	Assegnista	ICAR/08
COCCHETTI	Giuseppe	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
CEFIS	Nicola	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
ECKHAUT	David	Ingegneria Civile e Ambientale	Assegnista	ICAR/08
COLASANTE	Giada	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
COMI	Claudia	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/08
CONFALONIERI	Federica	Ingegneria Civile e Ambientale	Assegnista	ICAR/08
CORIGLIANO	Alberto	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/08
CREMONESI	Massimiliano	Ingegneria Civile e Ambientale	Assegnista	ICAR/08
CORNAGGIA	Aram	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
DOMANESCHI	Marco	Ingegneria Civile e Ambientale	Assegnista	ICAR/08
DOSSI	Martino	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
FEDELE	Roberto	Ingegneria Civile e Ambientale	Ricercatore	ICAR/08
FLORIS	Claudio	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
FRANGI	Attilio Alberto	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
FERRI	Francesco	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
GAFFORELLI	Giacomo	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
GHISI	Aldo Francesco	Ingegneria Civile e Ambientale	Ricercatore	ICAR/08
MARIANI	Stefano	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
MIRZAPOUR	Jamil	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
MIRZAZADEH	Ramin	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
NOVATI	Giorgio	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/08
PANDOLFI	Anna	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
ARDITO	Raffaele	Ingegneria Civile e Ambientale	Ricercatore	ICAR/08
SHAHMARDANI FIROUZJAH	Mahdieh	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
ZEGA	Valentina	Ingegneria Civile e Ambientale	Dottorando	ICAR/08

6. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Structural Design, Diagnostics And Rehabilitation (ProDRiS)
Descrizione	The research group "Structural Design, Diagnostics and Rehabilitation" is involved in scientific and educational activities dealing with both the structural design of new buildings, and the diagnosis, vulnerability analysis, assessment and rehabilitation of existing structures, with particular emphasis on the consolidation of historic buildings. It also deals with the assessment of geological hazards and risks, and in particular with local seismic effects. Applications encompass bridges, large span roofs, dams, tunnels, structures for industrial buildings, infrastructures and their terminals, existing masonry, reinforced concrete, wood and steel buildings. RESEARCH TOPICS Structural Design: Theories and Methodologies Development of theories and methodologies for structural analysis, modeling, and synthesis. Optimization techniques for the design of new structures and for the rehabilitation of existing buildings. Limit and nonlinear analysis of frames, two- and three-dimensional structures subjected to static, seismic and time-dependent loads. Formulation of theories specialized to different classes of concrete, steel and masonry structures (e.g., bridges, shells, vaults, cables). Structural safety assessment and reliability under uncertainty with probabilistic and fuzzy methods. Analysis of the time-variant performance of structures exposed to aggressive environment. Degradation over time of concrete and masonry structures subjected to cyclic or sustained loads of high intensity. Prediction of structural durability and life cycle of structures. Probabilistic assessment of the residual structural lifetime. Evaluation of the seismic performances of ordinary and precast structures exposed to damage. Structural robustness and resilience. Surveying, Monitoring and Structural Diagnostics Dealing with existing structures, especially those considered as Architectural Heritage, requires a deep knowledge of their geometry, their historical and constructive evolution, the stratigraphic composition of the structural elements, the conditions and properties of the constitutive materials and their compatibility with modern materials used in interventions for conservation purposes. The activities of the research group include structural surveying (identification and quantification of defects, geometry changes and state of damage), development and calibration of nondestructive testing and / or moderately destructive techniques (radar and sonic tests, ultrasonic tomography, thermography, flat-jack tests, coring, endoscopies, geophysical surveys for archeology), mechanical and chemico-physical testing on materials (possibly exposed to aggressive environment), effectiveness assessment of surface treatments, load tests on structures, testing of component materials for the repair and rehabilitation of structures. Additional research topics are techniques and methods for short- and long-term monitoring, monitoring strategies and monitoring system design, management of data obtained from surveying. Design of New Structures and Rehabilitation of Existing Structures Optimal design of size, shape, topology, static scheme and prestressing of structural systems by mathematical programming and artificial intelligence methods (heuristic techniques, genetic algorithms, evolutionary processes). Optimization methods for structural detailing (generation of strut-and-tie and stringer-panel models). Life-cycle optimization of structures under scheduled maintenance. Optimal seismic design of precast structures and connection systems. Testing of novel connectors (anchors) under static and seismic loads. Testing of structural elements, parts of structures and connections made with new materials (structural glass, high performance concrete, laminated wood) under static and variable loads, and environmental actions. For historic structures: mechanical and numerical modeling of survey data; selection of intervention strategies compatible with the principles of conservation. Development of special operative techniques, such as controlled injections, structural repointing, compatible use of composite materials. Evaluation of the effectiveness of the interventions. Research Lines Theory and Methods of Structural Design Structural Analysis Structural Reliability Structural Optimization Life-Cycle Design Survey, Inspection, Monitoring and Structural Diagnostics Built Heritage Non Destructive Testing (NDT) Geophysical Prospections Design of New Structures and Rehabilitation of Existing Structures Materials and Structures Bridges and Buildings Maintenance and Safety of Existing Structures Fastenings and Connections
Sito web	www.dica.polimi.it
Responsabile scientifico/Coordinatore	TALIERCIO Alberto (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:

PE10_17 - Hydrology, water and soil pollution

PE10_7 - Physics of earths interior, seismology, volcanology

PE1_13 - Probability

PE1_14 - Statistics

PE1_18 - Scientific computing and data processing
PE1_19 - Control theory and optimization
PE2_12 - Acoustics
PE2_17 - Metrology and measurement
PE4_18 - Environment chemistry
PE6_11 - Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)
PE6_12 - Scientific computing, simulation and modelling tools
PE6_7 - Artificial intelligence, intelligent systems, multi agent systems
PE7_7 - Signal processing
PE8_12 - Sustainable design (for recycling, for environment, eco-design)
PE8_16 - Architectural engineering
PE8_3 - Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment
PE8_4 - Computational engineering
PE8_9 - Materials engineering (biomaterials, metals, ceramics, polymers, composites...)
SH3_1 - Environment, resources and sustainability
SH3_2 - Environmental change and society
SH5_11 - Cultural heritage, cultural memory
SH5_7 - Museums and exhibitions
SH5_9 - History of art and architecture
SH6_1 - Archaeology, archaeometry, landscape archaeology

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BIONDINI	Fabio	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/09
BRICCOLA	Deborah	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
BRUGGI	Matteo	Ingegneria Civile e Ambientale	Ricercatore	ICAR/08
CONDOLEO	Paola	Ingegneria Civile e Ambientale	Ricercatore	ICAR/19
CARDANI	Giuliana	Ingegneria Civile e Ambientale	Ricercatore	ICAR/19
CORONELLI	Dario	Ingegneria Civile e Ambientale	Ricercatore	ICAR/09
CERVIO	Marco	Ingegneria Civile e Ambientale	Assegnista	ICAR/09
DAL LAGO	Bruno Alberto	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
GARAVAGLIA	Elsa	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
LUALDI	Maurizio	Ingegneria Civile e Ambientale	Ricercatore	GEO/11
LOMBARDI	Federico	Ingegneria Civile e Ambientale	Assegnista	GEO/11
MUCIACCIA	Giovanni	Ingegneria Civile e Ambientale	Assegnista	ICAR/09
MALERBA	Pier Giorgio	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/09
PORCU	Maurizio Gabriele	Ingegneria Civile e Ambientale	Assegnista	GEO/11
QUAGLIAROLI	Manuel	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
AROSIO	Diego	Ingegneria Civile e Ambientale	Assegnista	GEO/11
ROSATI	Gianpaolo	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/09
SGAMBI	Luca	Ingegneria Civile e Ambientale	Assegnista	ICAR/09
TACCIA	Mariagiovanna	Ingegneria Civile e Ambientale	Assegnista	ICAR/19
TEDESCHI	Cristina	Ingegneria Civile e Ambientale	Ricercatore	ICAR/19

TITI	Andrea	Ingegneria Civile e Ambientale	Assegnista	ICAR/09
ZANZI	Luigi	Ingegneria Civile e Ambientale	Prof. Ordinario	GEO/11

7. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Water Science and Engineering
Descrizione	The Research Group SIA (Water Science and Technology) has its historical roots in the School of Hydraulics and Hydraulic Engineering of Politecnico di Milan. It was established by Francesco Brioschi, the founder of the Polytechnic, and then perpetuated by well known scientists, such as Ettore Paladini, Gaudenzio Fantoli and Giulio De Marchi. The mission of the Section SIA has expanded over the years to new areas of theoretical and applied research, always pursuing and consolidating its historical multidisciplinary approach to water engineering, hydrology, hydraulics and marine construction. In the years of Italian Republic, the Section SIA expertise has contributed to the development of River Basin Management Planning, to hydropower growth advance, to the birth of modern Civil Protection, to environmental securing issues, to the modernization of water network services. Since the eighties of the last century, the strong boost to internationalization allowed the development of European and international projects, as part of an extensive network of collaborations with leading academic scientific institutions. In the New Millennium, food and environmental security, mitigation of hydrogeological catastrophes, adaptation strategies to the impacts of a changing climate, water management from district to transnational and global scales are all challenges tracing the Section SIA guidelines for current scientific paths. Main research lines Mitigation of hydrogeological risk. It concerns the analysis and the prediction of the hydrogeological risk and the development of structural and non-structural actions for mitigation. Starting from physical processes and their interaction with human systems, it aims to define mitigation actions and their field implementation, both during the emergency phase, and under a planning perspective. Examples are: Models and methods for risk assessment of extreme events, in particular climatic, meteorological, flood and hydrogeological risk. Field monitoring, through the development of methods for process direct observation, including innovative techniques for measurement and data assimilation of remote sensing data from satellite, weather radar / lidar telemetering data, and ground-based observations. Mathematical modelling at hillslope and basin scale, integrating in situ experimental analysis with numerical modelling of hydrological processes, with particular attention to extreme events, such as flash floods, debris flows, firefloods, soil slips, woody debris and dense snow avalanches. Climate scenarios modelling for the assessment of the impact of climatic and anthropogenic forcing on hydrogeological hazard at different spatial scales, including side effects resulting from mitigation through structural works, reservoirs for flood dampening and naturalistic engineering interventions. Models for short-term forecasting, through the development, calibration and validation of (1) simulation algorithms for real time prediction, alert and alarm of river floods, and (2) integrated risk-management tools based on the territorial planning and the operational rules of Civil Protection. Transient and permanent protection methods, from traditional hydraulics engineering interventions, to holistic, bioengineering methods, and flood proofing technologies for emergency defence of blocks and buildings. Control of the water cycle and integrated management of water resources It analyses, evaluates and innovates water use methods and processes, and develops engineering management and control systems of these processes. Examples are: Prediction and control of pollutant loads, assessment of impacts on natural and artificial networks, water bodies, groundwater and soil, and including both liquid phase and sediment transport. Planning, design and real-time control of network water services - sewerage, drainage systems and urban waterworks - including both experimental activities in the field, both mathematical modelling, especially in stochastic environment, for purposes of ordinary management and decision support during water scarcity emergency. Sustainable development of water systems, with a focus on control strategies and sustainable water management in smart cities, evaluation of water footprint and transnational virtual water trade flow, scenarios of medium and long range for water supply, and water security within different geographical contexts. Engineering of dams and river barrages, for the prediction of hydrological safety of works, riparian areas and downstream settlements, the identification of ageing-related emergencies, the evaluation of the economic, ecological and social impacts of barrages, both at national and international level. Sustainable design of water infrastructure, with a focus on environmental, landscape and functional context, both in new settlements, large infrastructures and urban landscape, and in interventions of functional recovery and restoration of historical works such as the Navigli, irrigation ditches, terraces, and karst springs. Dynamics of streams and water bodies. It studies, models and predicts the fundamental processes governing the water cycle in the different phases, liquid, solid and gaseous, and analyses its interaction with human activities and climate evolution. Examples are: Analysis of hydrological processes at the surface-soil interface, that affect soil moisture dynamics, surface runoff, groundwater-surface exchange, and vegetation dynamics, by combining together monitoring activities, high resolution mathematical modelling of water and energy fluxes, vegetation and lower atmosphere dynamics modelling. Analysis of snow and ice processes, including high altitude exploration and field experiments in order to assess (a) the processes of ablation and flow production, (b) the evolution of snow and ice covers, (c) hydrological and climatic trends, (d) the hydrologic budget in snow and ice-controlled areas (i.e. the European Alps, the Andes, the Karakoram and Himalaya regions). Analysis of climate actions and feedbacks -controlled by water cycle, with a focus on the development of downscaling schemes applied to of global and regional climate models (GCM) output, hydrological scenario re-analysis, and medium

	to long term IPCC scenarios projections. Analysis of surface erosion and dynamics of river sediments, combining field experiments, satellite monitoring and high resolution mathematical modelling, in the perspective of fighting against desertification, and preserving soils and ecosystems. Analysis of landslide surfaces, including of triggering natural and anthropic factors, and of soil and snow mobilization mechanisms, by using high resolution mathematical models. Water and food security It studies the generation, the availability and the usability of water resources, and their connections to food production, at different spatial and temporal scales. Examples are: water footprint of consumer goods. The evaluation of this indicator is used to determine the extent of water needs in the production cycle. Analysis of virtual water flows. It assesses the water exchange related to the exchange of goods. Effect of large-scale agricultural investment on water resources and food security. It considers the amount of water resources associated to agricultural production and analyses implications of food security both for investor and host countries. Evaluation of crop yield and water consumption by agricultural production, even under different climate scenarios. Maritime and coastal engineering It deals with sea waves dynamics, and convective ocean circulation, to study their effects on seabed and marine structures. Examples are: evaluation of wave action both on onshore works, as jetties, breakwaters, berths, and offshore works, with application on safety and durability; prediction of anthropic activity effects upon coastal dynamics, sediment transport, water quality with regard to port management, cliffs protection, and beaches touristic fruition; exploitation of seawaves energy through fixed and flexible, offshore and inshore works.
Sito web	www.dica.polimi.it
Responsabile scientifico/Coordinatore	MANCINI Marco (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:
LS2_2 - Population biology, population dynamics, population genetics
LS9_6 - Food sciences
PE10_14 - Earth observations from space/remote sensing
PE10_17 - Hydrology, water and soil pollution
PE10_3 - Climatology and climate change
PE10_4 - Terrestrial ecology, land cover change
PE1_14 - Statistics
PE8_3 - Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment
PE8_5 - Fluid mechanics, hydraulic-, turbo-, and piston engines
PE8_6 - Energy systems (production, distribution, application)
SH3_1 - Environment, resources and sustainability

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BOCCHIOLA	Daniele	Ingegneria Civile e Ambientale	Ricercatore	ICAR/02
BECCIU	Gianfranco	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/02
BIANCHI	Alberto	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/02
BOSCARELLO	Laura Anna	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
ACCATINO	Francesco	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
CUGERONE	Katia	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
CONFORTOLA	Gabriele	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
CEPPI	Alessandro	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
CORBARI	Chiara	Ingegneria Civile e Ambientale	Ricercatore	ICAR/02
CARCANO	Elena	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
D'AMBROSIO	Ersilia	Ingegneria Civile e Ambientale	Dottorando	ICAR/02

DE MICHELE	Carlo	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/02
DA RONCO	Pierfrancesco	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
DRESTI	Claudia	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
FEKI	Mouna	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
FIORIN	Lucia	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
GIANOLI	Paride	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
LOBO MARCHIONI	Mariana	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
LEE	Ju Hyoung	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
LE	Van Thinh	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
LAMERA	Carlotta	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
MACCHIA	Stefano	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
MENDUNI	Giovanni	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/01
ERCOLANI	Giulia	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
RULLI	Maria Cristina	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/02
RAIMONDI	Anita	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
ROSSO	Renzo	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/02
RAVAZZANI	Giovanni	Ingegneria Civile e Ambientale	Ricercatore	ICAR/02
SCARPA	Francesca	Ingegneria Civile e Ambientale	Dottorando	ICAR/02
SONCINI	Andrea	Ingegneria Civile e Ambientale	Assegnista	ICAR/02
SANFILIPPO	Umberto	Ingegneria Civile e Ambientale	Ricercatore	ICAR/02
AVANZI	Francesco	Ingegneria Civile e Ambientale	Dottorando	ICAR/02

8. Scheda inserita da questa Struttura ("Ingegneria Civile e Ambientale"):

Nome gruppo*	Structures and environment
Descrizione	The research activity of the group Structures and Environment deals with all the topics related to the interaction between structures and environment, to the mitigation of natural and anthropic risks, as well as to the issues related to sustainability and, in a broader sense, to the protection and promotion of natural resources. In this framework, the fluid-soil-structure interaction has to be considered as the key issue governing the design, in the field of civil and environmental engineering, of sheltering structures, wind towers, offshore structures, energy harvesting infrastructures from sea waves and tides, embankments and other civil engineering infrastructures such as pipelines and tunnels, either in persistent design situations or in accidental ones, including earthquake, fire and blast. Three main research areas can be identified in the activity of the group as a whole. Concrete and advanced cement based materials and structures • Concept, design, experimental investigation and modelling of the mechanical behavior of advanced cement based materials, including fibre reinforced concretes, hybrid composites and cementitious composites made with recycled and natural constituents. • Fundamental resistant mechanisms governing the concrete-reinforcement interaction and the resistant mechanisms of structural elements made with reinforced concrete and advanced cement based materials. • The concept of new design approaches for safety and sustainability of structures, with main reference to accidental design situations. • The residual load bearing capacity of structures that have suffered damages after natural (earthquake, hydrogeological accidents) and anthropic (fire, blast) accidental events. Earthquake engineering and structural dynamics • Engineering seismology, with main reference to the seismic hazard analysis, high performance numerical simulation of seismic wave propagation, prediction and analysis of earthquake motion. • Earthquake engineering, including analytical/numerical/experimental investigation of the earthquake response of different structure types, also with reference to national and international code prescriptions. • Structural dynamics and wind engineering, with main reference to complex (civil, building and industrial)

structural systems under the action of winds, sea waves, traffic loads or machine induced vibrations.

Geoengineering

- Prediction, prevention and mitigation of natural risks, with main reference to landslides and floods with the analysis of the onset, propagation and ending phases; design of earth sheltering structures under impulse loads.
- Geotechnical structures: formulation of performance based design approaches for advanced deep and surface foundation structures.
- Georesources, environment and underground engineering: advanced techniques for monitoring, excavation, stability of underground cavities, modelling of hydro-thermo-mechanical processes for the exploitation of geothermal energy sources.

Sito web

www.dica.polimi.it

Responsabile scientifico/Coordinatore

DI PRISCO Claudio (Ingegneria Civile e Ambientale)

Settore ERC del gruppo:

PE8_12 - Sustainable design (for recycling, for environment, eco-design)

PE8_3 - Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment

PE8_4 - Computational engineering

PE8_9 - Materials engineering (biomaterials, metals, ceramics, polymers, composites...)

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BOFFI	Giacomo	Ingegneria Civile e Ambientale	Ricercatore	ICAR/08
BELLANOVA	Mariagrazia	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
BAMONTE	Patrick	Ingegneria Civile e Ambientale	Ricercatore	ICAR/09
BONALUMI	Pamela	Ingegneria Civile e Ambientale	Assegnista	ICAR/09
COLOMBO	Matteo	Ingegneria Civile e Ambientale	Ricercatore	ICAR/09
COLOMBO	Isabella Giorgia	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
CALVETTI	Francesco	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/07
CARUSO	Marco	Ingegneria Civile e Ambientale	Assegnista	ICAR/07
DEGHANPOOR SICHANI	Ahmad	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
DELLA VECCHIA	Gabriele	Ingegneria Civile e Ambientale	Ricercatore	ICAR/07
DI LUZIO	Giovanni	Ingegneria Civile e Ambientale	Ricercatore	ICAR/09
DI PRISCO	Marco	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/09
FELICETTI	Roberto	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/09
FLESSATI	Luca	Ingegneria Civile e Ambientale	Dottorando	ICAR/07
FERRARA	Liberato	Ingegneria Civile e Ambientale	Ricercatore	ICAR/09
FARSHCHI	Iman	Ingegneria Civile e Ambientale	Dottorando	ICAR/07
GALLI	Andrea	Ingegneria Civile e Ambientale	Ricercatore	ICAR/07
GIANNI	Cristian	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
HASHEMYDAHAJ	Seyedeh Kiana	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
JOMMI	Cristina	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/07
KRELANI	Visar	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
LAI	Eleonora	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
LO MONTE	Francesco	Ingegneria Civile e Ambientale	Dottorando	ICAR/09

MUHAXHERI	Milot	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
MULAS	Maria Gabriella	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
MARTINELLI	Luca	Ingegneria Civile e Ambientale	Ricercatore	ICAR/09
MARTINELLI	Paolo	Ingegneria Civile e Ambientale	Ricercatore	ICAR/09
PAOLUCCI	Roberto	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/09
PEROTTI	Federico	Ingegneria Civile e Ambientale	Prof. Ordinario	ICAR/08
PISANO'	Federico	Ingegneria Civile e Ambientale	Assegnista	ICAR/07
PITCHAI	Pandi	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
PETRINI	Lorenza Maria	Ingegneria Civile e Ambientale	Prof. Associato	ICAR/08
REDAELLI	Irene	Ingegneria Civile e Ambientale	Dottorando	ICAR/07
ROSSINO	Chiara	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
RIZZO	Oliver	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
STERPI	Donatella Valeria	Ingegneria Civile e Ambientale	Ricercatore	ICAR/07
TRADIGO	Fabio	Ingegneria Civile e Ambientale	Dottorando	ICAR/07
TAVECCHIO	Charlotte	Architettura, Ingegneria delle costruzioni e Ambiente Costruito	Dottorando	MED/42
TEIXEIRA BUTTIGNOL	Thomaz Eduardo	Ingegneria Civile e Ambientale	Dottorando	ICAR/09
ZANI	Giulio	Ingegneria Civile e Ambientale	Assegnista	ICAR/09
AZIZI	Arash	Ingegneria Civile e Ambientale	Dottorando	ICAR/07

9. Scheda inserita da altra Struttura ("Matematica"), tra i componenti risultano persone afferenti a questa Struttura:

Nome gruppo*	Modellistica fisico-matematica
Descrizione	L'area di ricerca incentrata sui problemi modellistici riguardanti la fluidodinamica e i materiali complessi, e più specificamente i tessuti biologici e la materia soffice, si sviluppa in continua interazione con diverse altre aree di ricerca dipartimentali, e in particolare con quelle dell'Analisi Numerica, del Calcolo delle Variazioni, e delle Equazioni Differenziali. Ulteriori campi di ricerca vengono sviluppati sia in accordo con la tradizione dipartimentale (Relatività e Teoria Quantistica dei Campi), che seguendo nuovi filoni di ricerca (Archeoastronomia). Diverse quindi sono le tematiche su cui è focalizzata la ricerca attuale, e che si intendono confermare negli anni a venire. Microstruttura adattiva dei tessuti biologici molli I tessuti biologici molli sono in grado di rispondere in modo attivo alle sollecitazioni che agiscono su di essi, siano queste meccaniche o elettriche. Questi adattamenti pongono dei problemi che non hanno ancora trovato completa risposta nei modelli matematici attualmente proposti e utilizzati. Dal punto di vista teorico, si sviluppa l'applicazione della teoria delle miscele nello studio di fenomeni di crescita e riorganizzazione. Gli strumenti vengono successivamente applicati a problemi quali: studio della meccanica dello scorrimento cellulare e della capacità delle cellule viventi di modificare la propria forma; analisi delle interazioni tra fibre e tessuti attraverso la modellazione come materiali di grado superiore al primo, al fine di descrivere le interazioni tra sistemi di dimensionalità diversa. Cristalli liquidi e leghe a memoria di forma. Le teorie mesoscopiche basate su proprietà statistiche come il tensore d'ordine sono state sviluppate e studiate all'interno del Dipartimento nell'ambito dei cristalli liquidi nematici e delle membrane biologiche. Esse però si dimostrano attualmente utili anche al fine di studiare la durabilità e il degrado di sistemi complessi come le leghe a memoria di forma, dove la nascita dell'ordine è legata all'insorgenza della transizione tra le fasi austenite-martensite di particolari leghe metalliche. Lo sviluppo applicativo di tali similitudini hanno consentito infatti in tempi recenti la scoperta di nuovi materiali a memoria di forma, basati sui cristalli liquidi elastomerici. Applicazioni fluidodinamiche. Le equazioni alla base della teoria cinetica dei gas e della fluidodinamica in regime turbolento richiedono troppo dispendio di risorse per poter essere risolte per via diretta. Sono stati pertanto sviluppati metodi numerici e modelli per la loro soluzione approssimata. La caratteristica comune di tutti i metodi proposti è la notevole richiesta di memoria e di tempo di calcolo, che si accompagna però ad una relativa facilità di parallelizzazione dei relativi codici di calcolo. Nel caso di fluidi turbolenti un valido approccio modellistico è quello della simulazione a grandi vortici, che viene sviluppata all'interno del gruppo di ricerca. In assenza di soluzioni esatte, è inoltre interessante poter dedurre da soluzioni approssimate stime quantitative a priori del tempo di esistenza della soluzione esatta e dell'errore introdotto dalle soluzioni approssimate. A tal fine occorre determinare preliminarmente stime quantitative per le costanti sharp in disuguaglianze in spazi funzionali. Ricerche in corso riguardano in particolare le equazioni di Eulero e Navier-Stokes in spazi di Sobolev. Teorie quantistiche All'intersezione tra due settori di ampia tradizione, come sono Relatività e la Teoria Quantistica dei Campi, si sviluppa

	l'analisi della Teoria Quantistica dei Campi su varietà di Relatività Generale, con particolare riferimento agli effetti quantistici come l'evaporazione dei buchi neri, il cui studio per mezzo di sistemi analoghi realizzabili in laboratorio è un tema di ricerca all'avanguardia, e la loro perdita di carica elettrica, che è imparentata con l'effetto di creazione di coppie elettrone-positrone da parte di un campo elettrico intenso (effetto Schwinger). Per quanto riguarda in particolare l'analisi fisico-matematica concernente le Hamiltoniane quantistiche per campi di materia su varietà di spazio-tempo curvo, agli aspetti più strettamente legati all'elettrodinamica (scarica di buchi neri per mezzo di creazione di coppie, nel solco dell'effetto Schwinger) si affiancano la perdita di momento angolare e la creazione di coppie in presenza di ergosuperfici, che rappresentano una frontiera da esplorare sia dal punto di vista di una rigorosa trattazione matematica sia dal punto di vista di un migliore inquadramento dell'associato effetto fisico. Archeoastronomia Nell'antichità lo studio dei cicli celesti era legato ad un complesso apparato simbolico, connesso con la religione, il culto funerario e la gestione del potere, e dunque anche con l'architettura monumentale e l'urbanistica. La scienza che si occupa di studiare i legami tra architettura e astronomia prende il nome di Archeoastronomia; si tratta di una scienza multi-disciplinare che ha sia una componente fisico-matematica (legata sia alla ricostruzione del cielo in antico che all'acquisizione dei dati) sia una storico-archeologica. Presso il Dipartimento di Matematica ha sede l'Unità di Ricerca "Astronomia culturale" del Centro per la Conservazione e Valorizzazione dei Beni Culturali, dove vengono sviluppate ricerche nell'area del Mediterraneo, in special modo nel contesto romano/pre-romano e in Egitto. Nei prossimi anni sono previste ricerche sul campo legate alla topografia antica e ai suoi legami con l'astronomia durante il periodo dell'Antico Regno in Egitto. Questa linea di ricerca genera una intensa attività di divulgazione, in particolare sulle reti televisive nazionali e sui più noti canali internazionali.
Sito web	
Responsabile scientifico/Coordinatore	SECCHI Piercesare (Matematica)

Settore ERC del gruppo:
PE1_12 - Mathematical physics
PE1_20 - Application of mathematics in sciences
PE1_21 - Application of mathematics in industry and society
PE3_13 - Structure and dynamics of disordered systems: soft matter (gels, colloids, liquid crystals...), glasses, defects
PE3_16 - Physics of biological systems
SH5_11 - Cultural heritage, cultural memory

Componenti:

Cognome	Nome	Struttura	Qualifica	Settore
BELGIORNO	Francesco Domenico	Matematica	Ricercatore	MAT/07
BELLAS-CHATZIGEORGIS	Georgios	Matematica	Dottorando	MAT/07
BARBANTE	Paolo Francesco	Matematica	Ricercatore	MAT/07
BARRERA	Noemi	Fisica	Dottorando	MAT/07
BISCARI	Paolo	Matematica	Prof. Ordinario	MAT/07
FORTE	Sandra	Matematica	Ricercatore	MAT/07
GIVERSO	Chiara	Matematica	Assegnista	MAT/07
LORENZANI	Silvia	Matematica	Ricercatore	MAT/07
AMBROSI	Davide Carlo	Matematica	Prof. Associato	MAT/07
MAGLI	Giulio	Matematica	Prof. Ordinario	MAT/07
MAZZETTI	Alessandro	Matematica	Dottorando	MAT/07
PENTA	Raimondo	Matematica	Assegnista	MAT/07
PETTINATI	Viola	Matematica	Dottorando	MAT/07
SIMONINI	Irene	Ingegneria Civile e Ambientale	Dottorando	ICAR/08
SPINELLI	Giancarlo	Matematica	Prof. Ordinario	MAT/07
TAFFETANI	Matteo	Matematica	Assegnista	MAT/07
TURZI	Stefano	Matematica	Ric. a tempo determ.	MAT/07
VALDETTARO	Lorenzo	Matematica	Prof. Associato	MAT/07

VIANELLO	Maurizio Stefano	Matematica	Prof. Ordinario	MAT/07
VIVARELLI	Maria Dina	Matematica	Prof. Associato	MAT/07
ZANZOTTERA	Anna	Fisica	Dottorando	MAT/07
