



# UNIVERSITÀ DEGLI STUDI DI TRIESTE

Area dei Servizi Istituzionali  
Settore Servizi agli studenti e alla didattica  
Ufficio Dottorati di ricerca

ATTACHMENT 10

LAST REVISED 27/05/2020

## PhD IN EARTH SCIENCE, FLUID-DYNAMICS AND MATHEMATICS. INTERACTIONS AND METHODS OVERVIEW

IN BRIEF															
<b>Lines of research</b>	<ol style="list-style-type: none"> <li>1 Environmental fluid mechanics, fluid mechanics in industrial and technological processes, and in biological systems</li> <li>2 Solid and fluid earth geophysics and geology</li> <li>3 Mathematical methods and modeling in fluid mechanics and in geophysics, differential equations and inverse problems: qualitative, computational, and numerical aspects</li> <li>4 Development and use of Data Science techniques, both for the construction of statistical big-data black-box models and for the analysis of complex models by using machine learning methods</li> </ol>														
<b>Administrative location</b>	University of Trieste														
<b>Organizing Department</b>	Department of Mathematics and Geosciences														
<b>Partner University Department</b>	Department of Engineering and Architecture														
<b>Duration</b>	3 years														
<b>Attendance abroad that entitles to a scholarship increase - min. max. of months for each PhD student (over 3 years)</b>	3 - 12														
<b>Official language</b>	English The entrance exams, training activities (courses, seminars, schools...), the preparation of annual reports, the drafting and defense of the thesis are to be given in English.														
<b>Subject Areas</b> (in alphabetical code order)	<table border="0"> <tr><td>01</td><td>MATHEMATICS AND INFORMATICS</td></tr> <tr><td>04</td><td>EARTH SCIENCES</td></tr> <tr><td>08b</td><td>CIVIL ENGINEERING</td></tr> <tr><td>09</td><td>INDUSTRIAL AND INFORMATION ENGINEERING</td></tr> </table>	01	MATHEMATICS AND INFORMATICS	04	EARTH SCIENCES	08b	CIVIL ENGINEERING	09	INDUSTRIAL AND INFORMATION ENGINEERING						
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<b>Scientific Disciplinary Sectors</b> (in alphabetical code order)	<table border="0"> <tr><td>GEO/01</td><td>PALAEONTOLOGY AND PALAEOECOLOGY</td></tr> <tr><td>GEO/02</td><td>STRATIGRAPHY AND SEDIMENTOLOGY</td></tr> <tr><td>GEO/03</td><td>STRUCTURAL GEOLOGY</td></tr> <tr><td>GEO/04</td><td>PHYSICAL GEOGRAPHY AND GEOMORPHOLOGY</td></tr> <tr><td>GEO/06</td><td>MINERALOGY</td></tr> <tr><td>GEO/07</td><td>PETROLOGY AND PETROGRAPHY</td></tr> <tr><td>GEO/10</td><td>SOLID EARTH GEOPHYSICS</td></tr> </table>	GEO/01	PALAEONTOLOGY AND PALAEOECOLOGY	GEO/02	STRATIGRAPHY AND SEDIMENTOLOGY	GEO/03	STRUCTURAL GEOLOGY	GEO/04	PHYSICAL GEOGRAPHY AND GEOMORPHOLOGY	GEO/06	MINERALOGY	GEO/07	PETROLOGY AND PETROGRAPHY	GEO/10	SOLID EARTH GEOPHYSICS
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	GEO/11	APPLIED GEOPHYSICS
	GEO/12	OCEANOGRAPHY AND PHYSICS OF THE ATMOSPHERE
	ICAR/01	HYDRAULICS
	INF/01	INFORMATICS
	ING-IND/10	THERMAL ENGINEERING AND INDUSTRIAL ENERGY SYSTEMS
	ING-IND/34	INDUSTRIAL BIOENGINEERING
	MAT/05	MATHEMATICAL ANALYSIS
	MAT/06	PROBABILITY AND STATISTICS
	MAT/08	NUMERICAL ANALYSIS
<b>Domain European Research Council</b>	PE	PHYSICAL SCIENCES AND ENGINEERING
<b>ERC Panels</b>	PE10	EARTH SYSTEM SCIENCE: PHYSICAL GEOGRAPHY, GEOLOGY, GEOPHYSICS, ATMOSPHERIC SCIENCES, OCEANOGRAPHY, CLIMATOLOGY, ECOLOGY, GLOBAL ENVIRONMENTAL CHANGE, BIOGEOCHEMICAL CYCLES, NATURAL RESOURCES MANAGEMENT
	PE1	MATHEMATICS: ALL AREAS OF MATHEMATICS, PURE AND APPLIED, PLUS MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE, MATHEMATICAL PHYSICS AND STATISTICS
	PE8	PRODUCTS AND PROCESSES ENGINEERING: PRODUCT DESIGN, PROCESS DESIGN AND CONTROL, CONSTRUCTION METHODS, CIVIL ENGINEERING, ENERGY SYSTEMS, MATERIAL ENGINEERING

<b>WHO'S WHO</b>	
<b>Chair</b>	Prof. Stefano Maset – Department of Mathematics and Geosciences – University of Trieste – phone + 39 040.558.2675; email <a href="mailto:maset@units.it">maset@units.it</a>
<b>Vice</b>	Prof. Paolo Novati – Department of Mathematics and Geosciences – University of Trieste – phone + 39 040.558.2643; email <a href="mailto:novati@units.it">novati@units.it</a>
<b>PhD Academic Board</b>	<a href="#">List of members</a>
<b>Web site</b>	<a href="https://web.units.it/dottorato/esfm/en">https://web.units.it/dottorato/esfm/en</a>
<b>Email</b>	<a href="mailto:esfm.adm@units.it">esfm.adm@units.it</a>
<b>Course description and objectives</b>	<p>This PhD Course aims at the advanced training of students in the field of the Earth System Science, through a multidisciplinary approach, where specific skills integrate with modeling and computational tools that allow to effectively tackle complex problems. Special attention is devoted to the interactions between Mathematics, Scientific Computing, Data Science, Fluid Dynamics, and Earth Sciences.</p> <p>Within Earth Science, advanced methods of investigation are developed in geological, geophysical, atmospheric, oceanographic, and climatological fields. Special attention is paid to issues related to reduction of natural risks, finding of georesources, climate changes.</p> <p>In the context of fluid mechanics, the study of motion of the fluids is mainly addressed with reference to their transport properties, dispersion and mixing in environmental, industrial, biological processes, as well as to their interaction with the solid elements.</p> <p>The laws, which these disciplines are based on, are generally expressed by highly complex mathematical models. The qualitative and quantitative study of such models requires the development and the application of sophisticated mathematical tools, and it represents a relevant and topical research field even from the mathematical point of view.</p> <p>Mathematics therefore pervades the entire program, playing a central and unifying role.</p>

**Job placement opportunities**

This PhD course is designed to prepare students to pursue different careers in research, teaching and industrial use of high technologies in the fields of earth science, fluid mechanics, applied mathematics, and their interactions.

The students will be in contact with several local and international environments and gain an important experience in both theoretical and applied problems that originate in the disciplines mentioned above. In addition, the students will develop familiarity and competence in using the most advanced tools (both modeling and experimental) for the analysis of complex physical systems, which will be of great use for future activity in public or private research centers, or for any work in companies with high technological content.

The Doctoral School of Environmental and Industrial Fluid Mechanics, which the present course is a natural continuation and expansion of, have systematically partnered during the last ten years with the departments of several research institutions and services, such as OGS, ICTP, ISMAR-CNR, ENEA, ARPA-FVG, as well as with various industries in the area. The scholarships funded by such institutions, or factories, and their very presence, stem from their need to acquire highly specialized personnel in the topics addressed in this doctoral program. The students of this course will then have, as a natural outlet, post-doctoral grants, or employments, within the organizations themselves.

**Main cooperating international Universities and Research Institutions**

- 1 Princeton University, U.S.A.
- 2 University of California Irvine, USA
- 3 University of Oxford, United Kingdom
- 4 University of Cambridge, United Kingdom
- 5 New York University, USA