

<p align="center">PhD Programme in INNOVATION SCIENCES AND TECHNOLOGIES</p> <p align="center">- Curriculum 1: REGENERATIVE MEDICINE, BIOMEDICAL APPLICATIONS AND MANAGEMENT OF COMPLEX HEALTHCARE SYSTEMS</p> <p align="center">- Curriculum 2: METHODS AND SYSTEMS FOR THE ENVIRONMENTAL PROTECTION</p> <p align="center">- Curriculum 3: METHODOLOGIES AND PROCESSES FOR THE TRANSFORMATION AND USE OF MATERIALS</p>	
DISCIPLINARY SCIENTIFIC AREAS	03 - CHEMICAL SCIENCES; 04 - EARTH SCIENCES; 05 - BIOLOGICAL SCIENCES; 06 - MEDICAL SCIENCES; 08 - CIVIL ENGINEERING AND ARCHITECTURE; 09 - INDUSTRIAL AND INFORMATION ENGINEERING
COORDINATOR	PROF. MARIA FRANCESCA CASULA
HEAD DEPARTMENT	DEPARTMENT OF MECHANICAL, CHEMICAL AND MATERIALS ENGINEERING
DURATION	3 YEARS
LEARNING OUTCOMES AND RESEARCH TOPICS	<p>The PhD programme in Innovation Sciences and Technologies started as an international PhD program (from A.Y. 2013/14 to 2021/22) based on the positive experience of the international PhD course in Environmental Sciences and Engineering (active from 2001/02, XVII cycle to 2012/13, XXVIII cycle) and of the PhD course in Biomedical Engineering (active from 2010/11, XXVI cycle to 2012/13, XXVIII cycle). As a consequence, the PhD Programme in Innovation Sciences and Technologies covers many of the topics which were developed within the aforementioned PhD courses and includes additional research topics such as those related to materials science and technology.</p> <p>The PhD Course, through a 3-year programme, is intended to introduce young graduates to the field of basic and applied research, though a highly multidisciplinary approach, with reference to the general themes associated with the following routes:</p> <ol style="list-style-type: none"> 1) regenerative medicine, biomedical engineering and management of complex healthcare systems; 2) methods and systems for environmental protection; 3) methodologies and processes for the transformation and uses of materials. <p>The PhD students will carry out their project within the research groups related to the PhD committee members and will understand aspects related to:</p> <ul style="list-style-type: none"> - Management of the developed research activities; - The main aspects related to writing a proposal to be submitted for regional, national, or international grants; - The main routes for valorization of the results of the research activities (such as writing scientific papers, preparation of posters and oral presentations at conferences); - The most relevant ways to promote valorization/protection of intellectual property, a skill of great interest among the members of the PhD board. <p>English will be the language used for the presentation of the results and writing of scientific papers, and therefore a minimum C1 certification of English level must be acquired. To this end, the Language Center at UniCA will organize English courses devoted to all PhD students at the University of Cagliari. For those PhD projects which require specific computer skills, specific courses and tutoring activities will be arranged.</p> <p>Course Objectives:</p>

	<p>The dramatic employment situation, which is even more pronounced in Sardinia, determines the need to activate instruments to restore the competitiveness of the economic and production system through an extensive dissemination of scientific and technological knowledge, both for the production of primary goods and for public and private services. This involves the implementation of specific actions to create more advanced qualifications, at various levels, of researchers and technicians; the aim is to broaden the labor market towards new skills for activities of technical and economic support for enterprises, such as valorization, transfer, control and management of the innovation process of a scientific and technological approach compatible with the necessary scientific and technological innovation.</p> <p>These objectives are the cornerstones of the three-year PhD course in Science and Technology for Innovation, and can be summarized as follows:</p> <ul style="list-style-type: none"> - education of PhD students towards basic and applied research; - promotion of the attitude towards international scientific cooperation and connection with external users of research; - advanced education of the PhD students. <p>Particular care will be devoted to the development of advanced and independent research ability, both in relation to scientific understanding and of technological outcome of the research topics covered by the PhD course according to the three curricula.</p> <p>The main activity towards education to research is represented by in-depth investigation by the PhD students, under the guide of the Supervisors.</p> <p>The following typologies of educational activities can be envisaged:</p> <ul style="list-style-type: none"> - Courses aiming at strengthening the PhD preparation; - Specific classes organized within the PhD course; - Official courses from bachelor courses within the University of Cagliari or from other Universities (including outside Italy); - Summer schools, seminars, and other activities related to specific topics of interest of the PhD course. <p>Additional educational activities might be organized related to relevant aspect to the education of PhD students and proper and effective management of research (such as methods of management of research activities, protection of intellectual property, economic-financial aspects of research, analysis and planning of public actions within PNRR).</p> <p>Cognitive goals associated to the research activity of the PhD students will be identified with the Supervisor assigned to each student by the PhD board.</p> <p>With respect to the year of reference, among the specific cognitive objectives of doctoral candidates, depending on the chosen route, the following ones, by way of example, can be taken into account.</p> <p>1) As for the topic Regenerative medicine, biomedical engineering and management of complex healthcare systems topic:</p> <ul style="list-style-type: none"> - acquiring skills in the design of biomaterials and supports for regenerative medicine - acquiring skills in stem cells and artificial liver - infection and microbiology of mouth, molecular biology, new antimicrobics - mental health effect of epidemiological events (COVID-19) - circulatory apparatus regulation in healthy people and in people affected by cardiovascular and neurodegenerative diseases. <p>2) As for the topic related to Methods and systems for environmental protection topic:</p> <ul style="list-style-type: none"> - acquisition of skills relating to microalgae processes for the production of
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	<p>bio-fuels</p> <ul style="list-style-type: none"> - acquiring skills in sustainable industrial processes - acquiring skills in the study and management of morphological changes in coastal systems - acquiring skills in processes for the exploitation of renewable resources. <p>3) As for the methodologies and processes for the transformation and uses of materials topic:</p> <ul style="list-style-type: none"> - acquiring skills in model simulation of comminution, grinding and mechanical alloying processes and technology. - acquiring skills related to the synthesis, sintering, and advanced characterization of materials for advanced application (aerospace catalysis, solar thermodynamics, diagnostics, optoelectronics etc.) - acquiring knowledge on materials with controlled porosity - acquiring skills on the thermodynamic stability of nanocrystalline metallic alloys.
ELIGIBILITY AND OTHER REQUIREMENTS FOR CANDIDATES (ART. 2 - NOTICE OF COMPETITION)	EVERY ITALIAN 2ND CYCLE DEGREE (<i>LAUREA MAGISTRALE/SPECIALISTICA/VECCHIO ORDINAMENTO</i>) AND EQUIVALENT AND SUITABLE FOREIGN ACADEMIC DEGREES
ADMISSION TESTS	<p>ASSESSMENT OF QUALIFICATIONS AND CURRICULUM VITAE, AND INTERVIEW</p> <p>The interview will aim to ascertain the candidate's ability to orient on the main areas of study inherent in the doctorate and to verify his/her analytical, processing and communication skills.</p> <p>During the interview, a three-year research project proposed by the candidate will be discussed, which must be presented, in addition to the documents required by art. 3 of the call for applications (Annex A "Titoli valutabili e Curriculum Vitae"; Annex B 'Dichiarazione sostitutiva di certificazioni del/i titolo/i di accesso con esami e voti'; two-sided coloured scanned copy of a valid ID, with a clear photo), by uploading it to the system by the call expiry date (file name: research_project_surname_name).</p> <p>Candidates unable, for justified reasons, to take the interview at the established venue, may be granted the possibility of carrying it out by videoconference, on the same date and time established for face-to-face interviews, according to the procedure indicated in the notice of competition.</p>
ADMISSION TESTS FOR FOREIGN CANDIDATES APPLYING FOR RESERVED POSITIONS SUPPORTED BY A SCHOLARSHIP	<p>ASSESSMENT OF QUALIFICATIONS AND CV, AND VIDEO CONFERENCE INTERVIEW</p> <p>During the interview, a three-year research project proposed by the candidate will be discussed, which must be presented, in addition to the documents required by art. 3 of the competition announcement (certificate attesting the award of a 2nd level foreign degree needed to access a PhD programme, including exams and marks, with a translation in Italian or English; certificate attesting the award of a 1st level foreign degree, including exams and marks, with a translation in Italian or English; signed Curriculum Vitae preferably in EU format, in English or Italian; additional qualifications, certifications, publications; copy of a valid passport), by uploading it to the system, by the expiry date of the announcement (file name: research_project_surname_name).The interview can also be conducted in English.</p> <p>Reference letters (up to 3) must be written in English, using the form available on the webpage https://unica.it/dottoratiricerca (How to apply for PhD selection: Guidelines and forms- Annex D), by a university professor or an expert in the research fields of the PhD programme, on letterhead of their institution, dated and signed. Evaluators will send their letters directly</p>

	to the email address phdcall_referenceletter@unica.it (object: surname and name of the candidate being evaluated and name of the PhD programme for which he/she is applying).
POSITIONS	8 (1 of which, with scholarship, reserved for a foreign candidate with a foreign degree)
SCHOLARSHIPS	7: 1 funded by UniCa; 3 funded by Ministerial Decree no. 118/2023: 2 NRRP Research, 1 Digital and Environmental Transitions; 2 funded by Ministerial Decree no. 117/2023; 1 funded by an external institution: funds from the Department of Mechanical, Chemical and Material Engineering, Project ARTEMIS, financed through Call 2022 EIC Pathfinder, research project "Molecular materials for on-chip integrated quantum light sources", Contact person: Prof. Luca Pilia
POSITIONS WITHOUT SCHOLARSHIP	1
CONTACT PERSON	PROF. MARIA FRANCESCA CASULA EMAIL: phd.sti@unica.it_- TEL. + 39 0706755060
WEBSITE	https://sites.unica.it/internationalphdist/
SCHOLARSHIPS FUNDED BY MINISTERIAL DECREE NO. 118/2023	
SCHOLARSHIP 1	
TYPOLOGY	NRRP Research
RESEARCH PROJECT	Innovative technologies, processes and materials for advanced applications
PRINCIPAL INVESTIGATOR	Prof. Maria Francesca Casula
DESCRIPTION OF DOCTORAL TRAINING	<p>The purpose of the project is to develop topics aimed at increasing the number of researchers and at improving fundamental and applied knowledge, with interdisciplinarity and internalization features as required by NRRP, in the field of Innovative technologies, processes and materials for advanced applications. The project will be developed taking into account mission 1 and 4, and aims at strengthening the attitude towards innovation and at improving the conditions to support research, innovation and technological transfer.</p> <p>Potential topics for the development of the project include:</p> <ul style="list-style-type: none"> -Experimental activity and modelling of comminution processes, milling and mechanical alloying -Synthesis, sintering and advanced characterization of materials for innovative applications (Aerospace, catalysis, thermodynamic solar, diagnostics, etc.) - Materials with controlled porosity - Thermodynamic stability of nanocrystalline metallic alloys <p>The project within the course in Innovation Sciences and Technologies will be based on the training of PhD students in the field of fundamental and applied research within a multidisciplinary environment. The planned training and aims at promoting the attitude towards scientific international cooperation and connection with external users to research. To this end, research and study activities are required (within the University, abroad and in companies or research centers) and these will be supported by ad hoc courses and seminars. The ability to present the obtained data within an international audience is also achieved through C1 English certificate and co-authoring of at least 2 scientific papers is required. Training of PhD students within the proposed project is supported by the skills and facilities available in the course, which includes a specific curriculum devoted to Methods and processes for materials transformation and application.</p>
COMPANY/RESEARCH INSTITUTION/PUBLIC ADMINISTRATION	The company/research institution/public administration where the activity will be carried out and the relative contact person will be defined after the conclusion of the selection procedure.

NO. OF MONTHS TO BE SPENT IN THE COMPANY/RESEARCH INSTITUTION/PUBLIC ADMINISTRATION	To be defined
FOREIGN INSTITUTION	The foreign institution where the activity will be carried out and the relative contact person will be defined after the conclusion of the selection procedure.
NO. OF MONTHS TO BE SPENT IN THE FOREIGN INSTITUTION	6
SCHOLARSHIP 2	
TYPOLOGY	NRRP Research
RESEARCH PROJECT	Innovative approaches in regenerative medicine, biomedical applications, and healthcare systems management
PRINCIPAL INVESTIGATOR	Prof. Maria Francesca Casula
DESCRIPTION OF DOCTORAL TRAINING	<p>The purpose of the project is to develop topics aimed at increasing the number of researchers and at improving fundamental and applied knowledge, with interdisciplinarity and internalization features as required by NRRP, in the field of Innovative approaches in regenerative medicine, biomedical applications, and healthcare systems management. The project will be developed taking into account mission 4 and 6, and aims at supporting valorization and improvement of research related to healthcare and biomedicine.</p> <p>Potential topics for the development of the project include:</p> <ul style="list-style-type: none"> - Design of biomaterials and supports for regenerative medicine - Stem cells in the development of human liver - Infections and microbiology of oral cavity, Molecular biology, study of novel antimicrobial agents. - Effects on mental health of epidemiologic events (COVID-19) - Regulation of circulatory apparatus in healthy patients and in patients with cardiovascular and neuro-degenerative diseases. <p>The project within the course in Innovation Sciences and Technologies will be based on the training of PhD students in the field of fundamental and applied research within a multidisciplinary environment. The planned training and aims at promoting the attitude towards scientific international cooperation and connection with external users to research. To this end, research and study activities are required (within the University, abroad and in companies or research centers) and these will be supported by ad hoc courses and seminars. The ability to present the obtained data within an international audience is also achieved through C1 English certificate and co-authoring of at least 2 scientific papers is required. Training of PhD students within the proposed project is supported by the skills and facilities available in the course, which includes a specific curriculum devoted to Regenerative medicine, biomedical applications and management of complex healthcare systems.</p>
COMPANY/RESEARCH INSTITUTION/PUBLIC ADMINISTRATION	The company/research institution/public administration where the activity will be carried out and the relative contact person will be defined after the conclusion of the selection procedure.
NO. OF MONTHS TO BE SPENT IN THE COMPANY/RESEARCH INSTITUTION/PUBLIC ADMINISTRATION	To be defined
FOREIGN INSTITUTION	The company/research institution/public administration where the activity will be carried out and the relative contact person will be defined after the conclusion of the selection procedure.
NO. OF MONTHS TO BE SPENT IN THE FOREIGN INSTITUTION	6

SCHOLARSHIP 3	
TYPOLOGY	Digital and Environmental Transitions
RESEARCH PROJECT	Innovative technologies and methods for the environmental protection
PRINCIPAL INVESTIGATOR	Prof. Maria Francesca Casula
DESCRIPTION OF DOCTORAL TRAINING	<p>The purpose of the project is to develop topics and areas connected with ecological and digital transition; and in particular aspects related to climate, environmental, energy goals of interest of NRRP may be addressed.</p> <p>In agreement with mission 4, the project aims at increasing the number of researchers and skills on topics related to ecological and digital transition. Potential topics for the development of the project include:</p> <ul style="list-style-type: none"> - Production of biofuels from microalgae; - Sustainable industrial processes; - Morphological changes in coastal systems; - Processes for the exploitation of renewable resources. <p>The project within the course in Innovation Sciences and Technologies will be based on the training of PhD students in the field of fundamental and applied research by experimental and/or computational approaches. The planned training and aims at promoting the attitude towards scientific international cooperation and connection with external users to research. To this end, research and study activities are required (within the University, abroad and in companies and research centers) and these will be supported by ad hoc courses and seminars. A specific focus is to promote the ability to present the obtained data within an international audience, and in this framework a C1 English certificate and co-authoring of at least 2 scientific papers is required. Training of PhD students within the proposed project is supported by the skills and facilities available in the course, which includes a specific curriculum devoted to Methods and systems for environmental protection.</p>
COMPANY/RESEARCH INSTITUTION/PUBLIC ADMINISTRATION	The company/research institution/public administration where the activity will be carried out and the relative contact person will be defined after the conclusion of the selection procedure.
NO. OF MONTHS TO BE SPENT IN THE COMPANY/RESEARCH INSTITUTION/PUBLIC ADMINISTRATION	6
FOREIGN INSTITUTION	The foreign institution where the activity will be carried out and the relative contact person will be defined after the conclusion of the selection procedure.
NO. OF MONTHS TO BE SPENT IN THE FOREIGN INSTITUTION	6
SCHOLARSHIPS FUNDED BY MINISTERIAL DECREE NO. 117/2023	
SCHOLARSHIP 1	
TYPOLOGY	Innovative doctorates responding to the innovation needs of companies and promoting the recruitment of researchers by companies (M4C2 - Inv. 3.3)
RESEARCH PROJECT	Study and development of models for computation in isotopic separation in cryogenic distillation columns
PRINCIPAL INVESTIGATORS	Prof. Giacomo Cao
DESCRIPTION OF DOCTORAL TRAINING	The research activity will help train professionals with characteristics consistent with mission 1 of the PNRR "Digitalization, Innovation, Competitiveness, Culture, and Tourism". In fact, the project involves participation in the development of the separation of non-radioactive stable isotopes through cryogenic distillation, already the subject of research through the Aria Project co-financed by the Autonomous Region of Sardinia. The non-radioactive stable isotopes being researched make possible crucial technological processes (silicon doping for the creation of microprocessors) and various advanced diagnostic procedures. Both participation in training

	courses for the development of adequate skills in modeling terms, and the direct support of highly specialized professional figures in the field of cryogenic distillation and isotope separation are envisaged.
COMPANY/RESEARCH INSTITUTION	A Meras Annos s.r.l. Legal head office: Via Grazia Deledda, 3 - 09101 Gonnese (CI) Contact person: Prof. Cristiano Galbiati
NO. OF MONTHS TO BE SPENT IN THE COMPANY/RESEARCH INSTITUTION	12
FOREIGN INSTITUTION	Mines ParisTech Legal head office: Rue Saint Honoré 35, Fontainebleau, France Contact person: Prof. Paolo Stringari
NO. OF MONTHS TO BE SPENT IN THE FOREIGN INSTITUTION	6
SCHOLARSHIP 2	
TPOLOGY	Innovative doctorates responding to the innovation needs of companies and promoting the recruitment of researchers by companies (M4C2 - Inv. 3.3)
RESEARCH PROJECT	Optimization of the isotopic separation process by cryogenic distillation
PRINCIPAL INVESTIGATOR	Prof. Giacomo Cao
DESCRIPTION OF DOCTORAL TRAINING	The research activity will help train professionals with characteristics consistent with mission 1 of the PNRR "Digitalization, Innovation, Competitiveness, Culture, and Tourism". In fact, the project involves participation in the development of the separation of non-radioactive stable isotopes through cryogenic distillation, already the subject of research through the Aria Project co-financed by the Autonomous Region of Sardinia. The non-radioactive stable isotopes being researched make possible crucial technological processes (silicon doping for the creation of microprocessors) and various advanced diagnostic procedures. Both participation in training courses for the development of adequate skills in modeling terms, the direct support of highly specialized professional figures in the field of cryogenic distillation and isotope separation are envisaged.
COMPANY/RESEARCH INSTITUTION	A Meras Annos s.r.l. Legal head office: Via Grazia Deledda, 3 - 09101 Gonnese (CI) Contact person Prof. Cristiano Galbiati
NO. OF MONTHS TO BE SPENT IN THE COMPANY/RESEARCH INSTITUTION	12
TPOLOGY	Mines ParisTech Legal head office: Rue Saint Honoré 35, Fontainebleau, France Contact person: Prof. Paolo Stringari
RESEARCH PROJECT	6